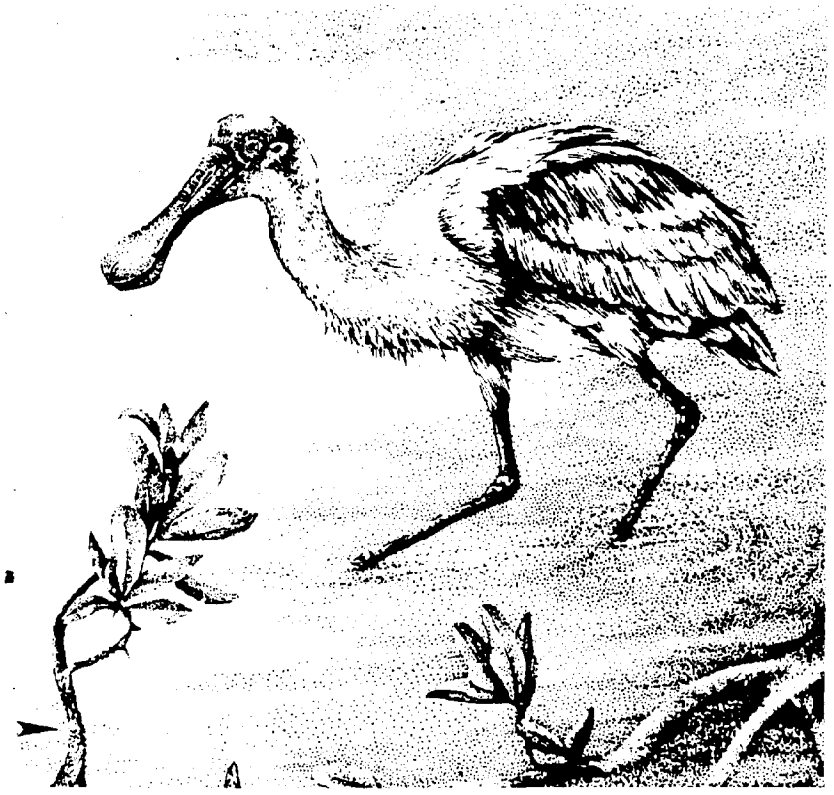
BISCAYNE BAY
CARD SOUND

AQUATIC PRESERVE MANAGEMENT PLAN



1991

DEPARTMENT OF NATURAL RESOURCES

MANAGEMENT PLAN
(cabinet draft)

FOR

BISCAYNE BAY AQUATIC PRESERVE
CARD SOUND

DECEMBER 1991

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Florida Department of Natural Resources

Division of State Lands

Bureau of Submerged Lands and Preserves

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EXECUTIVE SUMMARY

The Card Sound portion of Biscayne Bay Aquatic Preserve is recognized as an exceptional water resource of south Florida. The submerged portions of the preserve encompasses 17,000 acres of seagrass meadows, hard bottom communities and mangrove wetlands that are part of a larger system of protected waters and lands between the south Florida coast and the Florida Keys. This estuarine environment provides habitat for a wide variety of juvenile and adult marine species. The preserve encompasses critical habitat for the endangered Florida manatee and the American crocodile. The terrestrial and marine environments offer valuable habitat for more than 100 plant and animal species that are rare, threatened, endangered or species of special concern.

The marine resources of the preserve include expansive hardbottom communities with varying combinations of sponges, soft corals, hard coral and algae. The importance of this community to juvenile lobster prompted the Department to designate the area as a lobster sanctuary. Protection of nursery and settlement habitat enhances many of the other local fisheries.

The marine grassbeds in the preserve are prime feeding areas for wading birds and a valuable nursery area for juvenile fish and invertebrates, including many of commercial interest. In addition to habitat, the grassbeds perform valuable functions by trapping suspended sediments from the water column and stabilizing bottom sediments. Sea grasses, like their terrestrial counterparts, depend upon sunlight for life functions. Excessive nutrients and/or sediments in the water column reduce available light and can stress grassbed communities. Reproduction, stability and lowered energy production may result if communities are excessively stressed.

The preserve offers water oriented recreational opportunities to the metropolitan areas of Miami and south Florida, as well as the Keys. Activities within the preserve include boating, snorkeling, diving, commercial fishing, marine life collecting, charter sport fishing and recreational fishing. Impacts to resources as a result of these uses include propeller and grounding damage to grassbeds, extended boat anchoring which shades grassbeds, fishing and marine life collecting which introduce gear and chemicals that impact target and non-target species. Secondary impacts include suspension of sediments in the water column as a result of boat operation in shallow waters, individual personalized watercraft, ultra-light aircraft and private planes which disrupt wildlife, and chemicals and wastes introduced into waters of the preserve as a result of upland development and boats.

Pollution in the form of stormwater run-off and septic leachate are primary concerns in the preserve area. The preserve lies 'downstream' of the urban and agricultural development on the mainland. Extensive areas of former wetlands have been altered for drainage and flood control to accommodate this development. Diversion, alteration of flow rates and pollution contamination of the region's water resources has been cause for alarm among many resource managers and researchers. High density residential and commercial development on the north shoreline of Key Largo may also impact resources of the preserve. Expansive areas of the two major developments in this area are devoted to manicured lawns and golf courses. Pesticides, herbicides and fertilizers associated with these amenities are introduced into adjacent areas via run-off and drift. Most of these chemical compounds are toxic to marine organisms. Other pollution sources include desalinization and septic effluent.

Many of the noted impacts could be prevented or minimized with improved channel marking, land acquisition, public education, establishment of restricted boating areas, and an enforcement presence. This management plan establishes goals and objectives to address these and other management issues. Development of the plan and coordination with appropriate management or regulatory agencies and local government planning input are viewed as additional avenues to ameliorate these impacts and ensure that the purposes and intent of the aquatic preserve designation are fulfilled.

The main objective of the resource management program for the preserve is to protect natural resources for the benefit of future generations. On site management will be directed toward the maintenance of existing or essentially natural conditions and restoring damaged or degraded areas. Management activities will include gathering data on resources and protection of existing conditions through review of proposed and existing projects, input into local government planning efforts, and cooperative efforts with the other agencies and organizations who have education, research, resource management and acquisition projects in the area.

To protect natural resources and allow traditional uses, the preserve has been divided into several management areas. The management area designation is based upon the existing shoreline use and the quality of the adjacent submerged resources. Adjacent lands are developed with commercial and residential uses. Wetlands and currently vacant lands include many sensitive natural resource features that may degenerate or be destroyed by development. Acquisition of environmentally sensitive lands adjacent to the preserve is an additional management strategy to protect the preserve's resources.

The management plan also outlines the responsibilities of various agencies and their subdivisions as provided for through statutory direction and other applicable authorities. Management of certain aspects of the preserves resources can be enhanced through application of these programs. Whenever possible, existing programs and resources will be integrated into the management of the preserve. The statutory management authority for public and private uses of the preserve, as well as specific criteria for those uses are also provided. These uses are subject to the approval of the Board of Trustees or their designee. Approval is normally predicated upon demonstration that the proposed use is environmentally sound and in the public interest.

Management and protection of the aquatic preserve can be enhanced through research and education programs. Research is critical to determining the status of existing resources and to provide data for future reference and comparison. Proposed environmental education programs will coordinate with and be complimentary to existing programs whenever possible.

Funding and staffing levels to initiate the identified goals and objectives for resource management, protection, education and research are the minimum practicable for the identified areas. Continual monitoring of the accomplishments of this management plan will provide a standard for evaluating whether present budgetary and staffing estimates are adequate to manage and protect the preserve's resources for future generations.

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Copies of the legal description of the Card Sound portion of Biscayne Bay Aquatic Preserve, as well as copies of Chapters 253 and 258, F.S., and Chapters 18-18 and 18-21, F.A.C., may be obtained from: Bureau of Submerged Lands and Preserves
Department of Natural Resources
3900 Commonwealth Blvd.
Mail Station 125
Tallahassee, FL 32399-3000

CHAPTER I

INTRODUCTION

The Card Sound portion of Biscayne Bay Aquatic Preserve is located between the southeast mainland of Florida and the northern end of Key Largo, in Dade and Monroe counties. The aquatic preserve is part of a larger system of protected waters, which includes Biscayne Bay Aquatic Preserve, Biscayne National Park and the off-shore waters of John Pennekamp Coral Reef State Park and Key Largo National Marine Sanctuary. The preserve include approximately 17,000 acres of submerged lands and mangrove islands (Figure 1).

There are currently 42 aquatic preserves throughout the state (Figure 2). Card Sound is one of three preserves that are located in the Florida Keys. Lignumvitae Key Aquatic Preserve is located between Upper and Lower Matecumbe Keys and Coupon Bight is located south of Big Pine Key. Card Sound is unique within the state system because it is an estuarine nursery for commercially important marine species and a refuge for several endangered and threatened wildlife species. It also has the distinction of being one of the more pristine areas of south Florida.

The role of the Aquatic Preserve Program is to manage and protect the natural resources within the boundaries of a preserve through staff programs and coordination with other state and federal resource management programs. An integrated management plan encompassing all the legislatively delegated resource management and protection laws is essential in preserving the resource values of the preserve. Local government will be encouraged to incorporate this plan's management initiatives into the local government comprehensive plan.

The rich mosaic of resource types within the Card Sound portion of Biscayne Bay Aquatic Preserve contributes to the biological diversity and productivity of marine systems and enhances man's enjoyment of the area. The aquatic preserve was designated by the Florida Legislature in 1969 to conserve and protect these values. This plan is intended to be used as the primary tool for management of the preserve to attain these goals. It is designed to be site-specific in addressing resource management issues relative to lands within the preserve.

The process of developing this management plan involved compiling an inventory of resource information, coordinating with other plans that have been developed for the area and state, and identifying resource and management issues related

to present and future uses of the preserve and adjacent uplands. Various management areas will be identified or delineated. Supporting goals, objectives and tasks were developed to be consistent with statutory authority and the overall intent of the Aquatic Preserve Program for helping ensure that the resources of the Card Sound portion of Biscayne Bay Aquatic Preserve will remain for present and future generations to enjoy. As additional resource information becomes available or as laws are implemented or revised, the management plan will be changed to reflect those events.

The Governor and Cabinet, sitting as the Board of Trustees of the Internal Improvement Trust Fund has been legislatively delegated statutory authority (Section 253.03, Florida Statutes) to exercise proprietary control over state-owned lands and may assign management responsibilities for those lands to appropriate governmental agencies. Development and implementation of this management plan will be through the administrative support and the field staff of the Department of Natural Resources (DNR), Division of State Lands, Bureau of Submerged Lands and Preserves.

More specifically, this plan is divided into chapters according to their management application:

Chapter II cites the statutory authorities upon which this resource management program and plan are built.

Chapter III provides a description of the aquatic preserve and details the physical, biological and cultural components of the preserve.

Chapter IV contains an overview of regional and local land use and associated impacts.

Chapter V delineates the management areas within the preserve. These areas are defined by taking into account the quantity and the quality of the biological resources in conjunction with the use of the adjacent lands.

Chapter VI presents specific needs and issues that are unique to the preserve that are not addressed through statute or code.

Chapter VII outlines the program's goals, objectives, and the tasks required to fulfill those needs within the preserve for resource management, resource protection, research, and environmental education.

Chapter VIII identifies local, regional, state, and federal agencies, their authorities and programs, and how they related and assist in protection and management of the preserve. It

also identifies non-governmental organizations, interest groups, and individuals that have interest in or may assist in management objectives.

Chapter IX projects future staffing and fiscal needs necessary for providing effective management and protection of the preserve, as well as supporting research and environmental education.

Chapter X outlines a monitoring program for recording and reporting resource changes and establishes a tracking system for detailing the progress and accomplishments in resource management.

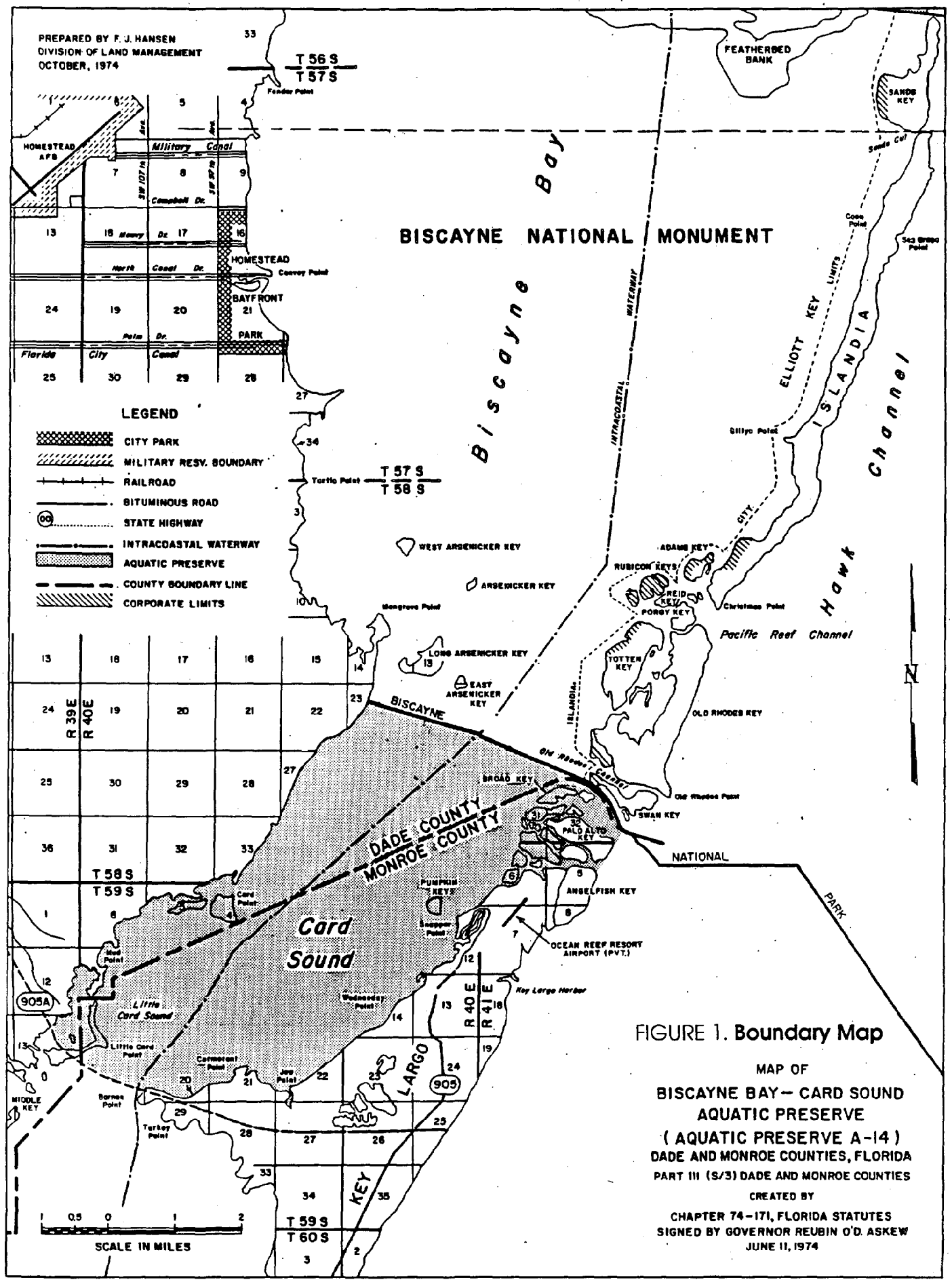


FIGURE 1. **Boundary Map**

MAP OF

BISCAYNE BAY – CARD SOUND AQUATIC PRESERVE

(AQUATIC PRESERVE A-14)

DADE AND MONROE COUNTIES, FLORIDA

PART III (S/3) DADE AND MONROE COUNTIES

CREATED BY

CHAPTER 74-171, FLORIDA STATUTES

SIGNED BY GOVERNOR REUBIN O'D. ASKEW

JUNE 11, 1974

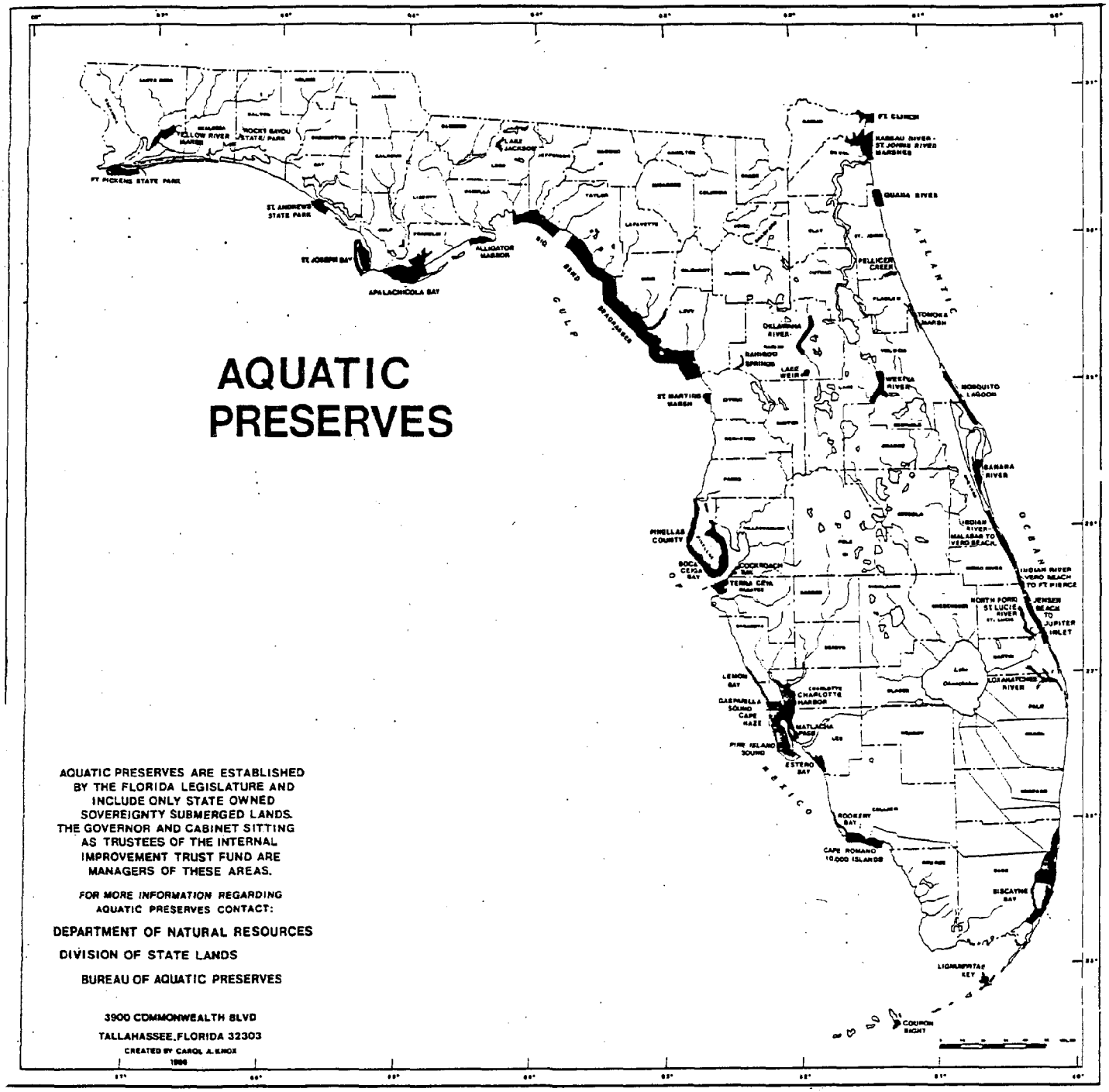


FIGURE 2. **Florida Aquatic Preserves**

CHAPTER II

MANAGEMENT AUTHORITY

The laws supporting aquatic preserve management are the direct result of the public's awareness and interest in protecting Florida's aquatic environment. The rampant dredge and fill activities that occurred in the late 1960's fostered this widespread concern.

In 1967, the Florida Legislature passed the Randall Act (Chapter 67-393, Laws of Florida), which established procedures regulating previously unrestricted dredge and fill activities on state-owned submerged lands. That same year, the legislature provided the statutory authority (Section 253.03, F.S.) for the Board of Trustees to exercise proprietary control over state-owned lands. Also, in 1967, government focus on protecting Florida's productive water bodies from development led to the Board of Trustees' establishment of a moratorium on the sale of submerged lands to private interests. That same year, an Interagency Advisory Committee (IAC) was created to develop strategies for the protection and management of state-owned submerged lands.

In 1968, the Florida Constitution was revised to declare in Article II, Section 7, the State's policy of conserving and protecting natural resources and scenic beauty. That constitutional provision also established the authority for the legislature to enact measures for the abatement of air and water pollution. Later that same year, the IAC issued a report recommending the establishment of twenty-six aquatic preserves.

On October 21, 1969, the Governor and Cabinet acted upon the recommendations of the IAC and adopted, by resolution, eighteen of the water bodies as aquatic preserves, which included Biscayne Bay Aquatic Preserve and Card Sound. Other preserves were individually adopted at subsequent times through 1989.

A. STATUTORY AUTHORITY

The fundamental laws providing management authority for the Card Sound Portion of Biscayne Bay Aquatic Preserve are contained in Chapters 258 and 253, Florida Statutes (F.S.). These statutes establish the proprietary role of the Governor and Cabinet, sitting as the Board of Trustees of the Internal Improvement Trust Fund, as Trustees over all sovereignty submerged lands. In addition, these statutes empower the Trustees to adopt and enforce rules and regulations for

managing all sovereignty submerged lands, including aquatic preserves.

In particular, Sections 258.35-258.46, F.S., enacted in 1975 by the Florida Legislature, represent the **Florida Aquatic Preserve Act.** These statutes set forth a standardized set of management criteria for all designated aquatic preserves, and represent the primary laws governing use of sovereignty submerged lands within aquatic preserves.

The Legislative intent for establishing aquatic preserves is stated in Section 258.36, F.S.: **"It is the intent of the Legislature that the state-owned submerged lands in areas which have exceptional biological, aesthetic, and scientific value, as hereinafter described, be set aside forever as aquatic preserves or sanctuaries for the benefit of future generations."** This statement along with the special provisions of Section 258.397, that establishes the boundaries and management authorities specifically for Biscayne Bay Aquatic Preserve, clearly mark the direction for management of the aquatic preserve. Management will emphasize the maintenance of essentially natural conditions and will include submerged lands, publicly owned islands and those lands leased by the State. Privately held uplands are specifically excluded from the boundary but may be included upon negotiated agreement with the Board of Trustees. Lands transferred to Biscayne National Park are specifically excluded (with certain reservations of state interests) from the boundary (Section 258.397 2(a)(b)(c)).

Management responsibilities for aquatic preserves may be fulfilled directly by the Board of Trustees or by staff of the Division of State Lands of the Department of Natural Resources through delegation of authority. Other governmental bodies may also participate in the management of aquatic preserves under appropriate instruments of authority issued by the Board of Trustees. The Division staff serve as the primary managers who implement provisions of the management plans and rules applicable to the aquatic preserves. Staff evaluate proposed uses or activities in the preserve, and assess the possible impacts on the natural resources. Project reviews are evaluated in accordance with the criteria in Sections 258.35-42, F.S. (Florida Aquatic Preserves Act), Chapter 18-21, Florida Administrative Code (Rules of Florida Aquatic Preserves), Chapter 18-18 Florida Administrative Code (Rules of Biscayne Bay Aquatic Preserve), and in accordance with the policies set forth in this plan.

Staff comments on proposed uses are submitted for consideration in developing recommendations to be presented to the Board of Trustees. This mechanism provides a basis for the Board of Trustees to evaluate public interest and the merits of any project while also considering potential

environmental impacts upon the aquatic preserves. Any activity located on submerged lands or state-owned uplands will require a consent of use, a lease or easement, or other approval from the Board of Trustees. Consent of use may be granted on small projects from the Division of State Lands in accordance with the authority delegated by the Board.

B. ADMINISTRATIVE RULES GOVERNING AQUATIC PRESERVES

Chapters 18-20 and 18-21, Florida Administrative Code (F.A.C.), are the administrative rules directly applicable to the uses of aquatic preserves specifically, and submerged lands in general. The general rules in Chapter 18-20, F.A.C., are supplemental to the rules in Chapter 18-21, F.A.C, in the regulation of activities in aquatic preserves.

Chapter 18-18, F.A.C. rules apply specifically to those submerged lands, both public and private, within Biscayne Bay Aquatic Preserve. The provisions of the three rules are intended to be used together in the management of Biscayne Bay and Card Sound. Where a provision of one rule may be more stringent than another rule provision, the intent is that the more stringent provision for maintenance of the aquatic preserve shall prevail (Section 258.39, F.S.).

1. CHAPTER 18-18, F.A.C.

Chapter 18-18, F.A.C., specifically addresses Biscayne Bay Aquatic Preserve and drives its authority from Sections 258.35, 258.36, 258.37, 258.38, 258.39, and 258.397, F.S. The intent of this rule is contained in Section 18-18.001, F.A.C., which states:

> "(1) The Biscayne Bay Aquatic Preserve, the boundaries of which are fully described in 18-18.002, F.A.C. was established for the purpose of preserving and enhancing Biscayne Bay and all natural waterways tidally connected to the bay in an essentially natural condition so that its biological and aesthetic values may endure for the enjoyment of future generations.
>
> (2) These rules shall apply to all lands public and private within the boundaries of the preserve. However, privately owned uplands shall be excluded from these rules except as otherwise provided for herein.
>
> (3) In promulgating and implementing these rules, it is the intent of the department to construe the provisions of Sections 258.397 and 258.35 through

258.46 F.S. together and to apply the more stringent statutory provisions for the maintenance of the preserve.

(4) The preserve shall be administered and managed in accordance with the following goals:

(a) To preserve, protect, and enhance Biscayne Bay and all natural waterways tidally connected to the bay by reasonable regulation of human activity within the preserve through the development and implementation of a comprehensive management program;

(b) To protect and enhance the waters of the preserve so that the public may continue to enjoy the traditional recreational uses of those waters such as swimming, boating and fishing;

(c) To coordinate with federal, state, and local agencies to aid in carrying out the intent of the legislature in creating the preserves;

(d) To use applicable federal, state, and local management programs, which are compatible with the intent and provisions of the Act and these rules, to assist in managing the preserve;

(e) To encourage activities that protect or enhance the biological and aesthetic values of the preserve, including but not limited to the modification of existing manmade conditions towards their natural condition when reviewing applications or developing and implementing management plans for the preserve;

(f) To preserve and promote indigenous life forms and habitats including but not limited to sponges, soft corals, hard corals, seagrasses, mangroves, mud flats, marine reptiles, game and non-game fish species, marine mammals, tropical marine invertebrates, birds and shellfish;

(g) To acquire additional title interests in land wherever such acquisitions would serve to protect or enhance the biological or aesthetic values of the preserve."

2. CHAPTER 18-20, F.A.C.

Chapter 18-20, F.A.C., specifically addresses aquatic preserves and derives its authority from Sections 258.35, 258.36, 258.37, and 258.38, F.S. The intent of this rule is contained in Section 18-20.001, F.A.C., which states:

"(1) All sovereignty lands within a preserve shall be managed primarily for the maintenance of essentially natural conditions, the propagation of fish and wildlife, and public recreation including hunting and fishing where deemed appropriate by the board and the managing agency.

(2) The aquatic preserves which are described in Chapter 73-534, Laws of Florida, Sections 258.39, 258.391, 258.392, and 258.393, Florida Statutes, future aquatic preserves established pursuant to general or special acts of the legislature, and in Rule 18-20.002, Florida Administrative Code, were established for the purpose of being preserved in essentially natural or existing condition so that their aesthetic, biological and scientific values may endure for the enjoyment of future generations.

(3) The preserves shall be administered and managed in accordance with the following goals:

(a) to preserve, protect, and enhance these exceptional areas of sovereignty submerged lands by reasonable regulation of human activity within the preserves through the development and implementation of a comprehensive management program;

(b) to protect and enhance the waters of the preserves so that the public may continue to enjoy the traditional recreational uses of those waters such as swimming, boating, and fishing;

(c) to coordinate with federal, state, and local agencies to aid in carrying out the intent of the Legislature in creating the preserves;

(d) to use applicable federal, state, and local management programs, which are compatible with the intent and provisions of the act and these rules, and to assist in managing the preserves;

(e) to encourage the protection, enhancement, or restoration of the biological, aesthetic, or scientific values of the preserves, including

but not limited to the modification of existing man-made conditions towards their natural condition, and discourage activities which would degrade the aesthetic, biological, or scientific values, or the quality, or utility of a preserve, when reviewing applications, or when developing and implementing management plans for the preserves;

(f) to preserve, promote, and utilize indigenous life forms and habitats, including but not limited to: sponges, soft coral, hard corals, submerged grasses, mangroves, saltwater marshes, freshwater marshes, mud flats, estuarine, aquatic and marine reptiles, game and non-game fish species, estuarine, aquatic, and marine invertebrates, estuarine, aquatic, and marine mammals, birds, shellfish and mollusks;

(g) to acquire additional title interests in lands wherever such acquisitions would serve to protect or enhance the biological, aesthetic, or scientific values of the preserve;

(h) to maintain those beneficial hydrologic and biologic functions, the benefits of which accrue to the public at large."

3. CHAPTER 18-21, F.A.C.

Chapter 18-21, F.A.C., controls activities conducted on sovereignty submerged lands in general and is predicated on the provisions of Sections 253.03, and 253.12, F.S. The stated intent of this administrative rule is:

"(1) to aid in fulfilling the trust and fiduciary responsibilities of the Board of Trustees of the Internal Improvement Trust Fund for the administration, management, and disposition of sovereignty lands;

(2) to insure maximum benefit and use of sovereignty lands for all citizens of Florida;

(3) to manage, protect, and enhance sovereignty lands so that the public may continue to enjoy traditional uses including, but not limited to, navigation, fishing and swimming;

(4) to manage and provide maximum protection for all sovereignty lands, especially those important to

public drinking water supply, shellfish harvesting, public recreation, and fish and wildlife propagation and management;

(5) to insure that all public and private activities on sovereignty lands which generate revenues or exclude traditional public uses provide just compensation for such privileges;

(6) to aid in the implementation of the State Lands Management Plan."

Section 18-21.0041, F.A.C. titled, Florida Keys Marina and Dock Siting Policies and Criteria, also contains specific policies and criteria for all applications for leases, easements or consent to use sovereignty submerged lands for multi-slip docking facilities in Monroe County. Section 18-21.0041 (1) of the rule further states:

"The following General Policies and Specific Criteria shall be used in developing recommendations to approve, approve with conditions or deny the use of state owned sovereignty submerged lands for multi-slip docking facilities.

(a) General Policies - special attention and consideration shall be given to the following:

1. the proximity to and potential adverse impacts on any rare, threatened or endangered species, or species of special concern, or their habitat, or on any portion of the entire Florida Reef Tract and other corals, including but not limited to those in the John Pennekamp Coral Reef State Park, Key Largo National Marine Sanctuary, Looe Key National Marine Sanctuary, and Everglades National Park;

2. eliminating any adverse impacts on wetland or submerged vegetation or benthic communities; and

3. requiring adequate tidal flushing and/or circulation;

4. maintaining or enhancing water quality at levels within or above State water quality standards;

5. requiring adequate water depths to avoid dredging and other bottom disturbance;

6. requiring consistency and conformity with local government land use plans, zoning, and other land use or development regulations; and

7. requiring consistency and conformity with Chapters 27F-8, 27F-9, 27F-10, 27F-11, 27F-12, 27F-13, and 27F-15, Florida Administrative Code, as amended, "Principles for Guiding Development in the Florida Keys Area of Critical State Concern."

Section 18-21.0041 (b), F.A.C. provides specific criteria for location, leasing, design and other requirements for projects in the Florida Keys.

C. RELATIONSHIP TO OTHER APPLICABLE PLANS AND PROGRAMS

The State Comprehensive Plan, established by Chapter 187, F.S., provides long-range policy guidance for the orderly social, economic and physical growth of the state. As such, the State Comprehensive Plan provides direction for the management of the physical resources within the state. The goals, objectives and policies set forth in this aquatic preserve management plan are designed to be consistent with those in the State Comprehensive Plan that pertain to the water resources, coastal and marine resources and natural systems.

The Conceptual State Lands Management Plan, adopted on March 17, 1981, and amended by the Board of Trustees on July 7, 1981 and March 15, 1983, contains specific policies concerning spoil islands, submerged land leases, "Outstanding Native Florida Landscapes," unique natural features, seagrass beds, archaeological and historical resources, and endangered species. These policies provide some of the fundamental direction for formulating management plans and policies of the Aquatic Preserves Program.

The Local Government Comprehensive Plans (LGCP) for Dade and Monroe counties are required by the Local Government Comprehensive Planning and Land Development Regulation Act to have a comprehensive management plan with elements relating to different governmental functions (e.g., housing, physical facilities, conservation, land use, coastal zone protection, etc.) Each plan, in effect, is intended to guide the future development of each respective county. Cities and counties are to adopt land development regulations and conform to the criteria, policies, and practices of their comprehensive plans, which must be updated periodically as required by recent statutory amendments.

The intent of the Aquatic Preserve Program is to guide county governments during their planning process towards developing local planning criteria and standards that will be consistent with the objectives of the program. Dade County has completed and adopted a comprehensive plan. Pertinent elements of that plan were found to be consistent with the intent of the LGCP act. Monroe County has completed a comprehensive plan that is currently being reviewed by the Department of Community Affairs.

South Florida Water Management District has completed a Surface Water Improvement Management (SWIM) Plan for Biscayne Bay. This plan is directed toward maintaining and restoring surface water resources. Restoration, monitoring and abatement are principle objectives currently being implemented. Goals, objectives and/or projects are compatible with or complementary to the intent of the state lands rules and this plan.

The recently drafted Everglades SWIM Plan addresses the much broader issues of the region. The Everglades Protection Area covered under this plan includes five water conservation areas, Everglades National Park, Florida Bay, adjacent basins and tributaries of these water bodies. Water flow, timing and quality are paramount to the vitality of the Everglades and estuarine ecosystems. Flood protection, water quality, groundwater recharge, habitat quality, recreation and other complex issues will also be have to be addressed. The draft plan establishes goals and objectives to establish stormwater containment sites, abate and monitor nutrients originating from the agricultural areas, restore historic water flows and periodicity to the Everglades and to modify water delivery to estuarine areas. Water quality assessments and monitoring, resource management and public education are also essential to the goals of the draft plan.

Many of the resource management, protection and monitoring goals outlined within this aquatic preserve management plan will be complimented and enhanced by the successful implementation of a number of other programs and plans for this region. Those relative to the aquatic preserve are discussed further in Chapter VII and VIII of this plan.

CHAPTER III

RESOURCE DESCRIPTION

A. LOCATION AND BOUNDARIES

The Card Sound portion of Biscayne Bay Aquatic Preserve contains approximately 17,000 acres of sovereign submerged lands located in Monroe and Dade counties and is more particularly described as follows and on the boundary map in Figure 1. The boundary map and this description are intended for informational and illustrative purposes only. They are not intended, nor do they represent the legally recorded boundaries of the preserve. Neither does this description exclude any natural waterways tidally connected to the preserve, which are not included in the description, nor does it include submerged lands of Biscayne National Park or privately held uplands, as provided for in Chapter 258.397, F.S. and Chapter 18-18.002, F.A.C.

Commencing at the southeasterly corner of Biscayne National Park boundary and the confluence of Broad Creek and the Monroe/Dade County line, proceeding easterly along the southern boundary of Biscayne National Park to the junction of that boundary with the coastal mainland of Dade County. Proceeding southwesterly along the westerly mean high water line of Biscayne Bay to the right-of-way of State Road 905A. Thence proceeding southeasterly along said right-of-way and crossing the Monroe County line to a point southwest of the Card Sound Bridge. Then proceeding northeasterly following the easterly mean high water line of Biscayne Bay along the westerly shores of the most easterly islands and Keys with connecting lines drawn across tidal creeks between the closest points of adjacent islands to the southeasterly intersection of Biscayne National Park boundary and the Monroe/Dade County line at Broad Creek.

The Monroe County portion of the preserve adjoins the western shorelines of north Key Largo, Broad Key, Linderman Key, Pumpkin Key, and several unnamed mangrove islands near Broad and Angelfish Creeks and northeast of the Card Sound Road (SR 905A). Extensive coastal development is primarily limited to the northern tip of Key Largo and includes Ocean Reef Club and the Angler's Club, two private residential/commercial and marina developments. Broad, Linderman and Pumpkin Keys exhibit modest residential development with attendant facilities.

The Dade County portion of the preserve adjoins a primarily undeveloped shoreline. Exceptions are the Model Land Company canal and the Card Sound cooling canals serving the Turkey Point power plant. A modest commercial development and

makeshift dockage is located near the northeast end of Card Sound Bridge. There are also several small, unnamed and undeveloped mangrove islands near Card Point, Mud Point and Little Card Point.

This portion of Biscayne Bay Aquatic Preserve is a part of a larger area of protected marine environments. As noted, Biscayne National Park is located to the north. John Pennekamp Coral Reef State Park and Key Largo National Marine Sanctuary are located to the east of Key Largo. Protected upland areas include the Crocodile Lakes National Wildlife Refuge and the Key Largo Hammocks State Botanical Site on Key Largo.

Card Sound is a prime settlement and nursery site for a large variety of marine fauna. The importance of this area to juvenile spiny lobster (Panulirus argus) prompted the Department of Natural Resources to designate the area as a Lobster Sanctuary. The boundary of the sanctuary roughly corresponds to that of this portion of the preserve described in the opening paragraphs. This area is closed to all harvesting of spiny lobster at all times.

Navigation interests in the area are served by the Intercoastal Waterway (ICW) that traverses the center of the Sound in a northeast/southwest orientation, connecting Biscayne Bay on the north with Barnes Sound to the south. Marked channel access to the Atlantic Ocean is available through Angelfish and Broad Creeks. The ICW corridor is excluded from the boundaries and management provisions of the preserve (Chapter 258.40 (2), F.S.).

B. GEOLOGY AND SEDIMENTS

The geology and sediment history of the Card Sound area is reflective of the ancient and modern processes of the marine environment. Formation of the present surficial geology began 100,000 years ago during the Pleistocene era when sea level was approximately 25 feet above the present level. The Florida Keys were submerged coral reefs that sheltered a shallow lagoon occupying most of what is today south Florida. These tropical marine waters teamed with organisms. Coral colonies flourished and generations of calcareous remains accumulated in the form of a highly porous rock formation called Key Largo Limestone Hoffmeister, 1974).

In the low energy, shallow waters behind the reefs, bits of sand or shell where gently rolled back and forth and were gradually coated with thin films of calcium carbonate. Cross-sections of these concentric formations look like eggs, or ooids from the Greek. This formation was named the Oolitic facies of the Miami Limestone, or Miami oolite. The second facies of the Miami Limestone is the Bryozoan facies which is

composed almost exclusively of the skeletal and shell remains of marine organisms cemented together in dense layers. Of the two facies of the Miami Limestones, only the oolite is of interest in the preserve area.

During the later period of Wisconsin glaciation, large volumes of the earth's water were bound up in glacial ice fields. Sea level dropped to 325 feet below present levels, approximately 10,000 years ago. The once submerged reefs became islands, the lagoon a low savannah or marsh. During the postglacial period of the recent Holocene, approximately 7,500 years ago, the sea rose and once again invaded the low area behind the islands to create the Bays and Sounds that we know today. Unlike other coastal lagoons in Florida, this system was not formed by river valleys having large amounts of alluvial sediments from upland sources. Both the ancient and modern sediments are typically produced by organisms that live in the bay (Wanless, 1969; Warzeski, 1976).

Card Sound, underlain by late Pleistocene bedrock, is 2-6 meters in depth, bordered on the east by Key Largo Limestone, to the northwest by an oolite ridge of Miami Limestone, and to southwest by the Everglades platform. Spencer (1967) and Hoffmeister (1974) further review evolution of bedrock beneath the Florida Keys and Everglades.

Modern sediments within Card Sound display a distinct gradient zonation from north to south. Longshore drift from the barrier islands to the north introduce quartzous sand into the south portions of Biscayne Bay and the northern parts of Card Sound. Calcarenite sands are more prevalent in the southwestern portions of the Sound (Earley and Goodell, 1968).

Small amounts of quartz may be eroded from exposed portions of the late Pleistocene Pamlico (sandstone) formation but most sediments are carbonate sand tidal bars, paralic peats, freshwater peats and calcitic mud deposits. Most of these deposits are along protected shorelines that have not been eroded. In the remainder of the Sound, a veneer (less than 15 centimeters) of quartz and carbonate sands overlies the bedrock. Depressions in the bedrock accumulate lime muds in association with seagrass beds (Wanless, 1969).

Irregularities of the basin floor and vagaries of tides and currents create the tidal bars known as Cutter Bank and Little Card Bank. Bottom topography and friction slow currents and heavier particles of sediment drop to the bottom. Sea grassbeds have a similar affect. Dense grass blades baffle the water stream and fine sediments are trapped within the blades and shoots.

Storm sedimentation plays a major role in reworking and redistributing the sediments within the Sound. Northerly winds

associated with cold fronts transport unstable sands southward. Muddy sediment is suspended in the water column and redistributed to seagrass beds, tidal deltas and tidal bars, or is carried out of the Sound on falling tides. The more forceful hurricane winds and storm surge are major agents which modify sediment bodies. Unconsolidated sediments of the Bay, Sound and reef tract are mixed and redeposited. Storm surge and waves may erode exposed shoreline sediments to bedrock. Mangrove mucks are thoroughly flushed and redeposited. As flood waters recede, layers of sediment up to 10 cm thick may be deposited upon land areas and/or carried offshore by storm discharge and tides (Warzeski, 1976).

C. PHYSIOGRAPHY AND HYDROLOGY

Card Sound is an extension of the shallow Biscayne Bay basin. Average midbasin water depths are 8-10 feet. Cutter Bank, on the north is traversed by a 6-7 feet deep channel and Card Bank on the south is traversed by a 5-7 feet deep channel in the immediate vicinity of the ICW. Card Bank, over much of its length, is less than 2 feet below the waters surface and effectively isolates Little Card Sound and represses tidal flood to the south.

Land areas to the west of the Sound are typically less than 2 feet above sea level up to 2 miles inland. This low profile, saltmarsh and mangrove forested shoreline contributes little channelized run-off into the Sound. Most freshwater run-off is gradually distributed as sheet flow and subsurface seepage, with two exceptions.

The Model Land Company canal channels direct run-off from lands to the west and north, often introducing large pulses of freshwater during the rainy season (July-September). The Turkey Point power plant takes in waters from the Sound for cooling equipment and after circulation through an extensive series of canals, the water is returned to the Sound. Salinity and other chemical constituents of the effluent water are dependent upon rainfall, evaporation rates, and residence time in the canals.

Historical freshwater water movement from surface flow and ground seepage has been considerably altered throughout south Florida by the extensive systems of water management canals. Pumping for various uses and a loss of ground water recharge areas has also affected the overall freshwater budget for the area. The net result of these changes has reduced input of fresh water into Biscayne Bay and Card Sound (SFWMD, 1988). More detailed reports on the hydrologic features of the major drainage basins were prepared for the Water Management District by Cooper and Lane, 1987.

Irrigation and potable water supplies are pumped from the Biscayne Aquifer at several wellfields in Dade County. The U.S. Geological Survey has conducted numerous surveys and can provide additional references regarding the characteristics and geology of the aquifer.

Key Largo does not have any permanent sources of freshwater. Most rainfall quickly percolates through the thin soils and porous limestone to be rapidly returned to the surrounding sea. Large quantities of freshwater are utilized by the two major developments on the north end of the island and most of this is returned to the ground as secondary treated sewerage. Ocean Reef Club operates a private sewerage collection system with secondary package treatment plants that have a daily maximum treatment capacity of 450,000 gallon per day. The secondary treated effluent is pumped into an array of 50 shallow wells (bore holes) that penetrate 10-90 feet below the surface. Angler's Club has a secondary plant with a 35,000 gallon per day capacity with a 9,000 gallon aeriation tank. Total combined capacity is 44,000 gallons per day. Ocean Reef Club also operates a reverse osmosis (r/o) plant that has a maximum daily capacity of 76,000 gallons. Desalinated water is used for irrigation of three golf courses and other grounds. Effluent from the r/o plant is discharged to surface waters in a canal (FDER, 1991). The smaller developments on Pumpkin, Broad and Lindeman Keys operate individual septic tanks or cess pools.

Tides are semi-diurnal with two highs and two lows of unequal amplitude. Tidal range for the north Biscayne Bay area is 2.5 ft. Maximum range in Card Sound is less than one foot (van de Kreeke and Wang, 1984; Swakon and Wang, 1977). Tidal flood (import) to the Bay is provided primarily by the broad shallow pass between Key Biscayne and the Ragged Keys, known as the Safety Valve. Minimal tidal import is provided to the south Bay and Card Sound through Caesers, Broad and Angelfish Creeks. Tidal flood is to the south and southwest. Tidal ebb is typically a simple reversing pattern.

Studies by Lee and Rooth (1972) indicate that tidal mixing and flow characteristics are generally poor within the Sound due to the configuration of the Sound and the characteristics of tides (tidal wave length, amplitude, salinity gradient, temperature, direction, etc.). Tidal mixing is most pronounced in the immediate vicinity of the tidal inlets. Full tidal exchange in the interior of the Sound may take up to a year under certain conditions (average winds and tidal cycles).

Wind generated waves and currents are especially influential on water movement and mixing within Card Sound. During the summer months, prevailing easterly winds propel waters westward and weak eddies circulate to the north and southwest. The Sound is generally protected from the full force of

prevailing easterly winds by the elongate land mass of Key Largo.

During the winter months frequent cold fronts pass over the area. Winds shift gradually to the northeast or north with increased wind speeds (20-35 miles per hour (m.p.h.)) before and after the front passes. Surface turbulence and cooler temperatures enhance thermal and chemical mixing of stratified layers. This process enhances exchange in the vicinity of the tidal inlets, thereby reducing the residence time of waters in the Sound. Full tidal flushing under these conditions is achieved in a much shorter period of time than previously noted (Lee and Rooth, 1972).

D. CLIMATE

Typically labeled as subtropical, the local environment is greatly influenced by the warming influence of the Gulf Stream and Florida Current. Summers (June-September) are warm and humid. Winters (November-March) are dry and balmy with frequent cold fronts in midwinter. Fall is typified by hot, humid weather in September that gradually cools and becomes noticeably drier by November. Spring is dry and warm. Sunlight is intense during 66% of daylight hours. Skies are sunny 72% of the daylight hours during the average year (Shermyen, 1989).

The annual average air temperature in Miami is 75.6 degrees Fahrenheit (F) with and average high of 82.4 degrees F in July and an average low of 67.1 degrees F in January (Shermyen, 1989). Temperatures in the vicinity of Card Sound are expected to be slightly lower than in Miami during the summer months because of the cooling influence of prevailing winds.

Water temperatures in Biscayne Bay average 66.2 degrees F in winter and 87 degrees F in summer. Cold fronts may cause 18 degree F drops in temperatures within a few days (Bader and Roessler, 1971).

Winds of less than 6 m.p.h. occur about 25% of the time and less than 11.5 m.p.h. 60% of the time. Average annual wind speeds are 9.2 m.p.h. in Miami and 11.2 mph in Key West (Shermyen, 1989). Higher winds occur during summer thunder storms and winter cold fronts. Cyclonic winds associated with tropical storms (38-73 m.p.h.), hurricanes (74-123 m.p.h.) and great hurricanes (>124 m.p.h.) may be expected from June until October.

Rainfall can vary substantially from month to month and from place to place throughout south Florida. The annual average for Miami is 57.55 inches (Shermyen, 1989). The average for the upper Keys is 42.7 inches (White, 1988.) The largest

proportion (70%) is associated with summer thunder storms and occasional tropical storms from June to October with lesser amounts occurring during passage of winter cold fronts.

Air pollution associated with the metropolitan area of Miami is above the average for the state and the Keys. Occasional lulls in prevailing winds during the summer months aggravate air quality. A brownish haze (primarily automobile exhaust) can be seen for great distances. The annual geometric mean for Miami is 73 micrograms (of particulate matter) per square meter (UG/m2). The Key West average is 41 UG/m2. The Florida mean standard is 60 UG/m2 (Shermyen, 1989). Air quality in the upper Keys is expected to be comparable to Key West because of easterly prevailing winds.

E. WATER QUALITY

Water quality is generally better in the southern reaches of Biscayne Bay than in the more highly developed and restricted areas in the northern Bay. A summary of data from Dade County Department of Environmental Resources Management (DCDERM) indicates that conditions and trends are generally much better in the Bay than had previously been thought. Relevant parameters from Dade's DERM sampling include salinity, dissolved oxygen, turbidity, nutrients, trace metals, and coliform bacteria.

Salinities in Card Sound would approach sea water values at or above 34 parts per thousand (ppt) except in the areas of the two previously mentioned canals. Data are not available for those areas but values for other canal systems to the north (Mowry and Black Creek) are usually less than 30 ppt, reflecting the influence of freshwater input (DCDERM, 1987).

Dissolved oxygen (DO) values are similarly affected by freshwater discharge areas. Canal mouths often had less than the 6 milligrams per liter (mg/L) that is considered the ambient level of dissolved oxygen. The station in Card Sound exhibited ambient or better levels of dissolved oxygen (DCDERM, 1987). Periodic sampling by DER near the Card Sound bridge during 1990 exhibited similar DO values (FDER, 1990). Typical nutrient values, including ammonia nitrogen, nitrate/nitrite nitrogen, and phosphate phosphorus are at or below background levels in Card Sound. Sampling areas to the north of the Sound that frequently have high nutrient levels (ammonia) are associated with canals (Mowry and Goulds) and/or the land fill near Black Point (DCDERM, 1987).

In the DCDERM study, trace metals were compared with the reported maximum average values for South Eastern United States coastal waters (from Windom and Smith, 1984; Windom, et al., 1983; Windom, 1977; Windom, et al., 1971). Values for

cadmium and iron were lower in Card Sound than those reported as the southeastern maximum average and lower than most of the sampled stations in the Bay. Copper was minimally above the southeastern average but still well below 9 of the 10 other Bay stations, at 0.5 micrograms per liter.

Lead is well above the southeastern average throughout the Bay. Values in Card Sound are comparable to other areas of the Bay, with the exception of Miami River, which is double the median for other stations.

Median zinc values were also higher than the southeastern average. Zinc values in Card sound were also amazingly higher than 8 of the other 10 Bay stations, including the Miami River station. Values for Card Sound were equal to the remaining two stations (Dumbfoundling Bay and Little River) with 11 micrograms per liter but still well within the state standards (1000 micrograms per liter)(DCDERM, 1987).

Turbidity within Card Sound is a result of both nature and man's activities. Strong winds associated with winter cold fronts resuspend sediments for several days after the passage of the front. This condition is probably representative of conditions throughout the Bay during the winter months. Higher levels of turbidity in the vicinity of channels and near the creeks is often exacerbated by boat traffic. Eroded sediments from spoil banks also creates localized turbidity problems. Dredging and upland run-off are additional sources of turbidity that are usually regulated to avoid chronic levels.

F. BIOLOGICAL COMMUNITIES

This section will discuss major plant and animal associations or communities within the preserve. Individual species are grouped in representative community types based upon dominance or absence of certain floral and faunal constituents. General descriptions and species lists are intended to be reflective of the community being discussed under each subheading. The listing of a species in one community does not limit its occurrence to that community. Each community association is presented separately, but in reality they display an infinite variety of mixed and interdependent associations.

Subtle differences in geology, topography, and other physical parameters may determine the initial dominance of a particular association in an area, or the particular area may be modified by the existing biota and thus evolve or succeed into an entirely different association. The natural components of the environment are never static and usually progress in an orderly sequence of change from one sere to the next. Each succeeding sere is generally more complex and diverse than the previous association. Those communities that have reached a

climax or balanced condition are usually most productive in terms of biomass and species diversity.

Catastrophic events, such as hurricanes and man-made alteration of natural features disrupt orderly progression and may set back the sere to an earlier stage that is less productive. Many of the man-made disturbances will be discussed in the text. These changes not only inhibit or reverse succession but may replace entire associations with other less productive environments. The affected environment or community is not the only one to be diminished. All marine systems are interrelated and thus changes to one association will directly or indirectly affect a number of other related and interdependent associations.

Major community associations in the preserve are mangrove/saltmarsh, marine grassbeds, and hardbottom. Figure 3 illustrates the various communities in the preserve.

1. Mangrove/Saltmarsh

The mangrove/saltmarsh community is a major component of the preserves resources, both in distribution and ecological value. This community is the most common interface between the upland and the marine environment. Shoreline stabilization, storm protection, filtration and stabilization of sediments, nutrient cycling and habitat diversity are only a few of the many functions that this community performs. It is composed of two diverse groups of salt tolerant plants.

The saltmarsh vegetation is represented by a large group of herbaceous and woody plants that lie landward of the fringing mangroves. Members of this plant community are often included in what is referred to as the "buttonwood" or "transition zone". It is distinguished by an open canopy of buttonwood (Conocapus erectus) trees and low growing species that are tolerant of periodic tidal inundation and extreme fluctuations in salinity. Plants in this community may also be intermixed with mangroves and beach/berm communities and form a rich mosaic of vegetative types. A partial list of the mangrove/saltmarsh vegetation is presented in Table 1.

TABLE 1

A PARTIAL LIST OF THE MANGROVE/SALTMARSH FLORA

Beach orach	Atriplex arenaria
Black mangrove	Avicinnia germinans
Saltbush	Baccharis spp.
Saltwort	Batis maritima
Sea oxeye daisy	Borrichia spp.

Saffron plum	Bumelia celestrina
Gray nicker	Caesalpinia crista
Seven-year apple	Casasia clusifolia
Saltgrass	Distichlis spicata
Seagrape	Coccoloba uvifera
Buttonwood	Conocarpus erectus
Geiger	Cordia sebestena
Clamshell orchid	Encyclia cochleata
Butterfly orchid	Encyclia tampensis
Seaside gentian	Eustoma exaltatum
Sedge	Fimbristylis castanea
Wild cotton	Gossypium hirsutum
Seaside heliotrope	Heliotropium curassavicum
Seaside hibiscus	Hibiscus tillaceus
Manchineel	Hippomane mancinella
Keys spider lily	Hymenocallis latifolia
White mangrove	Languncularia racemosa
Herbaceus sea lavender	Limonium carolinianum
Christmas berry	Lycium carolinianum
Sea lavender	Mallotonia gnaphalodes =Tournefortia gnaphalodes
Wild dilly	Manilkara bahamensis
Gutta percha mayten	Maytenus phllanthoides
Poisonwood	Metopium toxiferum
Key grass	Monanthochloe littoralis
Prickly pear cactus	Opuntia stricta
Knot grass	Paspalum distichum
Purslanes	Portulaca spp.
Red mangrove	Rhizophora mangle
Rouge berry	Rivina humilis
Glasswort	Salicornia spp.
Sea purslane	Sesuvium portulacastrum
Virginia dropweed	Sporobolus virginicus
Sea blight	Suaeda linearis
Bay cedar	Suriana maritima
Mahoe	Thespesia populnea
Air plants	Tillandsia spp.

Mangroves are a pan-tropical group, occurring on seventy-five percent of the worlds tropical coastline (McGill, 1959). Of the 72 species recognized by Chapman (1976), three species occur in Florida. Red mangrove (Rhizophora mangle) and white mangrove (Languncularia racemosa) grow along low energy shorelines from the Florida Keys to near Cedar Key on the west coast (Rehm, 1976) and north to Ponce de Leon Inlet on the east coast (Teas, 1977). Black mangrove (Avicennia germinans) extends farther north on the east coast to near 30 degrees north latitude and along the Gulf coast to Louisiana and Texas (McMillan, 1971). These tropical trees are sensitive to fluctuating temperatures and prolonged periods of cold or frost (Davis, 1940). Prolonged temperatures below 66 degrees F may be lethal or cause stunted growth forms (Waisel, 1972).

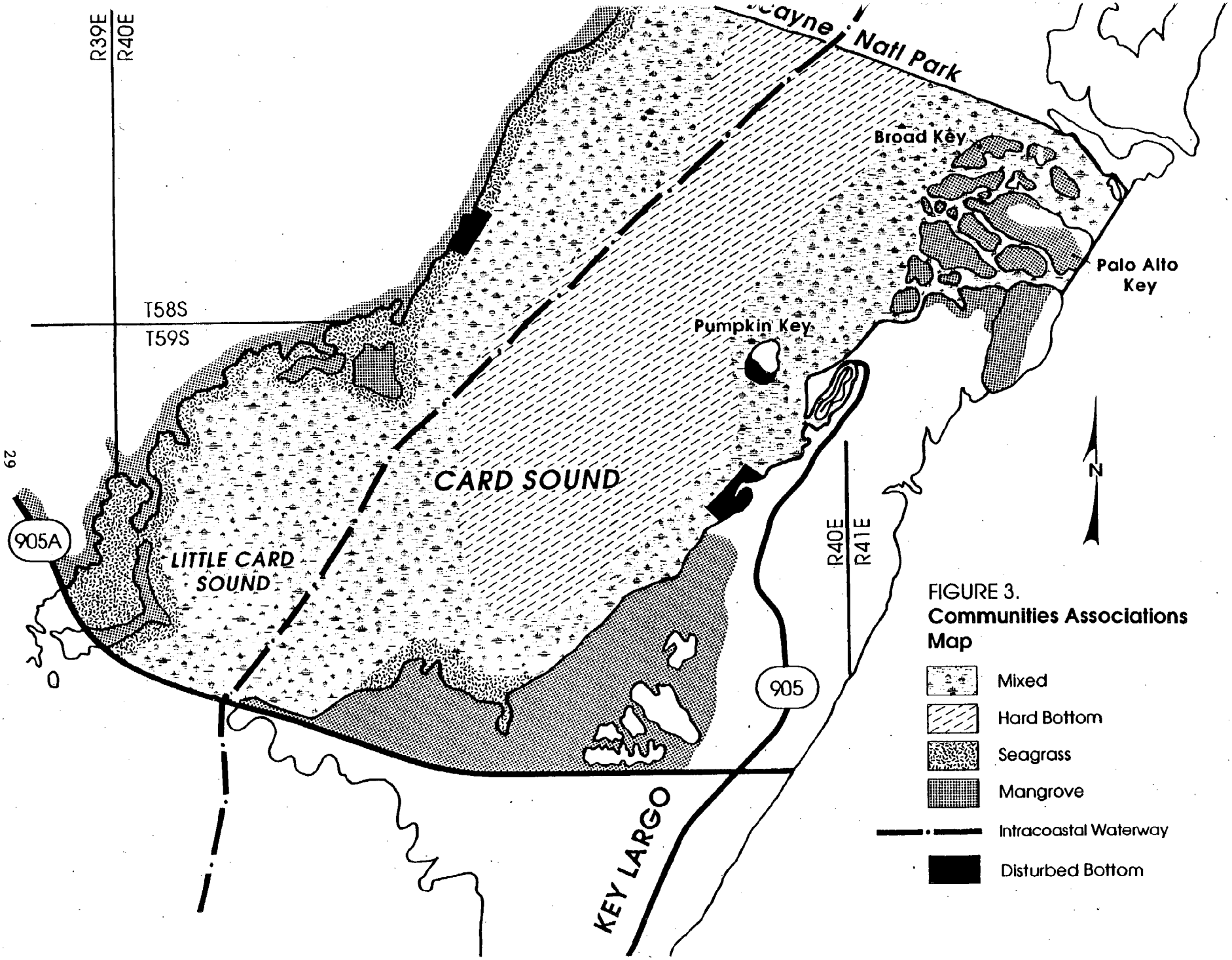


FIGURE 3.
Communities Associations Map

Accordingly, the largest mangrove forests (90% according to estimates by the Coastal Coordinating Council, 1974) are located in the more southern areas of the state, primarily in Lee, Collier, Dade, and Monroe Counties.

Of the six mangrove forest types described by Lugo and Snedaker (1974), only the fringing forest type is well represented in the preserve. Fringing mangroves are the most dominant feature of the mainland shoreline. The small islands along the eastern shoreline and in the tidal creeks are also dominated by fringing mangroves.

The larger islands (Key Largo, Broad Key, Linderman Key, and Palo Alto Key) exhibit a distinct zonation in vegetation. Tropical hardwood hammocks dominate higher elevations. Moving downslope, one encounters a narrow band of saltmarsh vegetation landward of the tidal interface. Fringing mangroves tend to dominate the intertidal zone and are especially abundant on the leeward sides of those islands that are protected from prevailing easterly winds and waves.

The dwarf mangrove forest (also called scrub mangroves by Lugo and Snedaker, 1974) are a dominant feature of the semi-impounded wetlands to the north of the preserve on the mainland. All three species of mangroves are present but the red mangrove is dominant. Increased soil salinity due to restricted tidal flow and high evaporation rates, increased water temperatures, shallow marl soils and low seedling survival may be contributing factors to the stunted growth forms and sparse distribution in this area (Teas, 1979; Cinron, et al., 1978; McMillan, 1971). One or all of these stress factors may have contributed to the extensive cold damage witnessed in this area after the freeze in December of 1989.

Local distribution of mangroves is affected by several physical parameters. Wave energy and substrate are probably most significant within the preserve. Fringing mangrove forests reach optimum development on low energy shorelines with deeper sediments. Fine sediments deposited in shallow depressions in the caprock and along the edges of tidal creeks provide sufficient depth for propagules and seeds to become rooted. Other shorelines may lack sufficient sediment depths or are buffeted by waves or swift currents that would bury seedlings or sweep them away.

Tidal regime in coastal areas also plays an important part in mangrove dominance of the shoreline. The advance and retreat of marine waters facilitates import of necessary nutrients into the community and exports organic carbons and other compounds to marine systems. Tides are also instrumental in dispersing the buoyant seeds (or propagules) and moderating salinity.

Ambient marine salinity benefits mangroves in several ways. Competition from less tolerant terrestrial plants is minimized and soil salinities are moderated by daily flushing. Unlike their terrestrial counterparts mangroves have evolved mechanisms to exclude or excrete salt from plant tissues. The red mangrove can exclude salt at the root surface (Scholander, 1968). Black and white mangroves secrete salt through modified glands on the leaf or trunk and by storing salt in succulent leaves and fruit that fall from the tree. Most halophytic plants are believed to use these mechanisms or a combination of them to dispose of excess salt (Teas, 1979).

Carbon and other nutrients from terrestrial sources (Carter et al., 1973), rainfall (Lugo et al., 1980), and from marine sources are assimilated and recycled in the form of plant material that is fed upon by a host of arboreal, epiphytic, infaunal, and pelagic life forms. Energy pathways may originate from several different sources within the community. Seagrass wrack and drift algae are trapped and broken down into particulate matter that is used by large numbers of consumers (Brook, 1975).

Senecsed mangrove leaves are attacked by fungi (Fell et al., 1975) and bacteria (Casagrande and Given, 1975) that colonize the leaf surface. As the leaf surface is fragmented, plant starches and proteins are broken down or converted to other compounds that are more easily consumed and assimilated by other life forms that break down the plant material to even smaller fragments. As more surface area is actually made available, the biotic community expands, thus increasing the net available energy. As these smaller, protein rich particles are consumed, the resulting energy is passed on to higher order consumers (Odum, 1971; Odum and Heald, 1972; Odum and Heald, 1975; and Odum et al., 1982).

Epiphytic and benthic algae that live on and near the mangrove roots also contribute substantially to the energy transfer to higher trophic levels. Rehm (1974) recorded 74 species of red, brown, green and blue-green algae associated with mangrove areas. This abundant resource is actively grazed by numerous faunal species on site or upon dying it becomes part of the detrital food web. The net primary production of prop root epiphytes and mud algae may equal emergent leaf production in some areas (Lugo et al., 1975).

The contributions of plankton to local marine energy budgets are difficult to evaluate. This dynamic group is subject to abrupt changes in density depending upon season, currents and nutrient levels. Although quantitive research has not been done specifically for mangrove estuaries, the importance of planktonic food chains has been well documented for other regions and it is evident that there are large numbers of invertebrate grazers that benefit from this community

component. The abundance of phytoplankton and zooplankton within the immediate area of mangroves would indicate that this energy source is important to many larval food webs (Odum, 1970). Table 2 contains a partial list of non-vascular plants and phytoplankton of the mangrove/saltmarsh association.

TABLE 2

A PARTIAL LIST OF THE NON-VASCULAR MANGROVE/SALTMARSH FLORA

	Genera	Location	Reference
FUNGI	Nigrospora	Leaf	Fell, et
	Phyllostica	"	al., 1975,
	Pestalotica	"	1980
	Phytophora	"	"
	Drechslera	"	"
	Gloeosporium	"	"
	Lulworthia	"	"
ALGAE	Monostroma	High water	Taylor,
	Rhizoclonium	mark on red and black mangrove	1960
	Bostrychia	Just below high	"
	Catenella	water mark on red	"
	Caloglossa	prop roots	"
	Acanthorphora	Submerged on	Almodovar
	Caulerpa	red prop roots	and Biebl
	Hypnea	"	1962
	Laurencia	"	"
	Spyrida	"	"
	Valonia	"	"
	Wrangelia	"	"
	Centroceras	"	"
	Dasya	"	Taylor,
	Dictyota	"	1960
	Halimeda	"	"
	Murrayella	"	"
	Polysiphonia	"	"
	Wurdemaniia	"	"
	Boodleopsis	Mud near roots	"
	Cladophoropsis	"	"
	Enteromorpha	"	"
	Vaucheria	"	"
PHYTOPLANKTON			
	Chaetocerus	Water column	Mattox, 1949
	Thalassothrix	"	"
	Nitzschia	"	Wood, 1965
	Skeletonema	"	Walsh, 1965
	Rhizosolenis	"	Bacon, 1970

Disploneis	Benthic	Wood, 1965
Mastogloia	sediments	"
Pluerosigma	"	"
Peridinium	Water column	Odum et al., 1982
Gymnodinium	"	"

(From Odum et al., 1982)

Faunal components of the mangrove/saltmarsh community are as diverse as the floral counterpart. This community provides food, cover, spawning, nesting and resting habitat for many species of mammals, birds, reptiles, amphibians, fish and invertebrates. Many species are dependent upon this community during all of their life cycle, while others may inhabit the community during specific portions of their life cycle. This interdependency may be critical for several endangered and threatened species that will be discussed in subsequent sections.

Animal life that graze directly upon arboreal leaf material include large numbers of insects including the olethrautid moth (Ecdytolopha sp.) and beetles (principally, Poecilips rhizophorae) (Onuf et al., 1977). Simberloff and Wilson (1969) list 200 species of insects that are associated with mangrove communities. The mangrove tree crab (Aratus pisonii) is also a primary consumer of mangrove leaves (Beever et al., 1979). Other invertebrate fauna of the emergent mangrove/saltmarsh include large numbers of gastropods. The snails (Littorina sp., Cerithidea sp. and Melampus sp.), isopods (Ligea spp.), and fiddler crabs (Uca spp.) are especially plentiful (Odum et al., 1982). These invertebrates are in turn a staple to many species of birds.

The striking avifauna is often the most noticeable in the mangrove/saltmarsh association. Many species depend upon the community for feeding, nesting and resting sites. Large wading birds, such as the egrets, ibis, spoonbill, herons and the open-water piscivorous birds, such as the osprey and pelican are especially dependent upon mangrove areas. Others are only occasional or seasonal visitors. Odum et al., (1982) list 181 species of birds that may be expected to use the mangrove community.

Other macrofauna that utilize the mangrove/saltmarsh include a number of terrestrial and aquatic reptiles, amphibians and mammals. Among the marine turtles, only the Atlantic loggerhead (Caretta caretta caretta) is relatively common in the preserve. This species may use mangroves as nursery areas (Odum et al., 1982). The Atlantic hawksbill (Eretmochelys imbricata) and the Atlantic green turtle (Chelonia mydas) are

known to feed upon mangrove roots and leaves (Ernst and Barbour, 1972) and may occasionally frequent mangrove areas in the preserve.

Several species of snakes and anoles, and two crocodilians utilize mangrove/saltmarsh areas. Of the snakes, only one, the mangrove water snake (Nerodia fasciata compressicauda) is entirely dependent upon mangrove/saltmarsh areas. The others are transitory in habit and may utilize a variety of environments. The American alligator (Alligator mississippiensis) is primarily an inhabitant of freshwater areas but may venture into mangrove areas especially during periods of drought (Jacobsen, 1983). The endangered American crocodile (Crocodylus actus) is commonly associated with the mangrove fringed shorelines adjoining deeper waters, such as natural creeks, canals, barrow pits or basins. It is a resident species in the preserve.

Amphibians are generally not well represented due to the scarcity of freshwater areas that are usually necessary for reproduction. Those listed are suitably adapted to reproducing during the brief rainy period and may utilize brackish water pools for this purpose. The giant toad (Bufo marinus) and the Cuban treefrog (Hyla septentrionalis) are introduced species that have expanded their range considerably in the last several decades (King and Krakauer, 1966; King and Krakauer, 1968; and Krakauer, 1970).

The mammals of the mangrove/saltmarsh include a number of species that utilize a broad range of habitat types. The Marsh rabbit (Sylvilagus palustris), Raccoon (Procyon lotor), and Virginia opossum (Didelphis virginiana) are most commonly observed. The Marsh rice rat (Oryzomys plaustris), Cotton rat (Sigmodon hispidus) and the introduced black rat (Rattus rattus) are also common but much more secretive in habit. The bobcat (Felis rufus) and River otter (Lutra canadensis) are the largest mammalian predators of the mangrove/saltmarsh areas of the preserve, although the endangered Florida panther (Felis concolor coryi) is known to frequent other mangrove areas of south Florida (Layne, 1974). Two marine mammals, the endangered Florida manatee (Trichechus manatus latirostris) and the Bottle-nosed dolphin (Tursiops truncatus) frequent deeper waters of the mangrove fringed creeks in the preserve.

The aquatic life of the mangrove/saltmarsh is by far the most diverse group of organisms in this association. Detritus and plankton are primary food sources for a large number of marine invertebrates that attach themselves to prop roots, live in adjacent muds, or swim in the water. Courtney (1975), Tabb et al., (1962), and Odum and Heald (1972) reported extensive lists of invertebrates that are associated with mangroves.

The prop root complex is also important to many species of fish. Ample food and close proximity to cover that offers protection from predators is essential for large numbers of juvenile and adult fish. Many complete their life cycle within the mangrove community. Others are dependent upon mangroves during juvenile stages and migrate to grassbeds or coral reefs when mature. Still others are opportunistic vagabonds that utilize a variety of habitats and may be only seasonally or locally abundant. Close proximity to other habitat types greatly increases the overlap of species from the other communities.

Many species of invertebrates and fishes that utilize the mangrove/saltmarsh are important to local recreational and commercial fisheries. Commercially harvested species include; pink shrimp (Penaeus duorarum), stone crab (Menippe mercenaria), jacks (family Caranigadae), grunts (family Pomadasyidae), grouper (Dpinepelus spp.), snapper (Lutjanus spp.), mullet (family Mugilidae), red drum (Sciaenops ocellata), ladyfish (Elops saurus), spotted sea trout (Cynoscion nebulsus) and large numbers of various bait fish. The spiny lobster (Panulirus argus) is also a valuable commercial species associated with mangrove areas. Those in the sanctuary are protected from harvest but the adults eventually migrate to offshore reefs where they may be taken in traps. Many of the commercial species are also important to local recreational fisherman. Additionally, tarpon (Megalops atlantica), snook (Centropomus undecimalis), barracuda (Sphyraena barracuda) and bonefish (Albula vulpes) are avidly pursued by local enthusiast as well as thousands of annual visitors.

Table 3 includes a partial list of the major invertebrate groups and the vertebrate fauna of the mangrove/saltmarsh association. For additional information on specific species, the reader is directed to the noted references. Odum et al., (1982) provide comprehensive lists of habitat types and diet preferences for fish and birds from published literature.

TABLE 3

PARTIAL LIST OF THE MANGROVE/SALTMARSH FAUNA

INVERTEBRATES

Zooplankton

This extensive group includes single-celled protozoans and the larvae and eggs of the invertebrates and fish listed below.

Jellyfish (Scyphozoa)

Upside-down jellyfish	Cassiopeia xamachana

Marine worms (Annelida)		
	Armandia agilis	
	Cirratulus sp.	
	Lumbrineries maculata	
Molluscs		
Blackhorn snail	Batillaria minima	
Ladderhorn snail	Cerithidea scalariformis	
Periwinkles	Littorina spp.	
Saltmarsh snail	Melampus coffeus	
Bleeding tooth	Nerita spp.	
Predatory snail	Pisania tincta	
Crustaceans (may comprise 70% of zooplankton)		
Barnacles	Chthamalus stellatus	
	Lithortrya dorsalis	
Copepods	Acartia spp.	
Searoachs	Ligia spp.	
Wood borer	Sphaerom terebans	
Pistol shrimps	Alpheus spp.	
Pink shrimp	Penaeus duorarum	
Shore shrimps	Palaemonetes spp.	
Cleaning shrimps	Periclimenes spp.	
Shrimp	Synalpheus fritzmuelleri	
Spiny Lobster	Panulirus argus	
Hermit crabs	Pagurus spp.	
Hermit crab	Clibanarius sp.	
Blue crab	Callinectes sapidus	
Crab	Cyclograpsus sp.	
Shore crabs	Pachygrapsus spp.	
Mangrove tree crab	Aratus pisonni	
Marsh crab	Sesarma sp.	
Fiddler crabs	Uca spp.	
Stone crab	Menippe mercenaria	
Holothurians		
Sea cucumber	Holothuria floridana	

(References: Odum et al., 1982) See Simberloff, 1976; Simberloff and Wilson, 1969 for comprehensive list of insects.

VERTEBRATES

Fishes		
Nurse shark	Ginglymostoma curratum	
Blacktip shark	Carcharhinus limbatus	*
Lemon shark	Negaprion brevirostris	
Bonnethead	Sphyrna tiburo	*
Smalltooth sawfish	Pristis pectinata	
Guitarfish	Rhinobatos letiginosus	
Lesser electric ray	Narcine brasiliensis	
Southern stingray	Dasyatis american	
Yellow ray	Urolophus jamaicensis	
Spotted eagle ray	Aetobatus narinari	

Ladyfish	Elops saurus	
Tarpon	Megalops atlantica	*
Bonefish	Albula vulpes	*
Scaled sardine	Harengula pensacolae	
Atlantic thread herring	Opisthonema oglinum	
Bigeye anchovy	Anchoa lamprotaenia	
Bay anchovy	Anchoa mitchilli	
Inshore lizardfish	Synodus foetens	
Sea catfish	Aruis felis	
Gulf toadfish	Opsanus beta	
Skilletfish	Gobiesox strumosus	
Shortnose batfish	Ogcocephalus nasutus	
Key brotula	Ogilbia cayorum	
Halfbeak	Hyporhamphus unifasciatus	
Redfin needle fish	Strongylura notata	
Timucu	Strongylura timucu	
Houndfish	Tylosurus crocodulus	
Sheepshead minnow	Cyprinodon variegatus	
Rainwater killifish	Lucania parva	
Rivulus	Rivulus marmoratus	
Mosquitofish	Gambusia affinis	
Mangrove mosquitofish	Gambusia rhizophorae	
Sailfin molly	Poecilia latipinna	
Reef silverside	Allanetta harringtonensis	
Rough silverside	Membras marinica	
Tidewater siverside	Menidia beryllina	
Lined seahorse	Hippocampus erectus	
Dwarf seahorse	Hippocampus zosterae	
Pipefish	Syngnathys spp.	
Snook	Centorpomus undecimalis	*
Black seabass	Centropristis striata	
Sand perch	Diplectrum formosum	
Jewfish	Epinephelus itajara	
Red grouper	Epinephelus morio	*
Nassua grouper	Epinephelus Striatus	*
Barred hamlet	Hypolectrus puella	
Gag	Mycteroperca microlepis	*
Bronze cardinalfish	Astrapogon alutus	
Conchfish	Astrapogon stellatus	
Bluefish	Pomatomus saltatrix	*
Cobia	Rachycentron canadum	*
Whitefin sharksucker	Echeneis neucratoides	
Blue runner	Caranx crysos	*
Jack crevalle	Caranx hippos	*
Bar jack	Caranx ruber	
Atlantic bumper	Chloroscombrus chrysurus	
Leatherjacket	Oligoplites saurus	
Florida pompano	Trachinotus carolinus	*
Permit	Trachinotus falcatus	*
Lookdown	Selene vomer	
Mutton snapper	Lutjanus apodus	*
Schoolmaster	Lutjanus apodus	*
Gray snapper	Lutjanus griseus	*

Dog snapper	Lutjanus jocu	
Lane snapper	Lutjanus synagris	*
Striped mojarra	Diapterus plumieri	
Mojarras	Eucinostomus spp.	
Grunts	Haemulon spp.	*
Pigfish	Orthopristis chrysoptera	
Sheepshead	Archosargus probatocephlus	*
Sea bream	Archosargus rhomboidalis	
Grass porgy	Calamus arctifrons	
Saucereye porgy	Calamus calamus	*
Pinfish	Lagadon rhomboides	*
Blue croaker	Bairdiella batabana	
Silver perch	Bairdiella chrysura	
Spotted seatrout	Cynoscion nebulosus	*
Southern kingfish	Menticirrhus americanus	*
Gulf kingfish	Menticirrhus littoralis	*
Atlantic croaker	Micropogon undulatus	*
Black drum	Pogonias cromis	
Red drum	Sciaenops ocellata	*
High hat	Equetus acuminatus	
Atlantic spadefish	Chaetodipterus faber	
Sergeant major	Abudefduf saxatillis	
Slippery dick	Halichoeres bivittatus	
Parrotfishes	Sparisoma spp.	
Mullet	Mugil spp.	*
Great barracuda	Sphyraena barracuda	*
Mottled jawfish	Opistognathus maxillosus	
Bluethroat pikeblenny	Chaenopsis ocellata	
Marbled blenny	Paraclinus marmoratus	
Banded blenny	Paraclinus fasciatus	
Blackbelly blenny	Stathmonotus hemphilli	
Florida blenny	Chasmodes saburrae	
Seaweed blenny	Blennuis marmoreus	
Spotted dragonet	Callionymus pauciradiatus	
Gobys	Gobionellus spp.	
	Gobiosoma spp.	
	Lophogogius sp.	
	Microgobius spp.	
Spanish Mackerel	Scomberomorus maculatus	*
King Mackerel	Scomeromorus cavalla	*
Barfish	Scorpaena brasiliensis	
Plumed scorpionfish	Scorpaena grandicornis	
Searobins	Prionotus spp.	
Eyed flounder	Bothus ocellatus	
Spotted whiff	Citharichthys macrops	
Fringed flounder	Etropus crossotus	
Gulf flounder	Paralichthys albigutta	
Southern flounder	Paralichthys lethostigma	
Dusky flounder	Syacium papillosum	
Lined sole	Achirus lineatus	
Scrawled sole	Trinectes inscriptus	
Hogchoker	Trinectes maculatus	
Blackcheek tonguefish	Symphurus plagiusa	

Orange filefish	Aluterus schoepfi
Fringed filefish	Monacanthus ciliatus
Planehead filefish	Monacanthus hispidus
Gray triggerfish	Balistes capriscus
Queen triggerfish	Balistes vetula
Scrawled cowfish	Lactophrys quadracornis
Trunkfish	Lactophrys trigueter
Puffers	Sphoeroides spp.
Burrfish	Chilomycterus spp.

(List modified from Odum et al., 1982)
* = Important species of commercial, sport and bait fisheries.

Amphibians and Reptiles

American alligator	Alligator mississippiensis
American crocodile	Crocodylus acutus
Mangrove terrapin	Malaclemys terrepin rhizophorarum
Atlantic loggerhead turtle	Caretta caretta caretta
Atlantic green turtle	Chelonia mydas mydas
Atlantic hawksbill turtle	Eretmochelys imbricata imbricata
Atlantic ridley turtle	Lepidochelys kempii
Green (American) anole	Anolis carolinensis
Brown (Cuban) anole	Anolis sagrei
Southern black racer	Columber constrictor haasti
Eastern indigo snake	Drymarchon corais couperi
Rat snake	Elaphe guttata guttata
Mangrove water snake	Nerodia fasciata compressicauda
Florida ribbon snake	Thamnophis sauritus sackeni
Giant toad	Bufo marinus
Southern toad	Bufo terrestris
Tree frog	Hyla squirella
Cuban tree frog	Hyla septentrionalis

(References: Carr and Goin, 1955; Duellman and Schwartz, 1958; Ernst and Barbour, 1972; Paulson, 1968)

Birds

Magnificent frigatebird	Fregata magnificens
Brown pelican	Pelecanus occidentalis
Double-crested cormorant	Phalacrocorax auritus
Roseate spoonbill	Ajaia ajaja
Great blue heron	Ardea herodias
Great white heron	Ardea herodias occidentalis
Cattle egret	Bubulcus ibis
Green heron	Butorides striatus
Great egret	Casmerodius albus
Snowy egret	Egretta thula
Reddish egret	Egretta rufescens
Louisiana heron	Egretta tricolor

Little blue heron	Egretta caerulea
White ibis	Eudocimus albus
Black-crowned night heron	Nycticorax nycticorax
Yellow-crowned night heron	Nyctanassa violacea
Blue-winged teal	Anas crecca carolinensis
Mallard	Anas platyrhynchos
Red-breasted merganser	Mergus serrator
Turkey vulture	Cathartes aura
Red-shouldered hawk	Buteo lineatus
American kestrel	Falco sparverius
Bald eagle	Haliaeetus leucocephalus
Osprey	Pandion haliaetus
Black-necked stilt	Himantopus mexicanus
Semiplamated plover	Charadrius semipalmatus
Black-bellied plover	Pluvialis squatarola
Spotted sandpiper	Actitis macularia
Ruddy turnstone	Arenaria interpres
Dunlin	Calidris alpina
Least sandpiper	Calidris minutilla
Semipalmated sandpiper	Calidris pusilla
Western sandpiper	Calidris mauri
Solitary sandpiper	Tringa solitaria
Greater yellowlegs	Tringa melanoleucas
Lesser yellowlegs	Tringa flavipes
Short-billed dowitcher	Limnodromus griseus
Laughing gull	Larus atricilla
Ring-billed gull	Larus delawarensis
Least tern	Sterna albifrons
Royal tern	Thalasseus maxima
White-crowned pigeon	Columba leucocephala
Mangrove cuckoo	Coccyzus minor
Red-bellied woodpecker	Melanerpes carolinus
Belted kingfisher	Megaceryle alcyon
Gray kingbird	Tyrannus domincensis
Great crested flycatcher	Myriarchus crinitus
Eastern phoebe	Sayornis phoebe
Mockingbird	Mimus polyglottos
Catbird	Dumetella carolinensis
Brown thrasher	Toxostoma rufum
Blue-gray gnatcatcher	Polioptila caerulea
White-eyed vireo	Vireo griseus
Black-whiskered vireo	Vireo altiloguus
Red-eyed vireo	Vireo olivaceus
Yellow-throated warbler	Dendroica dominica
Yellow warbler	Dendroica petechia
Yellow-rumped warbler	Dendroica coronata
Prairie warbler	Dendroica discolor
Palm warbler	Dendroica palmarum
Yellowthroat	Geothlypus trichas
Black-and-white-warbler	Mniotilta varia
Northern parula	Parula americana
American redstart	Setophaga ruticilla
Red-winged blackbird	Agelajus phoeniceus

Boat-tailed grackle	Quiscalus major
Cardinal	Cardinalis cardinalis

(References: Robertson and Kushlan, 1974; Sprunt, 1954; Bent, 1932)

Mammals

Virginia opossum	Didelphis virginiana
Marsh rabbit	Sylvilagus palustris
Gray squirrel	Sciurus carolinensis
Marsh rice rat	Oryzomys argentatus
Black rat	Rattus rattus
Cotton rat	Sigmodon hispidus
Raccoon	Procyon lotor
River otter	Lutra canadensis
Bobcat	Felis rufus
Whitetailed deer	Odocoileus virginianus

(References: Layne, 1974; Humphrey and Barbour, 1979; Lazell, 1984)

2. Marine Grassbeds

Marine grassbeds are an important feature in the aquatic resources of the preserve. Seagrasses stabilize sediments, baffle wave energy, cycle nutrients, and provide substrate for a complex floral and faunal community. Abundant food and cover make this an important resource for invertebrates and a nursery area for many fish species. However, biological productivity is not limited to the area of distribution. Marine energy cycling is enhanced as detrital material and nursery species are dispersed to other areas. Species from geographically and physiologically isolated habitats, such as, the hardbottom and the mangrove communities also forage in the seagrass community. Thus, marine grassbeds function as an interface between other communities and enrich the ecological diversity and productivity of all marine systems.

Dominant marine grasses in the preserve are turtle grass (Thalassia testudium) and Cuban shoalweed (Halodule wrightii). Shoalweed is typically a pioneer species that tolerates more disturbed sites and areas where other factors are less favorable for turtle grass. Turtle grass is a climax species (Phillips, 1960), and as such is usually considered to be the primary producer in this community. Turtle grass meadows are most expansive were sediments are deepest over the bedrock. Manatee grass (Syringodium filiforme) and several species of Halophila are also present within the turtle grass and shoalweed beds. Small patches of exclusively manatee grass are occasionally encountered. Widgeon grass (Ruppia maritima), a typically freshwater species, is also present in the canal systems and marsh creeks that enter the Sound.

Seagrasses are flowering plants that have evolved to a totally marine existence. They have adapted physiological and chemical mechanisms that facilitate photosynthesis, growth, maintenance and reproduction while completely submerged. Unlike their terrestrial counterparts seagrasses lack stomata on the leaf surfaces, thus gases are slowly diffused through the leaf tissue. Oxygen is stored in interstitial cell spaces and passed to root structures and rhizomes when needed. Stored gases also make the leaf blade buoyant, keeping it vertical to the substrate and allowing a much larger surface area to be exposed to solar radiation (Zieman and Wetzel, 1980). The release of gaseous bubbles from leaf surfaces is often the source of the faint popping sounds heard when grass flats are exposed at low tide.

Certain plant nutrients are derived from the sediments, while others are taken from the water column. Nitrogen fixation can occur in the rhizomes, on the leaf surface and in some cases may be transferred between the leaf surface and epiphytes on the leaf (Harlin, 1971). Nitrogen and carbons are also derived from the particulate organic matter from dead plant material and animal excretion. This highly efficient use of relatively limited nutrients and sunlight are the basis for a level of productivity often compared to the coral reefs and mangroves.

Marine grasses may reproduce both vegetatively and sexually. The study of seagrass reproduction has evolved primarily as a means to restore or mitigate those areas that have been adversely impacted by man's activities. Vegetative reproduction originates from the root or rhizome of the plant. Vegetative starts (plug or turion) are usually preferred for transplanting as they become established more quickly and survive longer. However, relative cost of this type of restoration may be prohibitive for large areas. Cost ranged from $27,000 to $86,500 per hectare (/ha) to revegetate one area in the Upper Keys (Lewis et al., 1981). This technique has also caused much controversy, as many scientists and environmentalists have questioned the possibly negative impacts to donor (source) areas. Donor areas are slow to recolonize, and large scale removal may cause a more serious disturbance than it is intended to remedy.

Sexual reproduction in marine grasses is less clearly understood. Orpurt and Boral (1964) observed flowering turtle grass in the Keys during April and fruiting until September. Seed production and seedling survival, however, may vary considerably from year to year. Lewis and Phillips (1980) while monitoring a revegetation project near Craig Key, reported a "prodigious" seed crop in the intertidal area of Lower Matecumbe Key during 1979. Previous observations by Moffler (from Lewis and Phillips, 1980) indicated little fruiting occurred in 1975 and Phillips reported large numbers

of seedlings in the same area in 1960. Periods of high seed production offers the opportunity to harvest and propagate seedlings for revegetation of disturbed areas but cost may again be prohibitive. Thorhaug and Austin (1976) reported costs of $42,000-$280,000/ha (depending on desired plant cover) for collection, propagation, planting and overhead for restoration efforts. Survival rates for transplanted seedlings are also very low, less than 30% (Zieman, 1982).

Marine grassbed distribution is influenced by physical and chemical factors similar to those described for mangroves. Temperatures and salinities are usually well within the tolerance limits of the species listed. Optimum temperatures (68-86 degrees F) and salinities (24 ppt to 35 ppt) for turtle grass (Phillips, 1960), occur throughout the aquatic preserve waters. Shallow waters that are often subjected to extreme fluctuations of salinity during extended periods of drought and during the rainy season are less favorable sites for turtle grass. These areas are also subject to more abrupt temperature changes than normally observed in deeper waters and therefore are usually less favorable for sea grasses.

The three most important parameters determining grassbed distribution in the preserve are light intensity, current velocity, and sediment depth. Like their emergent counterparts, marine plants must have access to sunlight to carry on the photosynthetic process. Unlike terrestrial plants, the water column lies between the source and recipient. Water depth and clarity affect the amount of sunlight that reaches the leaf surface. In this area water depth is less important than water clarity.

Shading from docks and turbidity in the water column inhibit photic zone access. Dredging for access channels or prop dredging and scouring also produce excessive turbidity. These impacts are usually localized and not normally of a duration or intensity to cause extensive light reduction but have other, more severe, consequences that will be discussed later.

Tidal currents in larger channels continually erode and redeposit sediments at sporadic intervals and may scour sediments to bedrock in some locations. These dynamic processes are not conducive to seagrass colonization. High turbidity in and near channels inhibits sea grass colonization in the deeper parts of many of the channels that do have adequate sediment depths. Conversely, turtle grass may be dense and have longer blades with fewer epiphytes along the edges of these channels and tidal creeks. Conover (1968) suggests that more rapid currents enhance leaf surface absorption of carbon and other nutrients. Swift currents would also inhibit epiphyte colonization on the leaf blades allowing a larger surface area for photosynthesis.

Turtle grass requires sediment depths from 3 inches (Scoffin, 1970) to 20 inches (Zieman, 1972) for optimum growth. These conditions are exemplified in the sheltered waters leeward of the islands in Broad and Angelfish Creeks where sediment 'fans' support lush grassbeds or flats. Marine grasses also parallel the low energy shoreline on the western side of the Sound, seaward of the fringing mangroves. Scattered depressions in the basement rock also accumulate sediment pockets that are colonized by marine grasses. In profile, these colonized depressions often appear as "domes". As the plants entrap additional sediments, the depression fills and appears elevated as more sediments are added.

In addition to the previously noted marine grasses, several species of algae are also commonly found in this community. The dominant genera of macrobenthic algae include Halimeda, Acetabularia, Penicillus, Caulerpa, Cladophora, Rhipocephalus, and Udotea. The algae are instrumental in producing organic carbons and calcium carbonate that are incorporated into the sediments (Zieman, 1982). Benthic algae are also early colonizers of fine sediments and their rhizoid holdfasts may stabilize these sediments so that seagrasses may become established on otherwise unoccupied areas (Williams, 1981). The fleshy red algae Goniolithon and the drift algae Laurencia, are also common components of the grassbeds.

Seagrass leaves provide substrate for a wide range of epiphytic algae. Some 66 species have been recorded to utilize seagrasses for attachment (Ballantine and Humm, 1975). While access to the photic zone is enhanced by this arrangement, the encrusting of the leaf surface may effectively reduce photosynthesis in the host plant (Sand-Jensen, 1977). The overall loss of photosynthetic production may be off-set by the increased habitat for epiphytic flora and fauna with a corresponding increase in animal and plant protein.

The faunal constituents of the marine grassbeds range from the microscopic zooplankton that drift with the currents, epiphytes that live upon the grasses, the infaunal association of the root and rhizome complex, and the pelagic invertebrates, fishes and mammals that utilize these areas. Trophic structure presents ample food for a variety of specialized feeders. Herbivores that feed directly upon the algae or seagrasses include a wide variety of invertebrates. Most notable are the crabs, queen conch, and sea urchins.

Detrital feeders make up a large percentage of the grassbed fauna and may well represent the primary pathway of energy transfer to higher tropic levels (Zieman, 1982). This group is composed of many small organisms that feed upon the decomposing plant and animal material in the vicinity of the grassbeds. Corals, sponges, tube worms and shrimp filter

detritus and plankton from the water column. Others glean material from the sediments and leaf surfaces. Exported detritus becomes available to an even wider range of consumers in more remote areas. Carr and Adams (1973) found detrital feeders to be a major food source for at least one feeding stage in 15 of 21 juvenile marine fishes studied. Commercially important detrital feeders include the pink shrimp (Penaeus duorarum), spiny lobster (Panulirus argus), and mullet (Mugilcurema spp.).

Vertebrate herbivores include the green, loggerhead, and hawksbill turtles, and a wide variety of fishes. Zieman (1982) lists 63 species that utilize seagrass in their diet. Many of these species also consume varying amounts of detritus and epifauna as they forage.

Marine grassbeds are also valuable cover for the larval and juvenile stages of many invertebrates and fishes. Some spend early development stages in the shelter of the sea grasses and move to other habitats when mature. Eldred et al., (1961 and 1972) document the importance of this habitat to juvenile spiny lobster and juvenile and adult shrimp.

Many adult fish, by alternating periods of diurnal and nocturnal activity, may utilize grassbeds for foraging at night and seek shelter in mangroves or coral reefs during the day. This partitioning of time and resources serves to eliminate competition between similar species and affords a much greater number of niches in the ecological structure of the community.

Marine grassbeds are heavily utilized by several bird species. The abundant marine fauna of this community are the staple food for most of these birds (Kushlan, 1978). Heron, egrets, and spoonbills exploit fish, crustaceans and other marine organisms in shallow water grassbeds and upon exposed grass flats during low tides. Open water piscivorous birds include the cormorant, osprey, pelican, and gulls.

Mammals that utilize marine grassbeds include the manatee and the bottle-nosed dolphin. The manatee is well known for its predilection for aquatic plants. It is assumed that the abundant seagrasses would provide a welcome repast for this nomad. Bottle-nosed dolphin are occasional visitors of the aquatic preserve and undoubtedly take quantities of schooling fish as opportunity permits. Consult Table 4 for a list of animal species commonly associated with the marine grassbed community.

TABLE 4

A PARTIAL LIST OF MARINE GRASSBED FAUNA

INVERTEBRATES	
Corals	
Golfball coral	*Favia fragum*
Rose coral	*Manicinia areolata*
Small finger coral	*Porites furcata*
Anemones	
Pale anemone	*Aiptasia annulata*
Pink tipped anemone	*Condylactis gigantea*
Annelids	
	Ammatrypane sp.
Lug worm	*Arenicola cristata*
	Eurythoe sp.
Green bristle worm	*Hermodice caruculata*
Sponge worm	*Eunice denticulata*
	Lysidice sp.
	Nereis sp.
	Phascolion sp.
Tube worm	*Onuphis magna*
	Sthenelais sp.
	Terebellides stroemi
Gastropods	
	Anachis sp.
Sea slug	*Aplysis dactylomela*
	Astrea sp.
	Bittium varium
	Caecum sp.
	Cardita floridana
Cerith	*Cerithium* spp.
Slipper	*Crepidula* sp.
Tulips	*Fasiolaria* spp.
	Mitrella lunata
	Modulus modulus
Horse conch	*Pluroploca gigantea*
	Rissoina sp.
Queen conch	*Strombus gigas*
	Tegula sp.
	Tridachia sp.
Caribbean vase	*Vasum* sp.
Pelecypods	
Cockle	*Americardia* sp.
Arks	*Anadara* spp.
Venus	*Antigona* sp.
	Atrina sp.
	Cardita floridana
Barred venus	*Chione cancellata*
Tiger lucine	*Codakia orbicularis*
Cockle	*Laevicarduim laevigatum*

	Lucine	Lucina pensylvanica
	Radiant tellin	Tellina radiata
Amphipods		
		Cymadus compta
		Gammarus mucronatus
		Melita nitida
		Grandidierella sp.
Cephalopods		
	Octopus	Octopus briareus
Arthropods		
	Snapping shrimp	Alpheus normanni
		Hyppolyte pleuracantha
	Shore shrimp	Palaemonetes spp.
	Spiny lobster	Penulirus argus *
	Pink shrimp	Penaeus duorarum *
	Cleaning shrimp	Periclimenes spp.
		Thor floridanus
		Tozeuma sp.
	Box crab	Calappa sp.
	Blue crabs	Callinectes spp.
	Striped hermit crab	Clibanarius sp.
	Bareyed hermit crab	Dardanus sp.
	Spider crab	Libinia sp.
	Decorator crab	Macrocoeloma sp.
	Spider crab	Microphrys sp.
	Spider crabs	Mithrax spp.
	Hermit crabs	Pagurus spp.
	Giant hermit crab	Petrochirus diogenes
	Pitho crabs	Pithos spp.
	False squilla	Pseudosquilla ciliata
Echinoderms		
	Thorny starfish	Echinaster spp.
	Cushion starfish	Oreaster reticulatus
	Brittle stars	Ophicoma spp.
	Long-spined urchin	Diadema antillarium
	Variegated urchin	Lytechinus variegatus
	Sea egg	Tripneustes ventricosus
	Sea bisuit	Clypeaster rosaceus
Holothurians		
	Sea cucumber	Actinopyga agassizi
	Florida sea cucumber	Holothura floridana
Tunicates		
	Flat tunicate	Botryllus planus
	Incrusting tunicate	Polycarpa obtecta

(From Zieman, 1982; Voss, 1976; Voss and Voss, 1955)
* = Species of commercial fisheries interest.

VERTEBRATES

Fishes

Nurse shark	Ginglymostoma curratum	
Lemon shark	Negeprion brevirostris	
Bonnethead	Sphyrna tiburo	
Smalltooth sawfish	Pristis pectinata	
Southern stingray	Dasyatis americana	
Ladyfish	Elops saurus	
Tarpon	Megalops atlantica	*
Bonefish	Albula vulpes	*
Scaled sardine	Harengula pensacolae	
Atlantic thread herring	Opisthonema oglinum	
Anchovies	Anchoa spp.	
Inshore lizardfish	Synodus foetens	
Sea catfish	Arius felis	
Gulf toadfish	Opsanus beta	
Skilletfish	Gobiesox strumosus	
Hardhead halfbeak	Chridorus atherinoides	
Needlefish	Hyporhamphus unfasciatus	
Goldspotted killifish	Flordichthys carpio	
Rainwater killifish	Lucania parva	
Sheepshead minnow	Cyprinodon variegatus	*
Rivulus	Rivulus marmoratus	
Sailfin molly	Poecilia latipinna	
Reef silverside	Allanetta harringonenesis	
Hardhead silverside	Atherinomorus stipes	
Dwarf seahorse	Hippocampus zosterae	
Dusky pipefish	Syngnathus floridae	
Fringed pipefish	Micrognathus crinigerus	
Snook	Centropomus undecimalis	*
Gag	Mycteroperca microlepis	
Jewfish	Epinephalus itajara	*
Cobia	Rachycentron canadum	*
Jacks	Caranx spp.	*
Permit	Trachinotus falcatus	*
Florida pompano	Trachinotus carolinus	*
Leatherjacket	Oligoplites zaurus	
Lookdown	Selene vomer	
Snappers	Lutjanus spp.	*
Silver blenny	Eucinostomus gula	
Grunts	Haemulon spp.	*
Pigfish	Orthopristis chrysoptera	
Porgies	Archosargus spp.	
Pinfish	Lagodon rhomboides	*
Red drum	Sciaenops ocellata	*
Silver perch	Bairdiella chrysura	
Spotted seatrout	Cynoscion nibulosu	*
Southern kingfish	Menticirrhus americanus	*
Atlantic spadefish	Chaetodipterus faber	
Sergeant major	Abudefduf saxatilis	
Slippery dick	Halichoeres bivittatus	
Hogfish	Lachnolaimus maximus	

	Parrotfishes	Scarus spp.
		Sparisoma spp.
	Mullet	Mugil spp. *
	Barracuda	Sphyraena barracuda
	Blennies	Paraclinus spp.
		Chaenopsis spp.
		Blennius sp.
	Dragonet	Callionymus parciradiatus
	Gobies	Bathygobius sp.
		Gobiosoma spp.
		Microgobius spp.
	Scorpionfishes	Scorpaena spp.
	Searobin	Prionotus spp.
	Lined sole	Achirus lineatus
	Tonguefish	Symphurus plagiusa
	Filefish	Monocanthus ciliatus
	Cowfish	Lactophrys quadricornis
	Trunkfish	Lactophrys trigonus
	Southern puffer	Sphoeroides nephalus
	Burfish	Chilomycterus schoepfi

(Adapted from Zieman, 1982)
* = Sport, commercial and bait species

Reptiles		
	Green sea turtle	Chelonia mydas mydas
	Loggerhead sea turtle	Caretta carretta carretta
	American crocodile	Crocodylus acutus
Birds		
	Roseate spoonbill	Ajaja ajaja
	Great blue heron	Ardea herrodias
	Great white heron	Ardea occidentalis
	Great egret	Casmerodius albus
	Little blue heron	Florida caerulea
	Reddish egret	Dichromanassa rufescens
	Louisiana heron	Hydranassa tricolor
	Bald eagle	Halieaeetus leucocephalus
	Red-breasted merganser	Mergis serrator
	Osprey	Pandion haliaetus
	Eastern brown pelican	Pelecanus occidentalis
	Double-crested cormorant	Phalacrocorax auritus
Mammals		
	Bottle-nosed dolphin	Tursiops truncatus
	West Indina Manatee	Trichechus manatus latirostris

(From Kushlan, 1978)

3. Hardbottom

This community association is referred to as live bottom (Jaap, 1984) or hard bottom (Voss, 1988; Marzalak et al., 1977; and others). This community type is generally included as a subcategory of the coral reef habitats, as described by these authors, but will be treated as a separate community association within this plan and in the resource maps. It is a major constituent of the aquatic preserve's resources.

The term hardbottom collectively describes those flora and fauna that complete all or a portion of their life cycle on or in rock or other hard substrates. It includes other associated organisms that live on or in the host organism. Marine grassbeds, sand, and mud bars are usually intermixed with the hard bottom, occupying shallow depressions in the limestone. Distribution of biota is generally scattered in random patterns and never appears as compact or diverse as are grassbeds or coral reefs. Never the less, this community association supports a diverse invertebrate and vertebrate fauna and is a valuable nursery area for many sport and commercial fish species.

The flora and fauna of the hardbottom association are highly variable. It may contain many species of the coral reef association but they are not three dimensional reef building communities. Species composition is visually dominated by algae and invertebrate species such as soft corals, sponges, and small stony corals. The algal species are well represented by the calcareous greens, Acetabularia, Batophora, Penicillus, Halimeda, and Udotea spp. These species are instrumental in binding sediments and the formation of calcareous sands that are the byproducts of their skeletal remains. Common brown algae include Dictyota and Sargassum, which supports a relatively complex microcommunity within it's delicate leaves and nodules.

Submerged rafts or windrows of the red algae Laurencia are a common feature in the Sound. These tangles of grasslike colonies are especially important to juvenile lobster and the species upon which it feeds. Recruitment of juveniles from offshore areas occurs throughout the year and growth is rapid after the lobster has settled. The importance of this settlement habitat is not necessarily based upon density of individuals but the abundance of habitat. Marx (1986) estimates that at a density of 0.03 lobsters per square meter, one hectare of Laurencia habitat can produce 1193 juveniles. The abundance of this habitat in the Sound and protection of the juvenile lobster population is vital to the local productivity of this fishery.

Invertebrate populations of the hardbottom include a variety of sponges, hard corals, soft corals, mollusks, annelids,

crustaceans and echinoderms. Sponges are well represented in the hardbottom community. Dominance of this group in certain areas has prompted some authors to refer to this community as sponge bottom (Lineback, 1968). The most common species are the chicken liver sponge (Chondrilla nucula), vase sponge (Ircinia campana), cake sponge (I. etherea), stinking sponge (I. felix), the little blue heavenly sponge (Dysidea etherea), the large loggerhead sponge (Spheciospongia vesparia), and the tube sponges (Aplysina cauliformis and Callispongia spp.). The Keys grass sponge (Spongia graminea), yellow sponge (Spongia barbara) and the Sheepswool sponge (Hippiospongia lachne) are important commercial species. Both sponges and octocorals are host or prey to a wide variety of organisms that live on or in their framework. Both groups obtain sustenence from the surrounding water and in doing so act as filtering mechanisms to remove minute particles and nutrients from the water.

Stony corals found in the live bottom communities include finger corals (Porites spp.), starlet coral (Siderastrea radians), rose coral (Manicina areolata), lobed star coral (Solenastrea hyades), and smooth star coral (S. bournoni). They are members of the phylum Cnidaria which includes related organisms such as jellyfish, sea anemones, and hydrozoans. Two classes of Cnidaria are principal colonial forms associated with the hardbottom, the Hydrozoa and the Anthozoa.

Hydrozoans are represented by the fire coral (Millepora alcicornis). As the name implies, this hydroid is often mistaken for a true coral. It may form a pale yellow crust on rock and occasionally may be found on soft corals or other hard substrate. Contact with this species produces painful inflammation.

Anthozoa contains two subclasses, the Octocorallia, the soft corals (e.g. whipcorals, sea feathers and sea fans) and the Zoantharia. Within the Zoantharia subclass is the order Scleractinia, containing the true stony corals (brain coral, star coral, etc.). The characteristics common to each subclass are the capability to secrete a calcareous skeleton and functional autotrophy (self-production) (Barnes, 1974).

Although many coral colonies are only a few inches in diameter, several species may reach dimensions of up to a foot or more. Larger specimens are referred to as boulder corals or coral 'heads'. The living coral tissue inhabits only the external surface of the head. The individual polyp secretes a cup or callous that provides shape and protection for the individual. As the colony grows, the calices of members of the same species join and the colony assumes a distinctive configuration and coloring. The particular species is often easily identifiable by the visual appearance of the colony as a whole. Some appear relatively smooth and spherical, such as the starlet coral (Siderastrea siderea) and others may be

flattened (rose coral) or form finger-like projections (finger corals).

Coral tissues are host to dinoflagellate zooxanthellae (microscopic algae) that live symbiotically within each coral polyp. The zooxanthellae, like other plants are capable of producing their own food. Using solar energy, they build protein, carbohydrates and other complex compounds from carbon dioxide, nitrates, and phosphates obtained from the surrounding sea water and the host coral polyp. The algae provide self-sustaining nourishment and contribute to the oxygen requirements of the coral host. The corals capture plankton and other mobile fauna with their tentacles and their metabolic waste products provide some of the basic structural compounds for the algae in return. If environmental influences (heat, cold, disease, pollution, etc.) are adverse, the coral polyps may expel the zooanthellae and the coral colony will die. This symbiotic relationship is only one of many that occur in the hardbottom community.

The soft corals (octocorals or gorgonians) form upright branched colonies that may attain several feet in height. The most common species are the sea whips (Pterogorgia spp.), sea rods (Plexaura spp.), and the sea plumes (Pseudopterogorgia spp.).

Infaunal organisms that inhabit the hardbottom include boring and burrowing sponges (Cliona sp.), gephyrid worms, urchins (Centrechinus and Echinometra spp.), and numerous gastropods, clams, and crabs. The barren rock or framework of the soft corals and sponges provide some of these organisms with substrate for attachment and access to nutrients.

Motile fauna of the hardbottom include many invertebrates and fishes of both the mangrove and seagrass communities. This area provides microhabitats for many juvenile fishes as well as infaunal organisms that tunnel the shallow sediments. Marine turtles are also quite frequently observed feeding or resting in these areas. The hawksbill turtle is especially fond of sponges which may comprise as much as 95 percent of it's diet (Meylan, 1988). The most frequently observed larger predators of the hardbottom include the barracuda (Sphyraena barracuda) and moray eel (Gymnothorax spp.). The nurse shark (Ginglymostoma cirratum), primarily a scavenger, is a common shark of the shallow water areas and is seldom a threat to man, unless stepped upon or harassed. Table 5 provides a partial list of the hardbottom fauna. The reader is referred to previous sections on mangroves and marine grassbeds for additional information on vertebrate species.

Distribution of the hardbottom communities in the preserve is predicated primarily by the availability of substrate. Composition of species in a particular area may be influenced

by other factors. Hard corals generally do not tolerate extremes in temperature or high turbidity levels. Those noted are generally more tolerant of adverse conditions than those found in the off-shore reef habitats. Fine sediments may blanket coral polyps and particles are sloughed off with a mucous film. However, excessive or chronic sedimentation reduces sunlight to the zooanthellae and creates physical stress upon the colony. Hard corals are typically found in areas closest to the tidal inlets where temperatures are more stable and where sediment loads are swept away with tidal currents.

Sponges and soft corals are physiologically adapted to withstand more turbid water conditions. Large pores in the sponges are not as easily clogged with sediments. Wave action and currents cleanse the sponges and the soft corals and carry the particles of food that these species require. Distribution of sponges and soft corals in the hardbottom community is random throughout the preserve.

TABLE 5

A PARTIAL LIST OF THE HARDBOTTOM FAUNA

INVERTEBRATES	
Porifera (Sponges)	
Variable sponge	*Anthosigmella varians*
Tube sponge	*Callyspongia vaginalis*
Chickenliver sponge	*Chondrilla nucula*
	Chondrosia collectrix
	Cinachyra cavernosa
Boring sponge	*Cliona* spp.
Heavenly sponge	*Geodia gibberosa*
Finger sponges	*Haliclona* spp.
Vase sponges	*Ircinia* spp.
	Neopetrosia longlevi
Loggerhead sponge	*Spheciosphongia vesparia*
	Spongia graminea
Fire sponge	*Tedania ignis*
	Tethya sp.
Candle sponge	*Verongia longissima*
Cnidarians	
Hydrozoans	
Encrusting stinging coral	*Millepora alcicornis*
Scyphozoans	
Comb jellyfish	*Mnemiopsis* spp.
Portugeuse man-of-war	*Physalia physalia*
By the wind sailor	*Velella velella*

Anthozoans	
Octocorallia (soft corals)	
Corky seafingers	*Briareum asbestinum*
Eunicea	*Eunicea* spp.
Venus seafan	*Gorgonia flabellum*
Sea rods	*Plexaura flexuosa*
	Plexaurella spp.
	Pseudoplexaura spp.
Purple sea plume	*Pseudopterogorgia acerosa*
Slimy sea plume	*Pseudopterogorgia americana*
Angular sea whip	*Pterogorgia anceps*
Yellow sea whip	*Pterogorgia citrina*
Hexacorallians	
Anemones	*Bartholomea annulata*
	Bundosoma cavernata
	Condylactis gigantea
Madreporarians (Stony corals)	
Ivory tube coral	*Cladocora arbuscula*
Flower coral	*Eusmilia* spp.
Golfball coral	*Favia fragum*
Rose coral	*Manicina areolata*
Large flower coral	*Mussa angulosa*
Ivory bush coral	*Oculina diffusa*
Finger coral	*Porites furcata*
Clubbed finger coral	*Porites porites*
Rough starlet coral	*Siderastrea radians*
Smooth starlet coral	*Siderastrea siderea*
Annelids	
	Arabella sp.
Tube worm	*Cistenides* sp.
	Eunice spp.
Green bristle worm	*Hermodice carunculata*
	Loimia sp.
Banded feather dusters	*Sabella* spp.
Molluscs	
Arks	*Barbatia* spp.
Scallops	*Chlamys* spp.
Tritons	*Cymatium* spp.
Cowries	*Cypraea* spp.
Tulip shell	*Fasiolaria tulipa*
Spiny lima	*Lima lima*
Burrowing mussels	*Lithophaga* spp.
Miter shells	*Mitra* spp.
Tulip mussel	*Modiolus amercanus*
Murex	*Murex* spp.
Joubin's octopus	*Octopus joubini*

Octopus	Octupus vulgaris
Pectin	Pectin sp.
Pearl oyster	Pinctada radiata
Pin shell	Pinna carnea
Reef squid	Sepioteuthis sepioidea
Slender chiton	Stenoplax floridana
Florida fighting conch	Strombus alatus
Milk conch	Strombus costatus
Queen conch	Strombus gigas
Fighting conch	Strombus pugilis
Hawk wing	Strobus raninus
Speckled tellin	Tellina listeri
Arthropods	
Snapping shrimp	Alpheus spp.
Cleaning shrimp	Lysmata intermedia
Spiny lobster	Panulirus argus
Pink shrimp	Penaeus sp.
Pederson's cleaning shrimp	Periclimenes pedersoni
Slipper lobster	Scyllarides nodifer
Squilla	Squilla sp.
Banded coral shrimp	Stenopus hispidus
Snapping shrimp	Synalpheus spp.
Star-eyed hermit crab	Dardanus venosus
Sponge crab	Dromidia sp.
Blue crab	Callinectes sapidus
Stone crab	Menippe mercenaria
Spider crab	Mithrax sp.
Hermit crabs	Paguristes spp.
Hermit crabs	Pagurus spp.
Swimming crabs	Portunus spp.
Decorator crab	Stenocionops furcata
Arrow crab	Stenorhynchusseti cornis
Echinoderms	
Agassiz's sea cucumber	Actinopyga agassizi
Furry sea cucumber	Astichopus multifidus
Basket starfish	Astrophyton muricatum
Sea star	Astropecten spp.
Sea biscuit	Clypeaster rosaceus
Long-spined sea urchin	Diadema antillarum
Boring urchins	Echinometra spp.
Slate-pencil urchin	Eucidaris tribuloides
Sea cucumber	Holothuria floridana
Brittle star	Ophiocoma echinata
	Ophioderma sp.
Bahama (cushion) starfish	Oreaster reticulatus
Chordates (Tunicates)	
	Ascidea sp.
	Didemnum amethysteum
	Styela sp.
	Symplegma sp.

VERTEBRATES

Fishes

Doctorfish	Achirurgus sp.
Blue tang	Achirurgus coeruleus
Cardinalfishes	Apogon spp.
Trumpetfish	Aulostomus maculatus
Orangespotted filefish	Cantherhines pullus
Filefishes	Monacanthus spp.
Jacks	Caranx spp.
Queen angelfish	Holacanthus ciliaris
Gray angelfish	Pomacanthus arcuatus
Blennies	Paraclinus spp.
Gobys	Gobiosoma spp.
	Microgobius spp.
Herrings	Clupeidae spp.
Bermuda chub	Kyphosus sectatrix
Slippery dick	Halichoeres bivittatus
Yellowhead wrasse	Halichoeres granoti
Hogfish	Lachnolaimus maximus
Clown wrasse	Halichoeres maculipinna
Puddingwife	Halichoeres radiatus
Bluehead wrasse	Thalassoma bifasciatum
Schoolmater snapper	Lutjanus apodus
Lane snapper	Lutjanus synagris
Gray snapper	Lutjanus griseus
Yellowtail snapper	Ocyurus chrysurus
Spotted goatfish	Pseudupeneus maculatus
Sergeant major	Abudefduf saxatilis
Damselfishes	Pomacentrus spp.
Porkfish	Anisotremus virginicus
Tomtate	Haemulon aurolineatum
Smallmouth grunt	Haemulon Chrysargyreum
French grunt	Haemulon flavolineatum
Spanish grunt	Haemulon macrostomum
White grunt	Haemulon plumieri
Bluestriped grunt	Haemulon sciurus
Atlantic spadefish	Chaetodipterus faber
Parrotfishes	Scarus spp.
	Sparisoma spp.
Bluelip parrotfish	Cryptotomus roseus
Emerald parrotfish	Nicholsina usta
Cubby	Equetus umbrosus
Reef croaker	Odontoscion dentex
Hamlets	Hypoplectrus spp.
Nassau grouper	Epinephelus atriatus
Black grouper	Mycteroperca bonaci
Grass porgy	Calamus arctifrons
Whitebone porgy	Calamus leucosteus
Great barracuda	Sphyraena barracuda
Pufferers	Canthigaster spp.
Pipefishes	Syngnathus spp.
Lined sea horse	Hippocampus erectus

Reptiles

Atlantic ridley turtle	Lepidochelys kempi
Atlantic hawksbill turtle	Eretmochelys imbricata
Loggerhead turtle	Caretta caretta caretta
Green turtle	Chelonia mydas midas

Mammals

Atlantic bottle-nosed dolphin	Tursiops truncatus

(Opersko, 1973; Opresko, et al., 1976; Schmall and Tilmant, 1980; Zischke IN Multer, 1977; Voss, 1976; Jaap, 1984; Voss, 1988 and Kaplan, 1982)

G. DESIGNATED SPECIES

One of the more intrinsic values of the Card Sound Aquatic Preserve area is the habitat provided to large numbers of endangered, threatened and species of special concern. The land and water areas around the Sound are refuge for a diverse group of designated plants and animals that have been extirpated or excluded from the sprawling metropolitan area to the north and are under intense pressure from loss of habitat or disruption of feeding, nesting and resting areas. Overharvesting, landclearing, coastal construction, dredging, ditching, pesticides and the introduction of exotic plants and animals have contributed to the decline of many of these species and will continue to stress recovery capabilities for most of them. The identification and protection of designated species and their habitat shall be a major function of this management plan and future management of the preserve.

1. Designated Plants

Many of the plants in south Florida and the Florida Keys are of West Indies origin. Most are at the extreme northern limits of their distribution and must compete with other subtropical and temperate vegetation. Natural selection has favored dominance of the West Indian vegetation in the Keys because of lower rainfall and warmer temperatures (Tomlinson, 1980). The tropical hardwood hammocks of Key Largo contain more than 30 species of threatened, endangered or commercially exploited plants species. Six additional species are associated with transitional and mangrove wetlands in the Keys and on the mainland shoreline.

Designated plant species are given minimal protection by state statutes. Although plants are listed, there are no enforcement measures to restrict the destruction of species on private lands. Monroe County provides some protection through development requirements that reduce density and clearing in

high quality hammocks or by requiring mitigation for the destruction of designated species through transplantation or replacement (Monroe County, 1986). Much of the transplantation is done without regard for the physiological requirements of the plants or the receiver site conditions (e.g., shade adapted specimens placed in full sun or those requiring moist, acidic soils placed in sterile, quarried, fine crushed oolitic limestone) (Personal observations). Revegetation with nursery grown plants from the mainland is similarly a less desireable alternative than preservation of the indigenous genetic stock.

Explosive growth and development have eliminated much of the tropical hardwood hammocks in the Keys. Proposed development for north Key Largo would have allowed approximately 3,500 residential units in addition to the existing development (Monroe County, 1989). Endangered and threatened hardwood hammock species, or small colonies of these species are generally dispersed randomly throughout a hammock. This 'clumping' is often overlooked by those who clear land for development. This practice may eliminate an individual or an entire colony of an already limited species.

Preservation of the West Indian tropical hardwood hammocks on north Key Largo is a primary objective of the Key Largo Hammocks State Botanical Site administered by the Florida Department of Natural Resources through the Division of Recreation and Parks. Approximately 2000 acres of primarily undeveloped woodlands have been purchased through the Conservation and Recreational Lands Program and negotiations are continuing on additional parcels (FDNR, 1990 (a)). Smaller tracts of hammock are also protected within the Crocodile Lakes National Wildlife Refuge and on several of the Keys within Biscayne National Park. Table 6 provides a partial species list of plants considered to be endangered, threatened or commercially exploited.

TABLE 6

FLORAL SPECIES OF THE CARD SOUND AQUATIC PRESERVE AREA THAT ARE DESIGNATED AS ENDANGERED, THREATENED OR COMMERCIALLY EXPLOITED

Common Name	Scientific Name	Status FDA	Status USFWS
Tamarindillo	Acacia choriophylla	E	
Golden leather fern	Acrostichum aurem	E	
Giant leather fern	Acrostichmu danaeifolium	T	
Bird's nest speenwort	Asplenium serratum	E	
Strap fern	Campyleneurum phyllitidus	T	
Prickly apple cactus	Cereus gracilis	E	UR
Dildoe cactus	Cereus pentagonus	T	

Satinleaf	Chrysophyllum olivaeforme	E	
Balsam apple	Clusea rosea	E	
Coconut palm	Cocos nucifera	T	
Geiger tree	Cordia sebestena	E	
Dollar orchid	Encyclia boothiana	E	UR
Clamshell orchid	Encyclia cochleata		T
Butterfly orchid	Encyclia tampensis	T	
Beach creeper	Ernodia littoralis	T	
Redberry stopper (ironwood)	Eugenia confusa	T	
Red stopper	Eugenia rhombea	E	
Wild cotton	Gossypium hirsutum	E	
Lignumvitae	Guaiacum sanctum	E	
Manchineel	Hippomane mancinella	T	
White ironwood	Hypelate trifoliata	T	
Rockland morning glory	Ipomoea tenuissima	T	
Joewood	Jacquinia keyensis	T	
Sea lavender	Mallotonia gnaphalodes (= Tournefortia gnaphalodes)	E	
Polypody fern	Microgramma heterophylla	T	
Hand fern	Ophioglossum palmatum	E	UR
Prickly pear cactus	Opuntia compressa	T	
Prickyl pear cactus	Opuntia stricta	T	
Golden polypody fern	Phlebodium aureum	T	
Mahogany mistletoe	Phoradendron rubrum	E	
Whisk fern	Psilotum nudum	T	
Ladder brake fern	Pteris longifolia	T	
Bay cedar	Suriana maritima	E	
West Indian mahogany	Swietenia mahogani	T	
Florida thatch palm	Thrinax floridana	C	
Brittle (Keys) thatch palm	Thrinax microcarpa	C	
Relexed wild pine	Tillandsia balbisiana	T	
Twisted air plant	Tillandsia circinata (= T.paucifolia)	T	
Wild pine or air plant	Tillandsia fasciculata	C	
Banded wild pine	Tillandsia flexuosa	T	
Needle-leaved air plant	Tillandsia setacea	T	
Wormvine (vanilla) orchid	Vanilla barbellata	E	
Shoestring fern	Vittaria lineata	T	

Note:
FDA==Florida Department of Agriculture and Consumer Services (list published in Preservation of Native Flora of Florida Act, Section 581.185-187, Florida Statutes). 1990.
E = Endangered
T = Threatened
C = Commercially Exploited

USFWS==United States Fish and Wildlife Service (list published in List of Endangered and Threatened Wildlife and Plants, 50 CFR 17.11-12).
E = Endangered
UR = Under review for federal listing

2. Designated Animals

Designated wildlife of the Card Sound area includes a diverse group of terrestrial and aquatic animals. Those of the upland areas include two rodents, two snakes, a tree snail and a butterfly. Management of habitat for these species is provided by other programs and they will not be discussed here. Published literature on the Key Largo woodrat and Key Largo cotton mouse is provided by Sherman, 1955; Hersch, 1981; Barbour and Humphrey, 1982 and Goodyear, 1985. Distribution of the various color phases of the Florida tree snail have been published by several authors, including Young, 1960. Published distribution and research findings for the Schaus swallowtail butterfly is provided by Emmel, 1986 (a). Like the hammocks that these animals inhabit, they are threatened by development, poaching, fires and exotic introductions. The Schaus swallowtail butterfly is especially vulnerable to the aerial application of insecticides for mosquito control. Table 7 includes all endangered, threatened and species of special concern that may occur in the Card Sound area.

The avifauna of the area represents the largest group of listed species. All except two species on Table 7 are dependent upon wetlands for their survival. The Little blue heron, Snowy egret, Reddish egret, Tricolored (or Louisiana) heron, and the Roseate spoonbill are currently listed as species of special concern. These colonial nesters were easy prey for the plume hunters of the early part of the century. Entire rookeries were annihilated as plume hunters killed the adult birds in breeding plumage and left chicks to die. As the demand for plumes declined, the real estate boom began in south Florida. Thousands of acres of wetlands were drained for agriculture and residential development. Depleted breeding stocks and ever vanishing habitat brought these species and others to the brink of extinction. Loss of habitat, water management practices on the mainland, and the introduction of pesticides into the food web may still compromise the survival of many.

The Southeastern snowy plover is a summer visitor to our shores and shallow-water wetlands but does not nest here (Wofenden, 1978). This threatened species has suffered decimation in many of the Caribbean countries. Excessive hunting pressures and destruction of habitat are instrumental in population declines (Arendt et al., 1979; Wiley, 1979).

The White-crowned pigeon, a threatened species, is hunted for sport and food in many of the Caribbean countries. Excessive hunting pressures, egg collecting and removal of tropical hardwood forests have seriously depleted resident populations in at least two countries. Cooperative agreements, closed seasons and complete protection in several areas have slowed the decline of this species. Populations in Florida are

protected from hunting but efforts must continue to stem the loss of tropical hardwood trees that the pigeon depends on for food. Poisonwood (Metopium toxiferum) is a favored food during the fruiting period. As the name implies, this tree has certain toxic properties that irritate sensitive human skin (and may cause more severe complications for hypersensitive persons). It is frequently eradicated from human environs. Other less objectionable hammock trees and shrubs, such as, Pigeon plum (Coccoloba diversifolia), Snowberry (Chiococca alba), stoppers (Eugenia spp.), Wild coffee (Psychotria nervosa) and wild figs (Ficus spp.) are also staple foods. However, few of these plant species are given explicit protection under local landclearing ordinances. The pigeon feeds in the hammocks and nests in the more remote mangroves. It is sensitive to human activity or disturbance in both areas (Robertson and Kushlan, 1974; Sprunt, 1986).

The endangered Peregrin falcon is a winter visitor to the area. Pesticides in the food chain were instrumental in the decline of this raptor. Elimination of certain insecticides and reintroduction of the falcon are proving successful in reestablishing this species in the former range. Perched upon utility wires or hovering over open areas, it can overtake and capture other birds in midflight. It may be encountered in variety of habitats from September to May (Snyder, 1978).

Open-water piscivorous birds include the endangered Bald eagle and the threatened Eastern brown pelican. The eagle population has suffered a 50% decline over the last 30 years. Florida populations have dropped from 1,000 to less that 350 breeding pairs (Robertson, 1978). Eagles are not known to nest in the preserve but suitable feeding habitat may attract an occasional visitor.

The Eastern brown pelican has suffered a similar fate on a national level. A massive die-off in Texas and Louisiana during the 1960's prompted the federal government to list the pelican as an endangered species until 1984. It appears that local populations have remained fairly stable and the pelican has been deleted from the endangered category. It is now considered to be a species of special concern in Florida. There are 19 breeding colonies of brown pelicans in the Keys. This represents 38% of the Florida population (Schreiber, 1978). The pelican prefers more remote mangrove areas for nesting and will often join other colonial species.

The Osprey, which is now listed as a species of special concern in the Keys, may well reach threatened status if populations continue to decline. The locally limiting factors are thought to be availability of suitable nesting habitat and adequate food during the nesting season. The osprey is tolerant of human occupation but like the eagle, prefers large, dead trees that rise above the surrounding canopy for

nesting. Hurricanes and landclearing have removed many of these suitable trees and the osprey has opted for nesting on utility poles and elevated platforms. The possible addition of artificial nesting platforms is being investigated as a means to encourage more osprey nesting. Continued protection of mangrove rookeries and the mangrove/detritus food chain are vital for the eagle, pelican, osprey, and the many wading birds that depend upon fish and marine invertebrates for food.

The marine turtles have suffered depredation similar to that described for the wading birds. Overharvesting, egg collecting and entanglement are global problems for all marine turtles. Nest predation, boat collisions, beach alteration, shoreline lighting, and illegal harvesting of eggs and adults are continued impediments to survival for Florida populations.

The Atlantic green turtle was once a mainstay to local fisherman. Shortly after the turn of the century, most of these turtles had been eliminated from local waters. It feeds in marine grassbeds.

The endangered Atlantic hawksbill may be observed occasionally in hardbottom areas and feeds extensively on marine sponges. The highly endangered Atlantic ridley turtle's specialized nesting habits have subjected this turtle to excessive egg collecting, slaughter and drowning in shrimp nets. The world population is estimated to be 3,000-5,000 females (Lund, 1978). The ridley is only an occasional transient in the preserve.

The Atlantic leatherback, a large, typically oceanic turtle is occasionally sighted in nearshore waters of the Keys but would only occasionally or accidentally enter the shallow waters of the Sound. The threatened Atlantic loggerhead turtle is observed frequently in the preserve. Loggerheads utilize a variety of habitats including mangrove creeks and marine grassbeds (Odum et al., 1982; Zieman, 1982). The loggerhead is the most common turtle in nearshore waters and is the most frequently recorded nesting species in Florida.

The preserve represents critical habitat for the endangered American crocodile. Populations in the Caribbean and South America are heavily hunted for hides. Steady declines of Florida population resulted in the crocodile being placed on the endangered species list in 1975. Protective status does not appear to have slowed the decline of this species. The Florida crocodile population is estimated to be 100-400 adults with approximately 20 nesting females (Ogden, 1978; Moler, 1991). Loss of habitat, altered drainage patterns, boating traffic and human habitation of the shoreline are limiting factors. Low reproductive success from predation or environmental factors that affect hatching are also suspected

to be instrumental in low recruitment numbers (Ogden, 1978; Lutz and Dunbar-Cooper, 1982).

Crocodile nesting is primarily limited to Everglades National Park, Barnes Sound and the canals at Turkey Point power plant. Both juvenile and adult animals frequent all areas of the preserve (Moler, 1991).

The endangered West Indian or Florida manatee is a frequent visitor to the preserve. Individuals and small pods or groups forage over large areas consuming vast quantities of marine grasses. Warm water temperatures prompt immigration of larger numbers of manatees into the area during the winter. Sightings of manatee are in boat basins and marinas. Offerings of food and fresh water will often entice the manatee to linger in these areas for longer periods. This practice should be strongly discouraged, as it increases the manatee's exposure to danger from boats. Although there are no designated "manatee areas", boaters should be cautious and reduce speed when manatees are in an area. Heavy penalties are imposed for harassing or negligently injuring or killing this highly endangered species.

In 1989, 167 (of the estimated 1,1464) manatees died in Florida. Fifty (30%) of those deaths were the result of boat and barge collisions. Another 3% were killed by other man-induced problems, such as entanglement in nets and lines and being crushed by water control gates. Prolonged cold weather and other natural causes also contribute to high mortalities (FDNR, 1990 (b)).

Qualitative information on marine fishes and invertebrates are conspicuously absent from the literature. Of those listed, only the Common snook (Centropomus undecimalis) has been extensively studied. This species is a prized sport and food fish and has suffered serious population declines throughout Florida in the past decade. Overharvesting, degradation of mangrove and grassbed habitats, and degraded water quality or a combination of these factors may have been instrumental in the decline. Insecticides are also implicated (EPA, 1981). These fish are extremely sensitive to cold weather. Cold shock results in large numbers of fish lying lethargically in shallow waters where they are subject to predators and poaching. Snook populations have shown some indications of increasing in the last three years. Continued protection, closed seasons and research are needed to ensure this trend.

Only a few marine invertebrates have been designated for protection. State law (F.S. 370.110) prohibits the taking of hard corals (Millepora spp. and the Scleractinia) and two species of sea fans (Gorgonia ventalina and G. flabellum) from state waters. The long term effects of harvesting, degraded water quality and other disturbances upon marine invertebrates

is at best poorly understood. As research and distribution studies continue, other species may eventually be added to the lists.

The concern for an individual endangered species may prompt a concerted effort for preservation and has proved successful in a limited number of cases. The Peregrin falcon and the Alligator are such examples. Other efforts have proved only marginally successful. The Florida manatee has benefited from designated sanctuaries but the steady growth of recreational power boats still imperils this slow moving siren throughout it's limited range. Much the same situation exists for the American crocodile, the Bald eagle and many other species. The onslaught of human populations, development in the coastal zone and water use priorities leave little hope for many of these animals. Designated refuges and preserves, stringent laws and a "conservation ethic" are possibly all that separate them from extinction.

TABLE 7

FAUNAL SPECIES OF THE CARD SOUND AQUATIC PRESERVE AREA THAT ARE DESIGNATED AS ENDANGERED, THREATENED, OR SPECIES OF SPECIAL CONCERN

Common Name	Scientific Name	Status FGFWFC	Status USFWS
INVERTEBRATES			
Schaus swallowtail butterfly	Heraclides aristodemus	E	E
Florida tree snail	Liguus fasiatus	SSC	
Small star coral	Montastrea annularis	*	
Large star coral	Montastrea cavernosa	*	
Starlet coral	Siderastrea siderea	*	
FISH			
Common snook	Centropomus undecimalis	SSC	
Rivulus	Rivulus marmoratus	SSC	
Key blenny	Starksia starcki	SSC	
REPTILES			
Atlantic loggerhead turtle	Caretta caretta caretta	T	T
Atlantic green turtle	Chelonia mydas mydas	E	E
American crocodile	Crocodylus acutus	E	E
Leatherback turtle	Dermochelys coriacea	E	E
Eastern indigo snake	Drymachon corais couperi	T	T
Atlantic hawksbill turtle	Eretmochelys i. imbricata	E	E
Atlantic ridley turtle	Lipidochelys kempi	E	E
Miami black-headed snake	Tantilla oolitica	T	UR

BIRDS			
Roseate spoonbill	Ajaja ajaja	SSC	
Southeastern snowy plover	Charadrius alexandrinus	T	UR
White-crowned pigeon	Columba leucocephala	T	UR
Little blue heron	Egretta caerulea	SSC	
Reddish egret	Egretta rufescens	SSC	UR
Snowy egret	Egretta thula	SSC	
Louisian or Tricolor heron	Egretta tricolor	SSC	
Perefrine falcon	Falco peregrinus	E	T
Southeastern kestrel	Falco sparverius paulus	T	UR
Bald eagle	Haliaeetus leucocephalus	T	E
Wood stork	Mycteria americana	E	E
Osprey	Pandion haliaetus	SSC	
Eastern brown pelican	Pelecanus occidentalis	SSC	
Least tern	Sterna antillarum	T	
Roseate tern	Sterna dougallii	T	
MAMMALS			
Key Largo wood rat	Neotoma floridana smalli	E	E
Key Largo cotton mouse	Peromyscus gossypinus allipaticola	E	E
West Indian manatee	Trichechus manatus latirostris	E	E

Notes:

FGFWFC==Florida Game and Fresh Water Fish Commission, 1990. (list published in Section 39-27.03-05, Florida Administrative Code)
E = Endangered
T = Threatened
SSC = Species of Special Concern

USFWS==United States Fish and Wildlife Service (list published in List of Endangered and Threatened Wildlife and Plants, 50 CFR 17.11-12).
E = Endangered
T = Threatened
UR = Under review for federal listing

* = Rare and Endangered Biota of Florida. P.C.H. Prichard, Series Editor. Vo. 1-6. University Presses of Florida, Gainesville, FL, 1978. (Species listed are considered as Threatened.)

H. HISTORIC AND CULTURAL RESOURCES

The maritime environment has played a very important part in the historic and cultural makeup of this small geographic area. From the ancient to the modern, most interests in the area have been turned toward the hospitable climate and the commerce of the seas.

The earliest human residents were the various tribes or clans of American Indians that traversed the nearshore waters and rivers of the region in dugout canoes. Evidence suggests that these tribes settled near the coast to exploit the abundant fish, turtles and mollusks. Shells and bones provided tools, vessels and ornament. Large shells were shaped for cutting and digging. Primitive agriculture and gathering of wild foods and fibers were facilitated with these tools. Bones were fashioned into fish hooks and implements. Clay pottery and stone implements were also common, indicating established trade systems with other tribes and nations to the north. Large kitchen middens and burial mounds are all that remain to mark the passage of these cultures (Tebeau and Carson, 1965).

The Tequesta tribe occupied the area of Biscayne Bay when the first Europeans explored the American coast. The Calusa Indians from the west coast were believed to have interacted, often violently, with the Tequestas. Other smaller tribes, principally the Matecumbes, also defended small settlements in the Keys (Bullen IN Tebeau and Carter, 1965).

The native Indian's occupation of the area was short lived after the Spanish made landfall in the west. Disease, warfare and capture were believed to have decimated Indian populations in less than 200 years. Early explorers included Ponce De Leon who navigated the peninsula in the early 1500's and was reported to have sailed into Chequescha Bay (Biscayne Bay) in 1513. Small Spanish missions were later established in St. Augustine and in the panhandle of Florida. Spanish explorers are believed to have landed in the area to secure water and provisions for the long journeys between the Caribbean islands but Indian hostilities prevented permanent settlements in south Florida. Spanish domination of the state lasted until 1763 (Bullen IN Tebeau and Carter, 1965).

In 1763, Florida was traded to the English for the city of Havana which the English had captured the year before. It was traded back to the Spanish in exchange for the Bahama islands and was later ceded to the fledgling government of the newly founded United States in a treaty agreement in 1821 (Chapin, 1914).

The somewhat sketchy but colorful exploits of the pirates who plundered the treasure laden ships of the Spanish fleets were also to become an indelible page in the south Florida history.

Fast boats, shallow water and miles of tangled mangrove creeks gave the pirates ample opportunity to attack the ungainly galleons and retreat to comparative safety. Reprisal was forthcoming when the new U.S. Navy dispatched the West Indies Squadron (locally referred to as the Mosquito Fleet) under the direction of Commodore David Porter. This fast fleet of shallow draft boats pursued the pirates to their hiding places and eventually ousted them from the area. Descriptive names, such as Caesar's Creek, remain to note their passing use of the area.

By the early 1700's many of the Spanish missions in north Florida had been abandoned. Creek, Oconee and Yamasee Indians from Georgia and the Carolinas raided settlements as far south as Cape Florida. The newly named Seminoles (meaning renegades or runaways) were joined by runaway slaves. Attempts to move the Indians to reservations in the west resulted in bloody warfare when a ruling chief was taken prisoner. The Seminoles waged war against the whites from 1832 until 1842. Disbanded and demoralized, the survivors retreated to the depths of the Everglades (Morris, 1989; Chapin, 1914). The estimated 3,600 Seminole and Miccosukee descendants now live on four reservations in south Florida (Morris, 1989).

Ft. Dallas, the site of modern Miami was established in 1830. In the 1870's there were regular steam ship routes between New York and Key West. Other parts of the Keys and the Miami River area were reached by small shallow draft ketches and sloops. By 1880 there was regular mail service to the area (Chapin, 1914).

The 1900's brought many changes to both the culture and their utilization of the areas natural resources. A chain of lighthouses on the reef edge guided vessels on a safer course. Blight and more productive ports in Cuba soon usurped the agricultural markets and declining numbers of turtles and sponging grounds severely limited those industries as sources of subsistence in the Keys. Motorized vessels and improved fishing methods were to become the basis for an ever expanding fishery. The warm climate, tropical environment and cheap land brought hundreds and then thousands of new settlers to south Florida.

In 1910 the city of Miami boasted a population of 5,500. By 1913 the local newspaper reported a resident population of 14,000 and an additional 25,000 people in the winter months. The Dade County (which included what is today Broward County) population was estimated to be 11,933 (Chapin, 1914).

The Florida Keys population was an impressive 21,563 in 1910. All except 2,000 resided in Key West (Chapin, 1914). Key West was a major port and commerce center by this time, with sponges, cigars and turtles representing a large proportion of

the export goods. The U.S. navy had established a base there and the city had been a port of entry for salvage (or wrecking) operations since 1822.

Settlement in other parts of the Keys included Bahamian fisherman and malcontents from the Carolinas after the Civil War. These settlers harvested the sea and farmed small plots of limes and pineapples. Welcome windfalls of goods from the cargos of unfortunate sailing ships that were dashed upon the treacherous reefs often supplemented basic needs and more often produced luxurious oddities. Pewter tableware and fine linens or silks occasionally adorned the driftwood shanties of coastal dwellers (Carter, 1976; Eyster, 1987).

Massive efforts were under way to drain and dredge the Everglades and Lake Okeechobee by 1881. Proponents of these projects sighted the availability of rich muck soils on which to expand agricultural and livestock interests. A system of canals would link the lake with the Atlantic and the Gulf to shorten navigation routes from east to west. Opponents to these projects were concerned about climate changes created by draining wetlands. They feared that massive drainage would move the frost line south of established citrus farming areas. Proposals also did not appear adequate to drain the land well enough for agricultural use, and a properly designed system would cost much more than the amount budgeted. Others were concerned that peat muck soils, once dried, were highly susceptible to fires that would affect large areas (Chapin, 1914). Under increasing demands for new development and commerce, these projects moved ahead, as did dredging new channels across upper Biscayne Bay.

Henry Flagler's railroad was the first land route to the south Florida region. Hotels were established along its route so that northern visitors would have accommodations and comfort. By 1912 the Florida East Coast Railroad was opened to Key West. The Keys portion of the railroad was replaced with a roadway and bridges after it was heavily damaged by the Labor Day Hurricane of 1935. The Overseas Highway would accommodate ever increasing numbers of tourists and fisherman to the area. Coupled with the tropical climate and year round abundance, both tourism and fisheries flourished (Martin, 1949; Dean, 1982).

CHAPTER IV

REGIONAL LAND USE, DEVELOPMENT AND ASSOCIATED IMPACTS

In one decade Florida has become the fourth largest state with a population of more than 12 million people. This represents a 31% increase since 1980 (Hoffman, 1991). As our population expands, increasing pressures are placed upon governments, services, infrastructure, and the natural resources that contribute to the quality of life in the state and region. This chapter of the management plan will discuss regional land use, local development and associated impacts to natural resources of the aquatic preserve.

An important component of the aquatic preserves program and management functions will be to balance the needs for recreation, residential, public works projects and other human activities with the need to maintain the functional integrity of natural systems and resources. Cooperation and coordination with regional and local planning staffs, property owners and local governments are seen as an avenue to communicate the preserve's goal to maintain the aesthetic, scientific and biological resources for the enjoyment of present and future generations.

A. REGIONAL LAND USE AND DEVELOPMENT

The south Florida region may be interpreted to include a variety of locations or features depending upon: political subdivision, county lines, geological formations, climate, watershed or any number of other natural or artificial boundaries. For purposes of this discussion, the south Florida region will include Monroe, Dade, Broward, Palm Beach, Hendry, Glades, Charlotte, Lee, and Collier counties. This delineation is based upon their proximity to the aquatic preserve. All counties except Glades and Hendry, which are principally agricultural lands, are coastal areas with substantial population densities. The south Florida region encompasses one-third of the state's total population. Three of the 10 fastest growing metropolitan areas in the United States are within this region (Hoffman, 1991). Table 8 contains current population figures for the noted counties.

From 1970 to 1980 populations increased at rates of 50% or more in all south Florida counties, except Dade and Monroe. Charlotte, Collier and Lee counties experienced growth rates of 112%, 126%, and 95%, respectively during that time period. The 1980's witnessed more conservative growth in some areas. However, once again, with the exception of Dade and Monroe

counties, all others more than doubled their previous 1970 densities (Sheryen, 1990).

TABLE 8

1989 POPULATION ESTIMATES BY COUNTY FOR SOUTH FLORIDA

COUNTY	POPULATION	RANK IN STATE
DADE	1,873,078	1
BROWARD	1,242,448	2
PALM BEACH	865,507	3
LEE	324,520	11
COLLIER	144,721	22
CHARLOTTE	99,214	26
MONROE	78,966	33
HENDRY	26,138	45
GLADES	7,765	64
TOTAL POPULATION	4,662,357	

(Adapted from Florida Statistical Abstract, Sheryen, 1990)

Land use in south Florida is principally dedicated to agriculture, tourism, residential, commercial, maritime and military activities.

The south Florida mainland is attractive to a variety of agricultural industries. The warm climate and irrigation water provide year round crops of sugarcane, fruit and vegetables. Ornamental foliage plants and flower crops also compete for national and world markets. Large areas of the Kissimmee and Okeechobee Basins and the East Everglades have been drained for livestock grazing. Beef and dairy cattle are major commercial products.

Biscayne and Florida Bay waters have historically provided recreational respite from the more heavily developed urban areas along the east coast of Florida and the northeastern states. Interstate road systems and international airports connect the metropolitan area with the region and the world. The area attracts millions of tourists each year, second only to Orlando in total visitors to the state (Sheryen, 1990).

Many who visit the area decide to stay, spurring the development of new residential and commercial facilities. During 1988 Dade and Monroe counties issued 2,323 permits for new single family homes. During the same time period, 3,715 multi-family residences were permitted. In 1989, permits were

issued for 5,013 multi-family units in the two counties (Sheryan, 1990).

For tourists and residents, the marine environment is the major attraction in the region. Diving, snorkeling and fishing are favorite pursuits involving the use of private or commercial boats. In 1988-89, 136,538 pleasure boats were registered in Dade, Monroe, Broward and Palm Beach counties (Sheryen, 1990).

From earliest recorded history, the area has been important to maritime interests. European trade routes and Caribbean basin traffic have linked the Keys and south Florida with the world. Port Everglades, Miami and Key West continue that tradition. They are major points of cultural and economic exchange. Cruise ships and tours provide additional access for the millions of tourists who visit the area annually. Miami is the largest cruise ship port in the world.

Fisheries were one the primary enticements to the early explorers and settlers of the area. Sponges, turtles, finfish, conch and spiny lobster supported many families and entire villages in some areas. All but protected turtles and queen conch are still a mainstay to the local commercial fisheries. Although this industry employees a relatively small proportion of the population, it is probably the fourth most important industry in the Keys and contributes a substantial boost to the Dade County economy. Table 9 provides currently available landings statistics for selected Dade/Monroe commercial fisheries. This table reflects the annual landings for species that are heavily dependent upon estuarine conditions during part or all of their life cycles.

Local commercial sponging has undergone an unprecedented resurgence following the collapse of the Mediterranean sponging industry. Products are used in the manufacturing, medical and cosmetic industries. Most sponges are taken in the shallow waters of the Bays and Sounds in the area. Sponges are harvested with hooked poles from small boats. Calm, clear water conditions aid the harvesters to visually locate and hook the sponge. Sponge landings in Dade for 1989 were 216,281 pounds with an estimated value of $ 1,148,452. Sponge landings for Monroe were 298,550 pounds with an estimated value of $ 1,585,301. Landings for Monroe and Dade represented 66% of the state landings with Pinellas County contributing 34%. Monroe landings exceeded those for Pinellas by more than 31,000 pounds (FDNR/MFIS, 1990).

Table 10 provides a comparison of the commercial sponge fishing landings for the Dade/Monroe area for 1984 and 1989. During that five year time period there was a 98% increase in pounds of sponges landed, while average price per pound declined by 59% during the same time period. (Average price

per pound in 1984 was $9.19. Average price in 1989 was $5.31 per pound.) (NMFS, 1986; FDNR/MFIS, 1990). The decline in price may be attributed to glutted markets, inferior quality, and/or small sizes of sponges harvested.

Economies are also stimulated by the facilities and services related to recreational fishing and accommodations for participants from throughout the region. In 1985, recreational fisheries accounted for 14,101 pounds of fish landed in Monroe County with a commercial retail value of $11,677 (Brooks, 1989). Monetary value of goods and services related to the fuel, provisions, bait, accommodations and other services rendered to this diverse group of sportsman is more difficult to extract but is considered to be worth several million dollars annually to local economies.

Geographically and historically, the region has been a strategic location for national security interests. The U.S. Navy, Coast Guard and Air Force maintain several facilities on the mainland and in the Keys. Flight training and aerial reconnaissance are routine activities that may potentially affect the aquatic preserve should there be an accident. Local populations and economies are also influenced by the presence of these facilities. Goods and services, as well as housing and other industries are stimulated by the additional population. Many of the retired staff remain to become permanent residents after service.

TABLE 9

PRELIMINARY SUMMARY OF COMMERCIAL LANDING DATA FOR SELECTED SPECIES FOR DADE AND MONROE COUNTIES 1989

	DADE		MONROE	
SPECIES	POUNDS	VALUE +	POUNDS	VALUE +
Bait fish	14,629	$ 1,463	124,926	$ 12,493
Mullet	28,238	10,166	202,713	72,977
Sea trout	2,349	2,537	32,583	35,190
Man. snap.*	10,639	14,788	355,905	494,708
Stone crab	34,814	176,507	1,617,860	8,202,550
Lobster	310,538	944,036	5,535,309	16,872,339
Bait shrimp	191,283	671,403	45,051	158,129
TOTALS	592,490	$1,820,900	7,914,347	$25,848,386

(+ Based upon average price per pound paid statewide)
(* Mangrove snapper)
(Adapted from FDNR, 1990 unpublished data)

TABLE 10

COMPARISON OF SPONGE LANDINGS IN DADE AND MONROE COUNTIES 1984-1989

YEAR	COUNTY	POUNDS LANDED	ESTIMATED VALUE
1984	DADE	17,334	$ 142,298
1989	DADE	216,281	1,148,452
1984	MONROE	23,017	228,844
1989	MONROE	298,550	1,585,301

(Source: NMFS/SEFC, 1986; FDNR/MFIS, 1990)

B. LOCAL LAND USE AND DEVELOPMENT

A major portion of the land area adjacent to Card Sound Aquatic Preserve is undeveloped or is developed with low density commercial and residential use. A primary restraint to development in this area is the lack of dry, fast substrate. Approximately 98% of the undeveloped shoreline is forested with mangroves. Most of this land is now in public ownership. Figure 4 provides an overview of existing land uses adjacent to the preserve.

For purposes of this management plan, adjoining uplands will be limited to five categories based upon type and intensity of existing use. Designations do not reflect any particular zoning or planning area districts as applied by Monroe or Dade County government.

Low Density Residential: Low density residential will include properties and facilities intended for private single family use and which have a density of less than 4 units per acre. Three small islands in and adjacent to the preserve fall within this category. Broad Key has a single residence with two staff cottages, a small dock and covered boat house. Linderman Key has a single residence, guest cottage and dock. Pumpkin Key is developed with a residence, staff housing, multi-slip dock, and conditional county approval for 15 additional residential units.

High density residential: High density residential will include areas with a majority of the units at a density of 4 or more units per acre. Two improved subdivisions are located on the north end of Key Largo. Ocean Reef Club and Angler's Club are exclusive residential facilities with commercial and recreational improvements for the use of members and guests. Ocean Reef Club

maintains a private air strip, fire department, sewerage treatment plants, medical facility, security staff and large commercial marina. Both facilities also provide private dockage for residents and guests. Angler's Club is principally multi-family residential with a sewerage treatment plant, marina and recreational amenities.

Commercial/Utility: Commercial and utility projects are grouped, as potential for intensity of use is similar. Utility activity is confined to two small areas of shoreline on the west side of the Sound and is associated with utilities service and water management activities.

Although not considered an appropriate or approved land use, a small portion of the shoreline at the southwestern boundary of the preserve is used for transient mooring, residential and commercial fishing purposes. Since structures and activities involved with this use are not authorized and are occurring on public right-of-way, the use is recognized but the shoreline will not be mapped for this activity.

Public Right-of-way: The right-of-way for Card Sound Road (C-905A) transits the southern boundary of the preserve. Activities involved would include maintenance and improvements of the roadway, bridge supports and the utility pilings within the right-of-way.

Undeveloped: The undeveloped areas category will include those lands that are mangrove and transitional wetlands and/or mangrove islands. As noted, much of this land is in public ownership. The majority of those lands still in private ownership on north Key Largo are identified for purchase though the C.A.R.L. fund for inclusion in the Key Largo Hammocks State Botanical Site which currently contains approximately 2,000 acres. Other parcels are identified for purchase by the USFWS for inclusion in the Crocodile Lake National Wildlife Refuge which currently contains approximately 6,522 acres (Holle, 1991). Undeveloped wetlands on the mainland shoreline are targeted for purchase as part of the 29,643 acre Save Our Rivers plan developed by the South Florida Water Management District.

The purchase of additional undeveloped lands has been identified as necessary to: 1) protect sensitive wetlands that are vital to the health and productivity of the region; 2) protect valuable and very limited habitat for endangered and threatened species and; 3) maintain the aesthetic and biological qualities of one of the more pristine areas in south Florida. To this end, purchased lands are typically managed to maintain or restore their natural condition, where feasible.

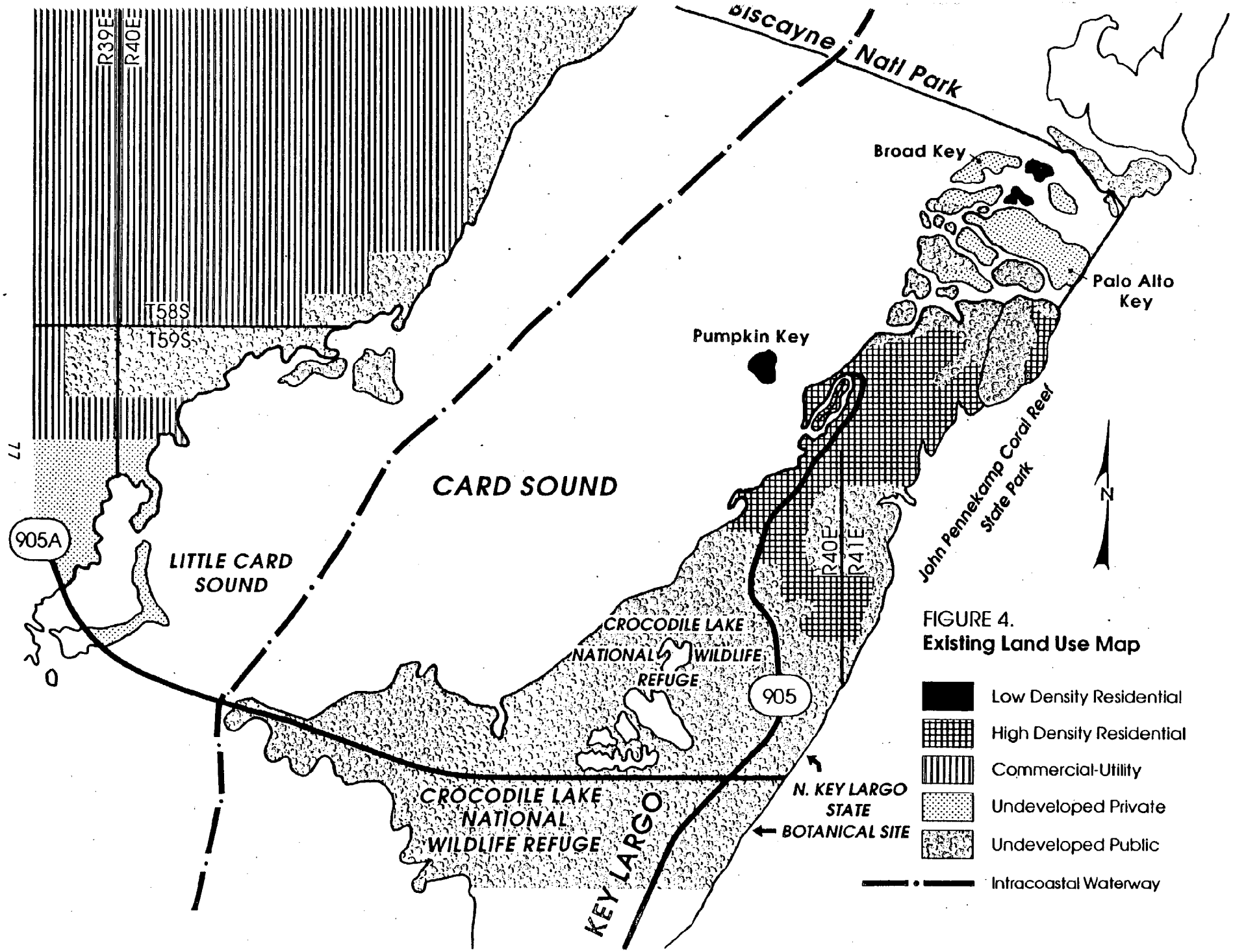


FIGURE 4.
Existing Land Use Map

C. ASSOCIATED IMPACTS

As an ecological unit the south Florida region is often characterized as the Kissimmee-Okeechobee, Everglades-Florida Bay-Coral Reef system. Water quality, accumulation, aquifer recharge, retention, dispersal and use are the common elements that unite this region. Water needs of agricultural and urban development must be balanced with the need to maintain or restore quality, quantity and periodicity of water flow to the larger environmental complex and for aquifer recharge. Pollution, depletion, flooding, drought, salt water intrusion, alteration or loss of environmentally sensitive wetlands, and priority of use are ongoing issues that must be addressed by the public and various management entities within the region. Because these systems are interconnected, the impacts to one part of the system will eventually impact all of the system, depending upon severity and/or duration. The aquatic preserve lies 'down stream' of this complex system.

Agricultural activities place demands upon the regions three most precious resources; space, soil and water. The use of pesticides and fertilizers pollute soils and degrade water quality. Peat soils (Everglades muck) are easily eroded and quickly depleted of nutrients. Nutrient depletion requires larger amounts of fertilizers to maintain production or the land is abandoned for new areas for cultivation. Abandoned lands are typically reclaimed by noxious exotic plants or developed for more intense use.

Pastures, feed lots and dairy yards accumulate tons of animal wastes that enter surface waters as raw nutrients. Nutrient pollution is a mounting problem in Lake Okeechobee and the east Everglades. Massive algal blooms in the lake are common during the summer months. Depressed dissolved oxygen levels and fish die-offs usually follow. Natural wetland communities are being replaced with monotypic stands of cattails (Typha) and melaleuca (Melaleuca quinquenervia) in areas of the Everglades. These less productive monocultures have limited value to wildlife and have displaced hundreds of acres of more desirable habitats.

As previously noted the extensive drainage and flood control construction have forever altered much of the natural water movement and storage capabilities of the once vast wetland systems of south Florida. During the summer rainy season, large volumes of water must be pumped through drainage canals and water control structures to prevent flooding of agricultural and residential lands to the north. Much of this water is directed to Biscayne Bay, Card Sound and Barnes Sound. While farm lands are protected from floods, lowered water levels in the Everglades threaten vegetation and wildlife. The large pulses of freshwater that enter the often hypersaline bays and sounds drastically alters water chemistry

and dissolved oxygen levels. Massive mortality of marine organisms has resulted from this practice. Implementation of the Biscayne Bay and Everglades SWIM plans will address many of these impacts.

Local activities that affect resources of the preserve include increased use by boaters, land development, mosquito control, and commercial harvesting of marine organisms. Increased use by boaters for fishing, diving, snorkeling and transient use stress certain resources of the preserve and in some cases will require new or revised evaluations of the compatibility of these activities with the long term conservation of biological and aesthetic values for which the preserve was established. Maintenance of water quality, listed species habitat, viable fisheries, healthy benthic communities and a quality recreational experience may be adversely affected by excessive numbers or types of activities in the relatively small area of the preserve. At the minimum, a system of monitoring the types and intensity of use must be established to analyze these impacts.

Commercial and residential land development may impact the quality and utility of the preserve. Excessive or poorly planned development can negatively impact water quality, vegetation, listed species, and the biological and aesthetic qualities for which the preserve was established. Monitoring of these activities and active participation in local planning efforts are seen as one avenue of addressing these concerns.

Fish larvae, as well as marine and terrestrial invertebrates are extremely sensitive to Batex and malathion. These insecticides are used or have been used for mosquito control applications on north Key Largo. Malathion use was discontinued on north Key Largo in 1971 because mosquitos were exhibiting increased resistance to the insecticide. Baytex is applied with fogging trucks on north Key Largo and manufacturer's labeling warns of toxicity to fish and wildlife. Aerial application is typically confined to the inhabited areas of Ocean Reef and Angler's Clubs. Careless, excessive or poorly timed applications may potentially impact resources of the preserve. The endangered Schaus swallowtail butterfly is extremely sensitive to most insecticides (Emmel, 1986 (b)).

All species of corals, one millepora (fire coral) and two soft corals (gorgonians) are protected in state waters. The taking of other gorgonians, tropical fish, mollusks, crustaceans, anemones, and other invertebrates is less stringently regulated. Permits are required for these activities but monitoring and regulating collectors is difficult, if not impossible, given the broad geographic extent of the state's marine waters. There are approximately 60 firms in south Florida that are involved in marine life and live rock

collecting. One firm in the Keys estimated that they export 80,000 pounds of live rock per year. The live rock industry is predicted to expand by 10-15% each year (Young, 1989).

Liverock harvesting from state waters was banned in 1990, although harvesting is still allowed in federal waters. Collecting is conducted by both professional and amateur aquarists, often with little regard for established size and bag limits or consideration for non-target species when pursuing specimens. Overharvesting is also a potential problem. Intensive collecting of a single species may eliminate that species from an area. The ecological repercussions are problematic but each organism fills a particular biological niche and mass alteration of community structure would affect other organisms that interact with the target species (e.g. predator/prey, parasitic, symbiotic, and mutualistic relationships) (Wheaton, 1989).

Commercial harvesting of sponges raises similar questions. Sponges perform an important function in removing particulate matter and nutrients from the waters of the bay and sound. Repeated harvesting of certain species and size ranges (5 inch or greater) eliminates a portion of this function as well as other biological relationships, including reduction of habitat for smaller organisms, such as juvenile lobster and shrimp. Additional research on the processes and functional contribution of marine hardbottom organisms is imperative to understanding the compatibility of this activity in the preserve.

Major impacts to the marine grassbed community in Card Sound Aquatic Preserve are associated with human activities. Direct removal of grassbeds by prop scouring and channel dredging are most noticeable. Although the single prop scar may be comparatively insignificant, the cumulative impact from repeated scaring, which is evident near the tidal creeks and the ICW are of concern. Zieman (1976) estimated recovery for these areas may take from 2-5 years and the natural recovery process may be further inhibited by rechanneling and increased erosion.

Dredging (and the spoiling of material) permanently eliminates grassbeds in most cases. Continual turbulence from prop wash and erosion of dredged channels inhibits re-colonization efforts. Material eroded from spoil banks may blanket nearby grassbeds and wave agitation resuspends fine sediments creating turbidity in the water column.

The cumulative effects of docking facilities must also be considered. Docks interrupt light penetration and "shade out" vegetation. As with prop scaring, the individual site may be insignificant but is compounded when the total area influenced (by all facilities) is tabulated. The loss in primary

productivity must then be multiplied by the "dock life" to comprehend the possible net loss in biological productivity over several years or decades.

Septic leachate, injection well seepage, agricultural effluent and upland run-off contribute excessive nutrients (and other forms of pollution) to marine communities that are adapted to a low nutrient (oligotropic) existence. A typical scenario for this type of pollution incident would progress from a dramatic population increase in opportunistic algae and phytoplankton followed by corresponding increases in zooplankton. The oligotrophic community is stressed by the increased turbidity and chlorophyll in the water column or blanketing of the organisms with films of aggressive bluegreen algae. Reduced levels of dissolved oxygen (as a result of decaying material and microbial respiration) depress photosynthetic rates in grasses (Hammer, 1968) and may be lethal to the animals that inhabit this community.

Detection of non-point sources of nutrient pollution is often difficult given the highly variable physical and chemical parameters of both the effluent and the community being studied. But recent and future technological improvements and additional research (and monitoring) may well scientifically validate the general assumption that all nearshore environments are subjected to measurable amounts of pollution from these sources when in close proximity to poorly planned development.

Manipulation of hydrological cycles may also have dire effects upon established grassbeds. Constricted tidal flow or the abrupt introduction of large volumes of freshwater alter preferred salinity and temperature. Turtle grass is most tolerant of salinities from 24-34 ppt. Abrupt or prolonged alteration of ambient salinity would unduly stress or destroy established beds. Water management practices on the mainland are most likely to influence salinity during floodwater release into the Sound or adjacent water bodies.

Thorhaug et al., (1972) documented the effects of thermal stress upon turtle grass and associated algae in the Card Sound and Turkey Point area preceding development of the cooling canals for the power plant. Their study found that naturally higher water temperatures (> 29 degrees C) during summer may suppress normal production of turtle grass. When temperatures were elevated 5 degrees C above ambient water conditions near the effluent canal, blue green algae became dominant and turtle grass and associated algae virtually disappeared.

Although the cooling canals have been redesigned to eliminate the thermal impacts, caution is warranted in regard to accidental discharge of this or other sources of thermally

polluted waters. The effects of global warming trends are also a potential threat to the survival of marine grassbeds.

Other potential sources of pollution that would affect marine grassbed communities in the Sound include the effluent generated by desalinization or reverse osmosis plants. The salt removed from the sea water is typically returned directly to the surrounding water by surface discharge or indirectly through seepage from shallow well injection sites. Water salinity in the zone of influence would greatly exceed the optimum conditions for turtle grass (24-34 ppt) and associated organisms.

The value of marine grassbeds cannot be evaluated by any monetary formula presently available. The comparatively high cost and relatively low success of restoring or mitigating damaged grassbeds has been discussed. Further research and experimentation are to be encouraged in hopes of discovering more successful and cost efficient methods of replanting damaged areas and encouraging expansion of marine grassbeds. However, the preferable alternative to costly and often futile restoration is to protect this dynamic and productive resource from further damage. To achieve that goal, preservation and protection of marine grassbed communities shall be a priority in the designation of management areas and the management procedure and policies in Chapters V and VI of this plan. Many of the other impacts identified in this section of the management plan will also be elaborated upon in the following chapters.

CHAPTER V

MANAGEMENT AREAS

A. INTRODUCTION

This chapter divides the Card Sound Portion of Biscayne Bay Aquatic Preserve into separate management areas and delineates the general or special rule criteria for allowable uses (e.g., activities and structures) associated with each area. Each management area is classified by the value of natural and cultural resources (e.g., types, occurrence) on submerged lands adjacent to the differing types of upland use (e.g., residential, commercial).

The purpose of this chapter is four-fold: (1) to provide a better understanding of the general and special rule criteria designed to preserve and protect resources and habitat, (2) to identify the types of allowable uses on state-owned submerged lands within a preserve, (3) to provide local planners with a guide for land use decisions, and (4) to provide both the staff of the Bureau of Submerged Lands and Preserves and other agencies a continuity of direction in the management of this segment of the preserve. As such, this intent will afford habitat protection while lending some measure of predictability for allowable public and private uses in the aquatic preserve.

Prior to providing the criteria for specific resource management areas, it is important that the intent, jurisdiction, and limitations of Florida's Aquatic Preserve Program be reiterated. Section 258.36, F.S., states that "It is the intent of the Legislature that the state-owned submerged lands in areas which have exceptional biological, aesthetic, and scientific value...be set aside forever as aquatic preserves or sanctuaries for the benefit of future generations." The program has jurisdiction over the use of state-owned submerged lands within the boundaries of a given preserve. Activities which occur outside the boundaries of an aquatic preserve or which do not directly affect state-owned submerged lands are not within the jurisdiction of the Aquatic Preserve Program (e.g., adjacent upland uses, regulation of commercial fishing).

There are a number of differences between the rules governing uses of state-owned submerged lands within an aquatic preserve relative to those not within an aquatic preserve. The principal difference is that uses of the submerged lands within an aquatic preserve must be shown to be "in the public interest" before they can be authorized.

Those submerged lands within the Intercoastal Waterway (ICW) and the associated easement shall be excluded from the provisions of the established management areas as provided for in Chapter 258.40(2), F.S. All other submerged lands, whether state owned or privately owned are included within the boundaries of the preserve (Chapter 258..397(2)(b), F.S., and are thus included within the designated management areas.

B. MANAGEMENT AREA CLASSIFICATIONS

A key component of the management program for any aquatic preserve is the division of the preserve into management areas. The classification of management areas in an aquatic preserve is based upon the resource value of submerged lands within the preserve associated with existing and future land uses on the adjacent uplands as designated in the local government comprehensive plan(s). As in the delineation of upland uses through zoning, the delineation of a preserve into management areas is two-fold: (1) to identify areas of public and private uses, and (2) to provide standards with which proposed uses and activities must comply. The intent of these management area classifications is to make potential development activities compatible with resource protection goals.

Designated or existing land uses are incorporated into the classification of management areas because use of the adjacent uplands has a direct bearing on the intensity of demand for uses of adjacent submerged lands. As mentioned earlier, the Aquatic Preserve Program has no jurisdiction over the designated use of the adjacent uplands. The incorporation of a designated land use into the management area classification is simply an acknowledgement of a local government's decision as to how a specific upland area can be developed. Specific land uses to be incorporated in the classification of management areas include:

Single-Family (SF): This category represents state-owned submerged lands adjacent to land with existing single-family residential use. It is intended to include areas using the adjacent portion of the preserve solely for private recreational activities.

Multi-Family (MF): This category represents state-owned submerged lands adjacent to land with existing multi-family residential use. It is intended to include areas where more than one private residence are using the adjacent portion of the preserve solely for private recreational activities. The associated residences may include townhouses, condominiums, apartments, and any other group of multi-family dwellings. This category may also include a group of single-family property owners

(i.e., homeowners association) that may propose to use submerged lands for the mutual benefit of the group.

Commercial-Utility (CU): This category represents state-owned submerged lands adjacent to land with existing commercial utility use. The category is also intended to incorporate uses associated with structures that charge fees or generate revenue. Examples of commercial uses include: marinas, restaurants, bait shops, or yacht clubs that charge membership fees. Utilities include those privately owned utilities and easements adjacent to or over submerged lands.

Public Land (PL): This category represents state-owned submerged lands adjacent to land designated on a future land use map or an existing conditions map as highway right-of-way, native area, environmental protection, preservation, or conservation. It is intended to include (1) areas where structures may be used by the general public at no charge and (2) federal, state, and local facilities that may charge a minimal fee. Certain properties, while not always open to the public, are included in this category since they are often designated as public lands and are administered or managed by public agencies.

Each of the land use classifications listed above is assigned an appropriate number to identify the resource value of the adjacent submerged lands. The methodology used to determine this resource value shall be consistent with the latest methodology approved by the Bureau of Submerged Lands and Preserves.

If an area within the preserve is identified as a **Primary Resource Protection Area (PRPA)**, then it will be assigned a resource value of **"1"**. A PRPA essentially combines Resource Protection Areas 1 and 2, as defined in Sections 18-20.003(31), and 18-20.003(32), F.A.C.

Submerged areas that are characterized by the absence of the above resource attributes will be identified as a **Secondary Resource Protection Area (SRPA)** and assigned a resource value of **"2"**. A SRPA is a Resource Protection Area 3 as defined by Section 18-20.003(33), F.A.C.

As stated previously, resource values are to be incorporated into the classification of management areas. For instance, if a submerged area within the preserve is determined to have a resource value of 1 and the adjacent uplands is zoned as single-family residential (SF), then this management area would be classified as **SF/1**.

In the following section of this chapter, minimum criteria are outlined for a number of uses and activities that can occur in this segment of the preserve. These minimum criteria, provided by the noted chapters of the Florida administrative Code (F.A.C.) apply to the uses and activities designated for each management area.

Criteria more restrictive than those listed in Chapters 18-20, 18-21, and 18-18, F.A.C., will be used if the biological and physical conditions of an area warrant it. As an example, docks may be limited in size to protect seagrasses. Areas requiring more stringent criteria will be referred to as **special management areas** and such areas will be labeled with the additional letter **"a"**. Again, as an example, if management area SF/1 required more restrictive criteria, then this special management area would be classified as **SF/1a**. Rationale and recommendations for management designation will be included for those special management areas.

C. MINIMUM CRITERIA FOR ALLOWABLE USES

Chapter 18-20, F.A.C., provides the minimum standards with regard to the utilization of submerged lands for structures within an aquatic preserve as authorized by the Board of Trustees and DNR.

It should be noted that other regulatory agencies rules and jurisdictions over activities may also apply within aquatic preserves. The minimum standards for each allowable use are detailed below. Where provisions of this chapter may conflict with those in Chapters 18-18 and 18-21, F.A.C., the more stringent of the two shall prevail.

All Dock Structures: Section 18-20.004(5)(a), F.A.C., states that all docking facilities within an aquatic preserve shall meet the following standards and criteria:

1. no dock shall extend waterward of the mean or ordinary high water line more than 500 feet or 20 % of the width of the waterbody at that particular location, whichever is less;

2. areas of significant biological, scientific, historic, and/or aesthetic value require special management considerations. Modifications to docks in these areas may be more restrictive and shall be determined on a case-by-case basis;

3. the number, lengths, drafts, and types of vessels allowed to utilize the proposed facility may be stipulated;

4. where local governments have more stringent standards and criteria for docking facilities, the more stringent standards for the protection and enhancement of the aquatic preserve shall prevail.

Private Residential Single Docks: Section 18-20.004(5)(b), F.A.C., states that private residential single docks, as defined by Section 18-20.003(23), F.A.C., shall conform to the following specific design standards and criteria:

1. any main access pier shall be limited to a maximum width of four feet;

2. must be designed and constructed to ensure maximum light penetration;

3. can extend from the shoreline to a maximum depth of -4 feet at (MLW);

4. when the water depth is -4 feet MLW at an existing bulkhead, the maximum dock length from the bulkhead shall be 25 feet, subject to modifications accommodating shoreline vegetation overhang;

5. wave break devices shall be designed to allow for maximum water circulation and built in such a manner as to be part of the dock structure;

6. the maximum size of the terminal platform shall be 160 square feet;

7. dredging to obtain navigable water depths is strongly discouraged.

In the interests of clarification, the term "private residential single docks" refers to those docks associated with single-family residences that are used for private recreational purposes.

Private Residential Multi-Slip Docks: Section 18-20.004(5)(c), F.A.C., states that private residential multi-slip docks, as defined by Section 18-20.003(24), F.A.C., shall conform to the following design standards and criteria:

1. the area of sovereignty submerged land preempted by the docking facility shall not exceed the square footage amounting to ten times the riparian waterfront footage of the affected waterbody of the applicant, or the square footage attendant to providing a single dock in accordance with the criteria for private residential single docks, whichever is greater. A conservation easement or other such restriction acceptable to the Board must be placed on the riparian shoreline, used for

the calculation of the 10:1 threshold, to conserve and protect shoreline resources and subordinate/waive any further riparian rights of ingress and egress for additional docking facilities;

2. docking facilities and access channels shall be prohibited in Resource Protection Areas 1 and 2 (= PRPA), except as allowed pursuant to Section 258.42(3)(e)1, F.S., while dredging in Resource Protection Area 3 (= SRPA) shall be strongly discouraged;

3. water depths adjacent to and within the proposed mooring area shall have a minimum clearance of one foot between the deepest draft vessel and the submerged bottom at MLW;

4. main access piers and connecting walks shall not exceed six feet in width;

5. terminal platforms shall not exceed eight feet in width;

6. finger piers shall not exceed three feet in width and 25 feet in length;

7. pilings may be utilized as required to provide adequate mooring capabilities;

8. specific provisions of Section 18-20.004(5)(d), F.A.C., for commercial, industrial, and other revenue generating/income related docking facilities shall also apply to private residential multi-slip docks.

Commercial-Industrial Docking Facilities and Marinas: Section 18-20.004(5)(d), F.A.C., states that commercial, industrial, and other revenue generating/income related docking facilities, as defined by Section 18-20.003(10), F.A.C., shall conform to the following specific design criteria and standards:

1. docking facilities shall only be located in or near areas with good circulation, flushing, and adequate water depths;

2. docking facilities shall not be located in Resource Protection Areas 1 and 2 (= PRPA); however, main access piers may be allowed to pass through Resource Protection Area 1 or 2 that are located along the shoreline to reach an acceptable Resource Protection 3 (= SRPA), provided that such crossing will generate minimal environmental impact;

3. the siting of docking facilities shall take into account the access of boat traffic to avoid marine seagrass beds or other aquatic resources in the surrounding area;

4. the siting of new facilities within the preserve shall be secondary to the expansion of existing facilities when such expansion is consistent with other standards;

5. the location of new facilities and expansion of existing facilities shall consider the use of upland dry storage as an alternative to multiple wet slip docking;

6. marina siting will be coordinated with local governments to ensure consistency with local plans and ordinances;

7. marinas shall not be sited within state designated manatee sanctuaries;

8. in any areas with known manatee concentrations, manatee warning/notice and/or speed limit signs shall be erected at the marina and/or ingress and egress channels, according to Florida Marine Patrol specifications.

Exceptions to the standards and criteria for any docking facility may be considered, but only upon demonstration that such exceptions are necessary to ensure reasonable riparian ingress and egress.

Section 18-21.0041(1), F.A.C., the Florida Keys Marina and Dock Siting Policies and Criteria establish specific conditions applied to all applications for leases, easements or consent to use sovereignty submerged lands in Monroe County for multi-slip docks, whether residential or commercial. This section further states the following General Policies and Specific Criteria shall be used in developing recommendations to approve, approve with conditions or deny the use of state-owned sovereignty submerged lands for multi-slip docking facilities.

(a) General Policies - special attention and consideration shall be given to the following;

1. the proximity to and potential adverse impacts on any rare, threatened or endangered species, or species of special concern, or their habitat, or on any portion of the entire Florida Reef Tract and other corals, including but not limited to those in the John Pennekamp Coral Reef State Park, Key Largo National Marine Sanctuary, Looe Key National Marine Sanctuary, and Everglades National Park; and

2. eliminating any adverse impacts on wetland or submerged vegetation or benthic communities; and

3. requiring adequate tidal flushing and/or circulation; and

4. maintaining or enhancing water quality at levels within or above State water quality standards; and

5. requiring adequate water depths to avoid dredging and other bottom disturbance; and

6. requiring consistency and conformity with local government land use plans, zoning, and other land use or development regulations; and

7. requiring consistency with Chapters 27F-8, 27F-9, 27F-10, 27F-11, 27F-12, 27F-13, and 27F-15, Florida Administrative Code, as amended, "Principles for Guiding Development in the Florida Keys Area of Critical State Concern." Should any of these provisions conflict with the Sovereignty Lands Management Rules, the Board shall advise staff which provision shall take precedence.

(b) Specific Criteria

1. There shall be a moratorium on the approval of all leases of state-owned submerged lands for multi-slip docking facilities from Tea Table Channel north to the Monroe County Line. This moratorium shall be maintained until rules are adopted for the currently proposed Florida Keys-Monroe County Aquatic Preserve or the revised Monroe County Comprehensive Plan with marina siting policies is adopted, whichever occurs first.

2. No docking facilities shall be approved which require either dredging or filling to provide access by canal, channel, road, or any other means. This restriction shall also apply to widening or deepening any existing canal or channel, but not to regular maintenance dredging of existing canal, basins, or channels, providing such maintenance does not exceed currently acceptable water depths.

3. Water depth requirements. Docking facilities shall only be approved in locations having adequate water depths in the boat mooring, turning basin, access channels and other such areas to accommodate the proposed boat use.

a. A minimum water depth of -4 (minus four) feet mean low water shall be required.

b. Greater depths shall be required for those facilities designed for, or capable of, accommodating boats having greater than a 3 (three) foot draft, so that a minimum of one foot of clearance is provided between the deepest draft of a vessel and the bottom.

c. These depth requirements shall also apply to the area between the proposed facility and any natural or other navigation channel, inlet or deep water. Where necessary, marking of navigational channels shall be required. At the Board's discretion, the conditions of the lease may stipulate the number, lengths, drafts and types of vessels to be moored in a facility.

4. Requirements of the size of the dock.

a. No dock shall be approved if its length exceeds 500 feet, unless the Board determines that it is not contrary to the public interest.

b. No dock shall be approved if its length preempts in excess of 20% of the width of the affected waterbody.

c. No dock for the use of a private residence, which is not subject to obtaining a lease, shall exceed four (4) feet in width. Such a dock may have a terminal platform the total area of which shall not exceed 160 feet, and the width of which shall not exceed eight (8) feet.

5. A specific lease condition for any new or expanded docking facility for 10 or more boats will be that the leasee shall maintain water quality standards as provided by Chapter 403, Florida Statutes. To assure compliance, the leasee shall maintain a water quality monitoring program approved by the Department of Environmental Regulation. Water quality data will be periodically reviewed by the Department of Environmental Regulation. In the event that water quality violations occur and water quality standards provided by Chapter 403, Florida Statutes are not maintained, the leasee will be given written notice to correct the problem. Such notice shall require any problems or violations to be corrected within 120 days, or less in the case of severe violations, or demonstrate to the Board's satisfaction that the violations are caused by other than the docking facility, or associated activities on the adjacent riparian uplands, including stormwater runoff. If the leasee is the cause of the violations, and does not correct the problem within the specified time, then the lease shall be subject to cancellation by the Board with the resultant removal of the docking facility and other structures within the lease area.

6. In the reviewing applications for new docking facilities or expansions to existing facilities, attention shall be given to identifying ways to improve,

mitigate or restore adverse environmental impacts caused by previous activities. This may include filling in over dredged areas in order to make them a depth acceptable for propagation of benthic biota, restoring wetland or submerged vegetation, improving circulation, installing sewage pump-out facilities, or marking navigational channels. Such mitigation or restoration may be required as a condition of approval for new or expanded facilities. Marina development shall be encouraged to locate in already developed or disturbed areas.

7. In addition to the threshold specified by Section 18-21.005(1)(b), Florida Administrative Code, all applicants proposing docking facilities designed to moor 10 (ten) or more boats shall be required to obtain a lease.

8. All applicants will be required to provide documentation to show that there is an economic demand for the number of boat slips requested, if the number requested is not consistent with the Department's Projections of Marina Needs for Monroe County.

9. No application to lease state-owned sovereignty submerged lands for the purpose of providing multi-slip docking facilities shall be considered for approval unless there are no benthic communities present where the boat mooring area, turning basins, mooring piles or other structures are to be located, excepting any main access docks required to cross benthic communities to reach acceptable areas. This shall not preclude them from applying for consent to use state owned submerged lands for the purpose of using the minimum amount necessary to obtain reasonable ingress and egress.

10. The Board may grant special consideration to the approval of leases or other consent to use state lands for projects which are approved by the Department of Community Affairs which are for the purpose of furthering the commercial fishing village or commercial fishing enterprise zone concept.

Lease or Transfer of Lands: Section 18-20.004 (1)(b), F.A.C., states that there shall be no further lease or transfer of sovereignty lands within an aquatic preserve unless such transaction is in the public interest. Section 18-20.004(2), F.A.C., specifically defines the public interest test (see Appendix A for a copy of Chapter 18-20, F.A.C.).

Section 18-18.006(3)(b), F.A.C., of the Biscayne Bay Aquatic Preserve rule further states that there shall be no further use, sale, lease, or transfer of interests in sovereignty submerged lands unless an applicant affirmatively demonstrates sufficient facts to support a finding by the Board that an

extreme hardship exists for the applicant at the time the application is filed; that the use, sale, lease or transfer of interest and the project planned in conjunction with the use, sale, lease or transfer of interest is in the public interest; and that the project planned in conjunction with the use, sale, lease, or transfer of interest is consistent with these rules and management plans when developed for the preserve.

Section 18-18.004(11), F.A.C., defines extreme hardship as a significant burden unique to the applicant and not shared by property owners in the area. Self-imposed circumstances caused to any degree by actions of any person subsequent to the enactment of the Act shall not be construed as an extreme hardship. Extreme hardship under this act shall not be construed to include any hardship which arises in whole or in part from the effect of other federal, state or local laws, ordinances, rules, or regulations. The term may be inherent in public projects which are shown to be a public necessity.

Section 18-20.004(1)(e), F.A.C., states that a lease, easement, or consent of use may be authorized only for the following activities: (1) a public navigation project; (2) maintenance of an existing navigation channel; (3) installation or maintenance of approved navigational aids; (4) creation or maintenance of a commercial/industrial dock, pier, or marina; (5) creation or maintenance of private docks; (6) minimum dredging of navigation channels attendant to docking facilities; (7) creation or maintenance of shore protection structures; (8) installation or maintenance of oil and gas transportation facilities; (9) creation, maintenance, replacement, or expansion of facilities required for the provision of public utilities; and (10) other activities which are a public necessity or which are necessary to enhance the quality and quantity of the preserve and which are consistent with the Florida Aquatic Preserves Act (Sections 258.35 - 258.46, F.S.). Section 18-20.004(1)(f), F.A.C., states that structures to be built in, on, or over sovereignty lands are limited to those necessary to conduct water-dependent activities.

Utility Easements: Section 18-20.004(3)(c), F.A.C., states that utility cables, pipes, and other such structures shall be constructed and located in a manner that will cause minimal disturbance to submerged resources (e.g., seagrass beds, oyster bars) and do not interfere with traditional uses. It will be the policy to place additional utilities into designated corridors or existing easements within the Card Sound Portion of Biscayne Bay Aquatic Preserve.

Spoil Disposal: Section 18-20.004(3)(d), F.A.C., states that spoil disposal within an aquatic preserve shall be strongly discouraged and may be approved only where the applicant has demonstrated that there is no other reasonable alternative and

that the spoiling activity may be beneficial to, or at a minimum, not harmful to the quality or utility of the preserve. It will be the policy to not recommend spoil disposal onto a PRPA within the Card Sound Portion of Biscayne Bay segment of the aquatic preserve. Exceptions to this criteria may be granted where beach quality sand is transferred and deposited onto shoreline beaches as part of an approved beach restoration management plan.

(The above lease, easement, or consent of use criteria for spoil disposal, utility easements and activities are stated in substantially similar language within Section 18-18.005 and 18-18.006, F.A.C.)

Piers: Piers shall be constructed in accordance with the minimum criteria provided by Section 18-20.004(5)(b), F.A.C. In addition, the following conditions apply to all piers: (1) the entire structure will be elevated to a minimum of 5 feet above the MHWL, (2) hand rails will be installed around the perimeter of the structure, (3) at least one "Docking Prohibited" sign will be posted and maintained on each side of the pier, (4) no temporary or permanent mooring of vessels will be permitted, and (5) dredging is prohibited when associated with pier construction and maintenance.

Ramps: Boat ramps will be reviewed on a case-by-case basis. Determining factors to be reviewed include: (1) the elimination or alteration of natural resources or habitat (e.g., seagrasses, shoreline vegetation, nesting areas), (2) the amount of dredging and/or filling of submerged lands, and (3) accessibility to the ramp from water and land routes.

For the purposes of this plan, the following conditions will apply: (1) the Intracoastal Waterway (ICW) is exempt from aquatic preserve rules and regulations, pursuant to Section 258.42, F.S.; and (2) certain activities are generally permissible in all management areas. These activities include shoreline stabilization, maintenance dredging of existing channels, and maintenance of channel markers. Where appropriate to protect environmental resources, certain conditions or restrictions may be placed on these types of activities. For example, seawalls in some locations may be discouraged, and riprap may be required to be placed along a seawall in order to provide additional habitat.

Additional criteria for the repair, replacement, and expansion of existing structures are provided for in Chapter 18-21, F.A.C. Replacement and expansion of structures must comply with the minimum criteria provided for in Chapter 18-20, F.A.C.

D. MANAGEMENT AREAS

In this section, each management area is delineated with boundaries, descriptions, and allowable uses. Specific criteria and supporting rationale for each special management area are also provided. Due to changes that may occur from the rezoning of adjacent uplands and altering biological conditions on submerged lands, the final decision on approving, modifying or denying uses of the submerged lands within the preserve will be made based on field surveys and assessments of project sites. Figure 5 is a map of all management areas within the Card Sound Portion of Biscayne Bay Aquatic Preserve. The purpose of providing this map is to give some general guidance and an understanding of where the management areas lie within this area.

Some management areas may have a specific activity occurring within that is not reflective of the overall upland use. As an example, a parcel consists of a multi-family dock with single-family homes adjacent to extensive seagrasses. The multi-slip facility may have preceded the aquatic preserve designation; therefore, it would be unreasonable to remove the facility. Facility expansion and/or commercial-type activities, however, will not be allowed in this management area because of the presence of seagrasses and/or the upland zoning restrictions. In such cases, the specific activity will be recognized as a "non-conforming use". This term simply recognizes the specific activity as such and is not to be interpreted as a termination of vested rights should a change in ownership occur nor does it imply that future non-conforming uses will be allowed.

MANAGEMENT AREA SF/1
(single-family/primary resource protection area)

Boundaries: This management area will include all submerged lands adjacent to existing upland parcels that are now developed or may be developed with single-family residential uses. It includes submerged lands adjacent to privately owned uplands of Ocean Reef Club on north Key Largo, Linderman Key, Broad Key, Anne Key, Little Anne Key, Black Swan Key, and Palo Alto Key in Monroe County.

Description: The submerged area is characterized by mixed grassbeds and hardbottom associations. Hard corals are also present. The shoreline is typically vegetated with mangroves. The Ocean Reef Club shoreline has been stabilized with rip-rap or bulkheads. In water structures are limited to single-family docks.

Linderman Key has a small dock. Broad Key has a small dock and a covered boat house. The structures on these islands predate the designation of the preserve. The boathouse will be considered a non-conforming use.

Allowable Uses: Private residential single docks, piers and utility easements.

MANAGEMENT AREA MF/2

(multi-family/secondary resource protection area)

Boundary: This management area includes those submerged lands adjacent to the Angler's Club shoreline on north Key Largo and the southern shoreline of Pumpkin Key. Existing uses at Angler's Club include two multi-slip docks, a rip-rap jetty/breakwater, pilings, navigation aids and concrete bulkhead. The boat basin to the south is accessed via a dredged channel and has a non-navigable circulation channel a few hundred feet to the north. This management area designation applies to only the existing preempted area of the docking facility, dredged channel, breakwater and a 25 foot buffer adjoining these disturbed areas. The remaining riparian shoreline is included within the SF/1 management area.

The management area boundary on the Pumpkin Key shoreline includes the leased areas for the multi-slip dock and the rip-rap breakwaters.

Description: Submerged lands adjoining the undisturbed shorelines exhibit mixed grassbeds and hardbottom associations. Hard corals are also present. Areas within the Angler's Club marina and jetty/ breakwater are significantly disturbed. Areas within the Pumpkin Key management area are moderately disturbed.

Allowable Uses: Private residential multi-slip docks, utility easements and piers.

MANAGEMENT AREA CU/1

(commercial-utility/primary resource protection area)

Boundary: This management area includes the existing utility corridor along the Card Sound Road right-of-way at the southern boundary of the preserve.

Description: The existing over head power lines are supported by concrete pilings. The submerged lands are mixed hardbottom and marine grassbeds.

Allowable Uses: Utility easements (in designated corridor).

MANAGEMENT AREA CU/2a

(commercial-utility/secondary resource protection area/ special management area)

Boundary: Submerged lands immediately adjacent to the Land Company Canal (a.k.a. Sea Dade Canal) and the Turkey Point Canal (a.k.a. Grand Canal) are included within this management area.

Description: Shoreline vegetation has been severely impacted by dredging and spoiling of material in the vicinity of the two canals. Erosion of spoil sediments is associated with the Turkey Point Canal. Submerged resources include degraded mixed hardbottom and marine grassbeds. Both are impacted by siltation, episodic freshwater input, and deep dredged channels associated with the canals. This area is critical habitat for the highly endangered American crocodile. The endangered Florida manatee also frequents the area.

Allowable Uses: Utility easements.

Rationale: All other uses that would encourage boating traffic in the vicinity will be discouraged. Protection of critical habitat for the crocodile and security interests of the utility are recognized as a priority in this area.

Recommendations: Investigate potential for shoreline stabilization with grading and mangrove planting. Investigate potential for back filling canals and channels to -5 water depth to encourage grassbed colonization. These issues will be further discussed in Chapter VI.

MANAGEMENT AREA PL/1

(public lands/primary resource protection area)

Boundary: All submerged lands adjacent to the Key Largo shoreline including all tidally connected creeks not otherwise included in the SF/1 and MF/1 management areas. This management area also includes all of the submerged lands adjacent to the entire Dade County shoreline with the exception of the Land Company and Turkey Point Canals, which will be included in the commercial/utility management area.

Description: Submerged lands are mixed grassbeds and hardbottom associations. Shorelines are undisturbed mangroves. Ownership and management of these lands are principally delegated to federal and state governments. One short section of the Key Largo shoreline is currently owned by the Audubon Society. All lands on the Key Largo shoreline are designated Native Area by Monroe County. Those on the Dade shoreline are designated conservation.

Allowable Uses: Utility easements (in designated corridors) public works projects including the Card Sound Road right-of-way, public docks meeting the single-family residential dock criteria, and ramps.

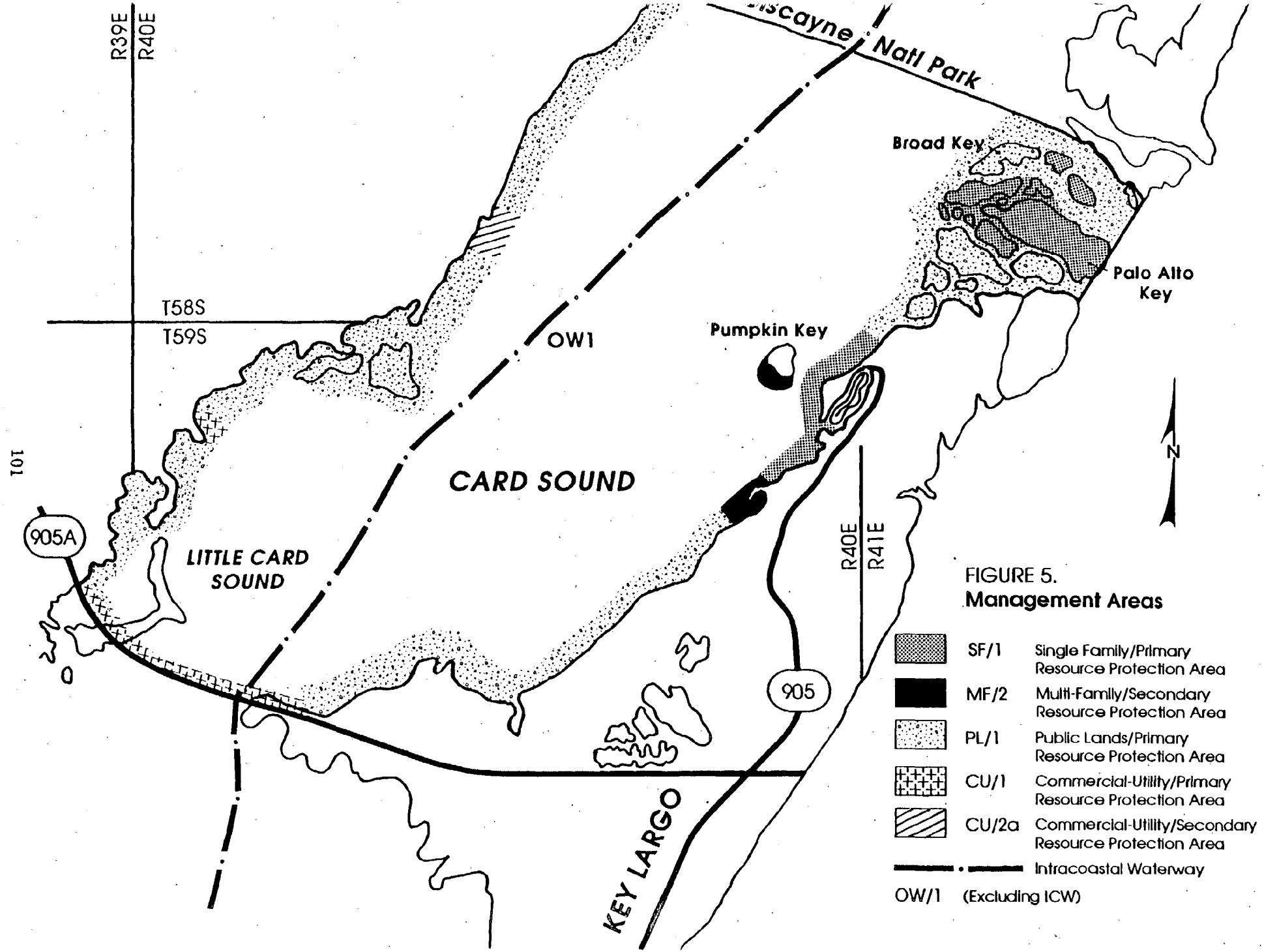
MANAGEMENT AREA OW/1

(open water/primary resource protection area)

Boundary: All remaining submerged lands within the preserve with the exclusion of the ICW corridor.

Description: Submerged lands are typically mixed hardbottom and marine grassbed associations. Extensive areas of the algae Laurencia and hard and soft corals are also present. The abundant algae is valuable habitat for juvenile spiny lobster.

Allowable Uses: Utility easements (in designated corridors).


R39E
R40E
Biscayne Natl Park
Broad Key
Palo Alto Key
T58S
T59S
OW1
Pumpkin Key
CARD SOUND
LITTLE CARD SOUND
905A
R40E
R41E
905
KEY LARGO
N
FIGURE 5.
Management Areas
SF/1 Single Family/Primary Resource Protection Area
MF/2 Multi-Family/Secondary Resource Protection Area
PL/1 Public Lands/Primary Resource Protection Area
CU/1 Commercial-Utility/Primary Resource Protection Area
CU/2a Commercial-Utility/Secondary Resource Protection Area
Intracoastal Waterway
OW/1 (Excluding ICW)

CHAPTER VI

SITE SPECIFIC MANAGEMENT ISSUES AND NEEDS

The first part of this chapter deals with management issues involving specific activities, as opposed to permitted structures, that directly affect the biological integrity of the Card Sound Portion of Biscayne Bay Aquatic Preserve. The issues that are specific to this area include, but are not limited to: increasing watercraft traffic, damage to submerged resources, damage to emergent resources, protection of designated species and their habitat, protection of bird feeding and resting areas, research needs, acquisition of environmentally sensitive lands, boundary extension, and enforcement. Other issues may arise as future use intensifies and these will be identified as they develop.

The second part of this chapter establishes management initiatives for these issues. These management initiatives are intended to provide additional management direction and supplement those set forth by Chapter 258, F.S., Chapters 18-18, 18-20, 18-21, F.A.C., and Chapter IV of this plan.

A. MANAGEMENT ISSUES AND SPECIAL NEEDS

1. INCREASING WATER TRAFFIC

Logically, the numbers and types of watercraft within any given body of water must be compatible with the available space and existing water depths. Two areas in the preserve present potential safety problems. Most traffic in the preserve consists of boaters in transit from north to south in the ICW or to the Atlantic via Broad and Angelfish Creeks.

Traffic to and from Ocean Reef Club and Angler's Club via Angelfish and Broad Creeks include a large variety of vessel sizes, some of which may exceed forty feet in length and four to six feet in draft. The areas on either side of Broad and Angelfish Creek channels are extremely shallow and much favored by small boat fisherman. Fast moving boats have limited visibility while traversing certain sections of the creeks. Anchored boats may obstruct navigation if they are anchored in the deeper parts of the creek channels.

At the preserve's southern boundary, Steamboat Creek is utilized by smaller boats as a protected shortcut between Card Sound and Barnes Sound. The other creeks that are bridged by the Card Sound Road are also used by smaller boats. Traffic in the creeks can be heavy as smaller boats bypass the more

congested ICW. Boats in the creeks are usually not visible until they are abreast of one another. The potential for serious accidents is evident. (Management Initiative 1)

2. DAMAGE TO SUBMERGED RESOURCES

Damage to submerged resources is directly and indirectly related to water craft use in the preserve. Marine grassbeds in several areas have been directly impacted by propeller scouring and dredging (prop dredging). The ICW can accommodate larger (25 feet or more) vessels but they must remain in the channels through Card and Cutter Banks to avoid grounding. Large boats that wander from the marked channels have damaged areas on either side of the ICW.

Controlling depths on the Atlantic side of Broad and Angelfish creeks are typically adequate for navigation. However, the narrow creek channels traverse areas of -4 feet on the Sound side. The channels and the expansive 'flats' on either side of the channels are marred with prop scars.

Prop dredging is also evident northeast of Card Point. The narrow berm in this area is used as for unauthorized camping and is accessible only by boat. Vessels also tend to stray from the main ICW channel at this point.

Secondary impacts to submerged resources are also associated with the ICW. Sedimentation from the spoil banks and prop scouring in the channel create turbidity in the water column that reduces sunlight to marine grasses and algae and may smother sedentary marine organisms. The sediment suspension in the channel is especially chronic during the winter. Larger draft vessels traverse the area more frequently and winds associated with cold fronts tend to keep the particles suspended for longer periods of time. Mud trails originate in the channels but are dispersed over a large area. (Management Initiatives 2 and 3)

A second source of turbidity is the dredged/filled shoreline in the vicinity of the Land Company and cooling canal outflow on the western shoreline. Sediments are continually eroded into nearshore waters and resuspended by wind and wave action. (Management Initiative 4)

Long term anchorage of boats in the vicinity of Pumpkin Key and Card Sound Road effectively shade submerged grasses and algal mats. Shading reduces sunlight to the plants, stressing or eliminating them from an area. Several of the vessels are used as residences. There are no publicly available sewerage pump out facilities in either area. Preliminary water quality sampling by Dade County's Department of Environmental Resources Management indicate that fecal contamination may

occur in Card Sound (from Biscayne Bay SWIM Plan, 1989). (Management Initiative 5)

3. DAMAGE TO EMERGENT RESOURCES

Mangrove wetlands and beach berms are impacted by a number of activities from exotic plant invasion to unauthorized structures and uses. Exotic (introduced by man) plant species, such as Australian pine (Casuarina sp.) and Brazilian pepper (Schinus terebinthifolius), invade disturbed areas and low beach berms to the exclusion of more desirable native plants, including endangered and threatened species. Indigenous wildlife are also impacted by invasive exotic vegetation. Preferred food, shelter and nesting plants may be excluded. The pine and pepper are poor substitutes for these requirements. Card Point and the filled areas at the noted canals are areas with extensive invasive exotic plants. (Management Initiative 6)

Emergent resources of the preserve are impacted by other activities such as camping, fires and poaching. Unauthorized camping in sensitive habitats impacts wildlife use of the area and creates a public nuisance, as well as potential health and safety hazards. Fires are also associated with camping. Improper disposal of sewerage and wastes degrades habitat and water quality. The taking of indigenous plants and/or animals (except for fishing within approved seasons and limits) on public lands in the preserve is seen as detrimental to the intent of establishing the preserve and in most cases is illegal. (Management Initiative 7)

4. PROTECTION OF DESIGNATED SPECIES AND THEIR HABITAT

The aquatic preserve is host to a variety of marine life and other species that have been designated as endangered, threatened or species of special concern. Designated animal species are not sedentary but traverse and utilize a wide variety of habitats. It is not always necessary, nor is it desirable to attempt to manage for an individual species. However, certain activities and uses are known to negatively or positively impact a species. To the greatest degree possible, management of the preserve will involve eliminating or reducing negative impacts to designated species.

To some extent implementation of many of the management initiatives that address other management issues will be beneficial to designated species. For example, reducing speed limits in creeks and narrow channels is beneficial to the slow moving manatee whose numbers are severely reduced each year by collisions with boats. Prohibition of camping on public lands and removal of invasive exotic vegetation will enhance

additional nesting habitat for the critically endangered American crocodile while restoring or preserving suitable habitat for many rare, endangered and threatened plant species.

Additional areas of consideration for the protection of designated species and colonial water birds include preservation of existing habitat and elimination of adverse conditions that interrupt feeding, nesting and resting behavior. Cormorants, pelicans, osprey and bald eagles utilized waters of the preserve for feeding. Remote islands and shoreline mangroves are preferred resting and nesting sites for these birds and the threatened white-crowned pigeon. Some of these islands are in private ownership.

Vessel traffic in shallow waters and near the mangroves disrupt these activities. As individual personal watercraft (power skis, jet boats, water taxis, etc.) become more popular, impacts to these species may become more pronounced. These shallow draft vessels can traverse extremely shallow waters near shore and emit considerable noise and disturbance. Birds flush from nests and eggs or chicks are left to ravages of exposure during critical development periods. Adult birds abandon feeding activities or resting sights when approached by the vessels. Feeding success is reduced and nonproductive activity is increased. (Management Initiatives 8 and 9)

5. IDENTIFY MONITORING AND RESEARCH NEEDS

a. Water Quality

Potential sources of water quality degradation include effluent related to canals, live aboard vessels, sewerage plants or septic tanks, reverse osmosis plants, docking facilities and the canals at the power plant. More remote sources include agricultural lands, land fills and urban development on the mainland and in the Keys.

Tidal flushing and circulation are extremely limited within Card and Barnes Sounds. Long residence times, extreme fluctuations in salinity and sediment deposition are phenomena that require special consideration when evaluating activities or projects within these areas. Water quality, sediment quality and biological monitoring within Card Sound and Barnes Sound is imperative to gain a data base from which to assess historic and periodic change within the various resource components and to better understand the relationships between the components and the waterbodies themselves. Long term, consistent and comprehensive data are currently not available for these areas. Dade County's Department of Environmental Resource Management (DERM) has initiated monitoring for Biscayne Bay and portions of Card Sound. Water quality

sampling has indicated fecal contamination in the Sound. Earlier sediment studies by Corcoran et al., (1984) disclosed levels of phthalate acid esters that were higher than any other site in Biscayne Bay.

Coordination with other agencies to establish common sampling parameters and establishment of a permanent funding mechanism for similar monitoring in the Card/Barnes Sound basins and drainage system are considered essential to maintaining the quality and utility of the preserve and its resources. (Management Initiatives 10 and 11)

b. Biological Resources

The biological components of upland, estuarine and marine environments within and adjacent to the preserve are subject to a variety of pressures from human occupation and interaction with these systems. Understanding past and present events and how they may alter the natural functions and processes of the systems requires a complete understanding of the organisms, their functions, and the various abiotic processes of the environment. Additional research is needed to facilitate this understanding and to provide effective management of the preserve's resources. (Initiative 12)

6. ACQUISITION OF ENVIRONMENTALLY SENSITIVE LANDS

Several parcels of submerged lands have been deeded to private interests in the vicinity of Broad and Lindeman Creeks. The submerged parcels are adjacent to privately held mangrove islands. Under current local land development regulations the Off Shore Island Land Use District may permit self contained residential use. On the western shoreline of the Sound there are several mangrove islands and adjacent wetlands that are in private ownership. Likewise, there are two parcels of privately held mangrove wetlands on the shoreline of Steamboat Creek at the southern boundary of the preserve. Although development of these parcels would require intensive review by regulatory agencies, there is potential for loss of valuable wetlands and additional sources of disturbance to resources of the preserve. (Management Initiative 9)

7. BOUNDARY EXTENSION

The inclusion of Barnes Sound within the preserve is seen as a more holistic approach to management of similar characteristics, resources and problems. This area is currently excluded from the larger system of protected waters in the vicinity. Issues such as water quality, designated species habitat, development pressures and local jurisdictional boundaries mandate that a comprehensive

management plan be developed for this area. Water quality impacts, salinity fluctuations, poor flushing capabilities and development impacts are primary concerns. Valuable nesting habitat for the American crocodile would also benefit from the designation.

The wetlands to the north of Barnes Sound have been extensively altered by past water management structures and practices. The C-111 drainage system diverts overland sheet flow from the wetlands and during the rainy season, pulses of flood water are released into the Sound. Past releases have severely shocked marine organisms and caused massive die-offs of grasses, fish, sponges, crustaceans, and other invertebrates. (Management Initiative 13)

8. ENFORCEMENT

Although several federal and state agencies have jurisdictional authority on lands and waters of the area, staffing and jurisdictional boundaries often limit a comprehensive approach to protection of the environmental resources. Agency patrols may concentrate on designated species or marine fisheries but overlook encroachments or trespass on habitats that are vital to these species when those lands are not encompassed in their jurisdictional authority. Communication, coordination and staffing are often a hindrance to effective management and enforcement. (Management Initiative 14)

B. MANAGEMENT INITIATIVES

This section of the chapter contains a number of management initiatives that address the site specific management issues identified as being particular to the Card Sound Portion of Biscayne Bay Aquatic Preserve. Adoption of these management initiatives will provide specific direction for managing those issues not addressed directly by legislated statutes or rules. The major management initiatives for these issues include:

1. Seek appropriate agency action to reduce potential safety hazards in the vicinity of tidal creeks by posting idle speed zones and/or limiting anchorage to those areas where the anchored vessel may be seen from a distance of 1000 feet or more from any approach.

2. Reduce the impacts to submerged resources in the vicinity of the ICW and tidal creeks by seeking appropriate Coast Guard and Navigation District action to periodically maintain the ICW and/or

request that the U.S. Department of Commerce (NOOA/National Ocean Service) revise navigation chart 11451 to advise mariners of limited depth accessibility in the ICW and Broad, Angelfish, and Steamboat Creeks.

3. Promote recognition and appreciation of the importance of submerged resources in providing essential habitat and food for a variety of organisms essential to the biological integrity of the preserve. This biological integrity translates into significant economic value to this region, especially in terms of recreation, tourism and fisheries.

4. Reduce impacts to water quality and sediment related problems by requesting that responsible owners stabilize filled areas by regrading and replanting with native wetland vegetation in the vicinity of the Land Company and the Florida Power and Light Company canals.

5. Reduce impacts to water quality and benthic communities by pursuing prohibition of live aboard vessels and permanent mooring in the preserve except in established docking areas with pump out facilities and establishing time limitations on transient mooring.

6. Protect the integrity of habitats for indigenous plants and animals by controlling or eliminating invasive exotic plants on public lands. Encourage removal of invasive exotics on private lands through coordination with local governments in enforcing existing vegetation ordinances. Encourage removal of exotics on public and private lands in the preserve as a mitigative option attendant to permitting, leasing or other authorization to utilize any state owned submerged lands in Dade or Monroe counties.

7. Protect emergent resources by prohibiting camping and removing unauthorized structures on public lands. Areas with persistent problems will be identified, appropriate signs established and strictly enforced.

8. Protect valuable feeding, nesting and resting areas for birds and other wildlife by prohibiting individual personal watercraft and other motorized vessels from operating in shallow waters and around rookeries by supporting appropriate rule changes to exclude motorized watercraft from certain areas of the preserve.

9. Support the acquisition of privately held, environmentally sensitive lands to protect designated species habitat, tropical hardwood hammocks, marine, and wetland resources.

10. Establish long term, uniform monitoring of water, sediment and biological components of Card Sound and Barnes Sound by supporting recommendations of the Biscayne Bay SWIM Plan and seeking permanent funding for these programs.

11. Participate in and support constructive efforts by the South Florida Water Management District's Everglades and Biscayne Bay SWIM Plans to resolve water management practices that impact the biological and hydrological regime within Card Sound, Barnes Sound and the C-111 drainage basin.

12. Identify, solicit and support applied research projects directed toward the comprehensive management of water quality, designated species, marine, and wetland resources of the preserve.

13. Protect marine resources, water quality and designated species habitat by proposing Barnes Sound for inclusion as an aquatic preserve and develop a management plan for the area.

14. Pursue effective enforcement of all federal and state laws pertaining to environmental resources by seeking adequate Departmental staffing to provide routine patrols of State lands and coordinate with various other law enforcement agencies to bring about timely and consistent resolution of violations.

CHAPTER VII

MANAGEMENT ACTION PLAN

This chapter establishes the guidelines which allow for the management and protection of the Card Sound portion of Biscayne Bay Aquatic Preserve's natural and cultural resources for the benefit of future generations (Section 258.35, F.S.).

Before an effective program can be designed to manage and protect natural resources, the function, importance, and location of the resources must be defined. Additional efforts will consist of identifying those activities or parameters that affect these resources, either positively or negatively. This information will form the foundation from which action will be initiated to manage and protect these resources. The management strategies for an aquatic preserve program must consist of a variety of components such as resource management, resource protection, research, and environmental education.

Implementation of this plan will depend upon adequate funding and staffing to achieve the established goals for management of the aquatic preserve. The management goals, objectives, and tasks that follow should be implemented in the priority given, based upon available staffing and funding provided. Budgetary considerations and the anticipated 2 year budget for the three aquatic preserve in the Keys is presented in Chapter IX.

In general, the role of the management program for this portion of the preserve includes: (1) providing information on the ecological functions and economic importance of the natural resources within the Sound, (2) overseeing those activities that affect the natural resources within the Sound, (3) ensuring that accurate biological and physical information is considered in permit-related issues and planning decisions, (4) ensuring that all statutes and rules regarding the Sound's natural resources are followed and that violations are enforced by the appropriate authorities, (5) conducting site surveys for specific activities, (6) coordinating with other resource management and enforcement agencies, (7) educating the public on the inherent and economic values associated with natural resources, (8) conducting or cooperating with other entities to conduct pertinent research projects, and (9) developing a comprehensive management program that can be periodically updated to reflect the dynamics of natural systems and the changing needs of man and the resources. To achieve those ends this section of the plan establishes goals and identifies the supportive objectives and tasks to accomplish those goals.

A. RESOURCE MANAGEMENT

The overall goals of resource management within aquatic preserves are: (1) conducting and maintaining current, detailed resource inventories, (2) assessing the impact of human activities on the resources, (3) establishing habitat restoration programs, and (4) cooperating with other agencies in assessing, improving and/or maintaining conditions that are conducive to preserving the preserve's resources and water quality.

GOAL A.1: CONDUCT AND MAINTAIN RESOURCE INVENTORIES

Objective A.1.1: To conduct and maintain a resource inventory of submerged and emergent vegetation.

Task A.1.1.1: Conduct an inventory of marine grassbeds, algal beds, mangroves, saltmarsh, and other shoreline vegetation by using available satellite imagery (e.g., LANDSAT, SPOT, etc.), aerial photography, Loran coordinates, and groundtruthing efforts.

Task A.1.1.2: This inventory shall be conducted once every three years.

Task A.1.1.3: The database generated from this inventory will be used to create and maintain biological resource maps that will assist when assessing a proposed activity or evaluating potential impacts from manmade or natural events.

Task A.1.1.4: These inventories will be available to public agencies involved in resource management and land use planning.

Objective A.1.2: To conduct an inventory of designated species and their habitats.

Task A.1.2.1: Conduct an inventory of designated species and their habitats by using data from existing literature, managing agencies, field observations, and current research studies, if available.

Task A.1.2.2: This inventory shall be conducted once every three years or more often, if deemed necessary.

Task A.1.2.3: Coordinate with appropriate management and enforcement agencies to ensure that preserve management decisions and public actions or activities are compatible with the viability and management of a species or habitat.

Objective A.1.3: To conduct an inventory of wading, diving, and migratory birds and their habitats for this portion of the preserve.

Task A.1.3.1: Conduct an inventory of coastal waterfowl and migratory bird species that feed, roost, loaf, and nest in this portion of the preserve by using existing literature, bird counts, field observations, and current research studies.

Task A.1.3.2: This inventory shall be conducted once every three years.

Task A.1.3.3: Coordinate with appropriate management, enforcement and research interests to ensure that preserve management decisions and public actions or activities are compatible with the viability and management of a species or habitat.

Task A.1.3.4: Coordinate with public agencies or conservation interests that may be conducting similar inventories of species, populations, life histories, migration patterns and habitat needs where mutual benefits in knowledge and management objectives are to be gained.

GOAL A.2: ASSESS THE EFFECT OF HUMAN ACTIVITIES AND CUMULATIVE IMPACTS

Objective A.2.1: To inventory and assess the effects of human activities and structures on the natural resources of the preserve.

Task A.2.1.1: Conduct a survey of all structures in the preserve. This survey shall contain at a minimum:

a) types of structures (dock, pier, seawall, rip-rap, piling, mooring buoy, utility pole, etc.);
b) design of structure (width, length, height above MHW, square footage of access pier and terminal platform, number of pilings, number and size of finger piers, construction material (wood, boulder or concrete), deck spacing, material treatment (pressure and/or chemical) type of anchorage for buoys or pilings, etc.);
c) the water depth at the structure's terminus and/or the relation to the MHW line for shoreline stabilization;
d) the number, size, and drafts of boats using the structure, if applicable;
e) the functional condition of the structure;
f) any accessory facilities and ancillary uses associated with the structure;

g) the structure's use category (e.g., single-family, commercial);
h) an inventory of the biological resources within 25' of the identified structure;
i) appropriate documentation when adjacent resources exhibit signs of sedimentation, prop dredging, or other facility or boating related impacts;
j) historical or traditional use of the area;
l) a survey of all dredged areas including:
    1) the location, length, width, and depth of the dredged area;
    2) depth of profiles of the surrounding area;
    3) biological resources in the dredged and surrounding area;
    4) whether the dredged area is a private or public project;
    5) pre-existing resource conditions, if known;
    6) potential alternatives to alleviate the need for maintenance dredging (shoreline stabilization, wave baffles, etc.);
    7) whether channel markers may be needed to direct traffic away from adjacent submerged resources; and
m) a survey of all shoreline stabilization projects, including:
    1) location and total length of riparian shoreline;
    2) length of the shoreline stabilization;
    3) design of project;
    4) review of existing and pre-existing (if known) resource conditions on the site;
    5) whether the project is effective in stabilizing the shoreline; and
    6) whether toe rip-rap or mangrove plantings may improve upon the effectiveness of the structure.

Task A.2.1.1: Monitor and conduct periodic surveys of uses of the preserve including information related to;

a) type of use (commercial, recreational, consumptive, non-consumptive, active, passive, etc.);

b) incidents of direct or indirect resource stress related to a type of use; and

c) user group conflicts or safety hazards.

Task A.2.1.2: Use accumulated data from Task A.2.1.1. to identify existing and potential resource impacts or safety problems that may warrant further action by staff or other agencies.

Objective A.2.2: To inventory and assess the cumulative impacts of activities and structures on the natural resources.

Task A.2.2.1: A survey of all docks/piers, dredged areas, shoreline stabilization, and other applicable human uses will be made as outlined in Task A.2.1.1 and Task A.2.1.1. These surveys shall be conducted every three years to establish net loss or gain of resources as related to structures and activities.

Task A.2.2.2: Files shall contain at the minimum:

a) size, configuration and preempted area of the structure and related use;
b) a survey of the biological resources within the preempted area and within 50 feet of the preempted area;
c) condition and extent of those resources as related to previous surveys (expansion, modification or decline of biological communities, prop scouring, etc.); and
d) whether existing use is consistent with the type of use or activity authorized.

GOAL A.3: HABITAT RESTORATION

Objective A.3.1: To identify and restore disturbed habitats or resources where feasible.

Task A.3.1.1: Using resource inventories generated from Goal A.1., identify those resource areas that have been or are being negatively impacted by external influences. These impacts may include, but are not limited to: prop scars, spoil banks, dredged areas, boat grounding areas, clearings, dumping, erosion, abandoned traps or vessels, and invasive exotic vegetation.

Task A.3.1.2: Prioritize potential restoration areas according to severity of impact to the immediate resources and to the overall functional integrity of the preserve.

Task A.3.1.3: Develop procedures and guidelines for addressing the priority areas for restoration, such as exotic plant removal, revegetating grassbed or mangrove areas, enhancing listed species habitat, removal of derelict vessels and abandoned traps.

Task A.3.1.4: Contact other agencies, groups, institutions, and individuals who may be available to provide scientific, logistic, financial, enforcement, manpower or other support in accomplishing the habitat restoration or enhancement.

Task A.3.1.5: Monitor, record and review progress on restoration or enhancement projects.

a) monitor and record restoration procedures while in progress and restored areas on at least an annual basis;
b) records of the project will include, but are not limited to:
    1) type of project;
    2) anticipated results;
    3) benefits to the species and resource;
    4) location, date, parties involved, duration of project;
    5) completion date;
    6) monitoring schedule;
    7) results or changes observed;
    8) additional maintenance or monitoring required;
    9) cost of project in time and funding;
    10) an assessment of the success of the project or an explanation of why anticipated results were not achieved;
    11) recommendations as to how the project could or should be improved upon; and
    12) if the procedure could or should be used for future or similar projects.

Objective A.3.2: Coordinate with the Department of Environmental Regulation (DER) and the South Florida Water Management District (WMD) in restoring habitats in the preserve.

Task A.3.2.1: Enter into a mutual agreement with the South Florida Water Management District in order to accomplish habitat restoration elements of the Biscayne Bay SWIM Plan.

Task A.3.2.2.: Support acquisition and restoration of environmentally sensitive wetlands through the Save Our Rivers Program.

GOAL A.4: RESTORE, ENHANCE OR MAINTAIN WATER QUALITY

Objective A.4.1: To coordinate with DER, South Florida Water Management District, and local governments toward improving water quality in the preserve.

Task A.4.1.1: Enter into a mutual agreement with DER to utilize Pollution Recovery Trust Funds to conduct demonstration projects that improve water quality.

Task A.4.1.2: Coordinate with the South Florida Water Management District and local governments toward improving

the management of surface water and stormwater discharges into the aquatic preserve.

Task A.4.1.3: Coordinate with local mosquito control districts to review arthropod control management plans submitted in compliance with Section 388.4111, F.S.

Task A.4.1.4: Acquire, maintain and review all water quality data for the preserve area.

Task A.4.1.5.: Encourage DER to establish permanent water quality monitoring stations in the preserve.

Task A.4.1.6: Report suspected or identified instances of water quality violations to appropriate agencies.

GOAL A.5: COORDINATE WITH LOCAL GOVERNMENTS ON LAND USE PLANNING

Objective A.5.1: To coordinate with local planning departments, regional planning councils, and the Department of Community Affairs to develop/revise/evaluate local government comprehensive plans and amendments.

Task A.5.1.1: Review local government comprehensive plans and amendments for compatibility of natural resource, conservation, coastal zone and other element goals that affect the preserve.

Task A.5.1.2: Review local ordinances that affect zoning, planning and permitting of activities adjacent to and within the preserve.

Task A.5.1.3: Provide input on proposed changes, uses and other local decisions that affect the preserve, when appropriate.

Task A.5.1.4: Contact local planners to assist in the development of policies and ordinances that regulate activities affecting state-owned lands.

B. RESOURCE PROTECTION

In order to maintain the biological integrity of the aquatic preserve, it is imperative to protect the resources that comprise the system. Since it is not feasible to target all of the organisms adequately, the primary purpose of the resource protection element is to protect the various habitats that make up the preserve. The goals of the aquatic preserve program with regard to resource protection therefore include

(1) protection of the existing submerged vegetation (e.g., marine grassbeds, algal beds), (2) protection of emergent vegetation (e.g., mangroves, saltmarsh, and beach berm vegetation), and (3) protection of habitat of designated species.

GOAL B.1: PROTECTION OF SUBMERGED AND EMERGENT VEGETATION

Objective B.1.1: To minimize potential damage to submerged and emergent vegetation through the review of applications for use of state-owned land in the aquatic preserve.

Task B.1.1.1: Field staff will develop a written policy describing a scientifically based, standardized method to inventory the submerged and emergent biological resources at the proposed project site. At a minimum, this policy will contain the following information:

a) The area to be surveyed:
   1) will be described as a polygon, and
   2) will include the proposed location of the activity/structure and the adjacent area surrounding the project. The size of this adjacent area shall be determined by the methods described in the written policy.

b) How the survey is to be performed:
   1) Two areas within the survey area will be assessed:

      i. the submerged bottom, including:
         * a description of all communities/habitats,
         * a description of the bottom type,
         * depth profiles,
         * tidal amplitude and stage (where appropriate), and
         * a physical description of the surrounding waterbody;
         * adjacent and adjoining uses, and
         * distance to navigation channels:

      ii. the shoreline, including:
         * a description of the vegetation,
         * a description of the shoreline type,
         * a description of any existing structures,
         * a description of adjoining and adjacent uses,
         * notation of any nesting birds, and
         * notation of the presence/absence of designated species, their habitat, or whether known to occur in the area.

c) A definition of a Primary Resource Protection Area (PRPA). This definition will be used to determine if significant resources exist within the expected area of impact. It will consider, but is not limited to:

1) marine grassbeds and algae,
2) mangroves and saltmarsh/buttonwood vegetation,
3) commercial species present,
4) unvegetated soft-bottom communities,
5) hard-bottom communities, including hard and soft corals,
6) designated species or their habitat, and
7) nesting sites for solitary or colonial birds.

Task B.1.1.2: Coordinate with the appropriate regional DNR staff in order to process the field staff comments in a timely manner.

Task B.1.1.3: Coordinate, when possible, with other agencies that have regulatory authority for these projects.

Objective B.1.2: To ensure that structures and projects that have been authorized are in compliance with the authorized conditions.

Task B.1.2.1: Coordinate with the appropriate regional DNR staff to receive copies of all letters of consent, easement agreements, lease agreements, and other forms of authorizations.

Task B.1.2.2: Report variations from the authorized conditions to the appropriate DNR enforcement staff.

Task B.1.2.3: Coordinate, when possible, with other agencies that have regulatory authority for these projects.

Objective B.1.3: To ensure that structures and projects that have been built or are occurring have been authorized.

Task B.1.3.1: Report activities that do not appear to have been authorized to the appropriate DNR enforcement staff.

Task B.1.3.2: Coordinate, when possible, with other agencies that have regulatory authority for these projects.

Task B.1.3.3: Maintain records of reports and subsequent actions taken by regulatory and enforcement agencies. At a minimum, these records will contain:

a) date, location first observed, observers name;
b) date reported to appropriate agency, agency name, and reporters name;

c) action taken by agencies;
d) resolution of report, if known.

Objective B.1.4: To ensure that projects and activities within the preserve do not adversely affect submerged resources.

Task B.1.4.1: Seek authorizations to establish no motorized vessel and personal watercraft (jet ski, water taxi, etc.) zones in areas of shallow water.

Task B.1.4.2: Require that all dredge and fill projects use effective turbidity control practices.

Task B.1.4.3: Inventory and report all abandoned vessels and traps to the Florida Marine Patrol and encourage removal in a timely manner.

Task B.1.4.4: Encourage or require the establishment of channel markers, where appropriate, to protect marine grassbeds and hardbottom communities from boating damage.

Task B.1.4.5: Seek appropriate legislation and rule changes to prohibit the harvesting of live rock, tropical fish and marine invertebrates within the preserve.

Task B.1.4.6: Encourage and support the acquisition of privately held submerged lands and wetlands within and adjacent to the preserve.

GOAL B.2: PROTECT EMERGENT VEGETATION AND HABITATS

Objective B.2.1: Minimize potential damage to emergent vegetation through the review of all applications for use of state owned lands within the preserve.

Task B.2.1.1.: Field staff will develop a written format describing a scientifically based, standardized method to inventory the emergent vegetation and characteristics of a project site and it shall include, at a minimum, the following information:

a) description of the area to be surveyed;
   1) legal description of the property,
   2) as a polygon,
   3) with a buffer zone surrounding the project of sufficient size so as to include a majority of the potentially affected area, and
   4) a description of the vegetation with notations as to designated plant and animal species within the project site and buffer zone.

Task B.1.1.2: Coordinate with other DNR staff in order to process surveys and related comments in a timely manner.

Task B.1.1.3: Coordinate with other regulatory agencies.

Task B.1.1.4: Coordinate and cooperate, whenever possible, with other agencies or conservation organizations that have specific management objectives, research projects or other interests in the area of a project, or that may own lands adjacent to the project site, including but not limited to:

1) Division of Recreation and Parks (Florida Park Service),
2) Biscayne National Park,
3) U.S. Fish and Wildlife Service (Crocodile Lakes National Wildlife Refuge),
4) Florida Game and Fresh Water Fish Commission,
5) National Audubon Society, and
6) The Trust for Public Lands.

Objective B.2.2: Ensure that structures and activities on state owned lands have been authorized.

Task B.2.2.1: Report activities or structures that do not appear to have been authorized to the appropriate DNR enforcement staff.

Task B.2.2.2: Coordinate and cooperate, whenever feasible and appropriate, with other agencies that have regulatory or enforcement authority for the project or activity.

Objective B.2.3: To ensure that activities that have been authorized are in compliance with the conditions of the authorization.

Task B.2.3.1: Coordinate with the appropriate DNR staff to receive copies of all letters of consent, easement agreements, lease agreements and other authorizations for the use of state owned lands.

Task B.2.3.2: Report variations from the authorized conditions to the appropriate DNR enforcement staff.

Task B.2.3.3: Coordinate and cooperate, when feasible and appropriate, with other agencies that have regulatory or enforcement authority for these projects or activities.

GOAL B.3: PROTECTION OF DESIGNATED SPECIES AND THEIR HABITAT

Objective B.3.1: Determine which portions of the aquatic preserve serve as habitat for listed species.

Task B.3.1.1: Assimilate a working library of relevant literature and information on listed species expected to occur in the preserve.

Task B.3.1.2: Coordinate with the Division of Marine Resources, Florida Game and Fresh Water Fish Commission, U.S. Fish and Wildlife Service, the Audubon Society, and other groups or agencies to determine which designated species use what portion of the aquatic preserve for various aspects of their life cycles.

Task B.3.1.3: Coordinate and cooperate, whenever possible, with appropriate agencies and groups to conduct monitoring, inventories, habitat evaluations of other activities that relate to the status or distribution of designated species or their habitats.

Task B.3.1.4: During the course of routine field work and patrols, preserve staff will observe and record, whenever practical, sightings, locations, activity and other information relevant to a designated species.

Task B.3.1.5: Report all manatee sightings to the local office of the Division of Marine Resources.

Objective B.3.2: To protect all designated plant and animal species.

Task B.3.2.1: Be familiar with designated species, identification, status and relevant laws pertaining to designated species.

Task B.3.2.2: Report, without delay, any incidence of harassment, poaching, killing, taking or other unlawful activity, including feral dogs and cats, to the appropriate enforcement agencies.

Task B.3.2.3: Maintain a current list of agencies and individuals who enforce relevant laws and those who are permitted or otherwise authorized to rescue, attend, hold, rehabilitate or salvage designated species or their remains.

Task B.3.2.4: Ensure that preserve staff and volunteers are cognizant of designated species laws and procedures for dealing with or handling distressed or dead animals.

Task B.3.2.5: Coordinate and cooperate with appropriate management and enforcement agencies in identifying any activities or projects that may potentially affect a designated species.

Objective B.3.3: To protect designated species habitat.

Task B.3.3.1: Ensure that potential impacts to designated species habitats are identified in the review of projects or activities within the preserve. Potential impacts may include, but are not limited to:

1) modification or obstruction of nesting areas,
2) dock or marina siting,
3) disruption of nesting or feeding areas, and
4) removal of vegetation.

Task B.3.3.2: Coordinate and cooperate, whenever possible, with appropriate management and enforcement agencies to evaluate potential impacts to designated species as a result of a proposed project or activity.

Task B.3.3.3: Recommend, where appropriate, modifications to a proposed project or activity that would eliminate or minimize encroachment upon the habitat of a designated species.

Task B.3.3.4: Seek appropriate state statute and rule changes and/or local ordinances to exclude individual/personal watercraft from designated species habitat, including jet ski, water taxi, jet boat, and similar types of shallow draft, motor powered watercraft.

Task B.3.3.5: Seek appropriate federal statute, state rule and/or local ordinance changes to regulate use of ultra-light, private and commercial aircraft over and in the preserve.

Task B.3.3.6: Coordinate and cooperate with appropriate DNR and other enforcement agencies in the investigation of potential violations of federal, state or local laws that impact designated species or their habitats.

C. RESEARCH

Effective management of any biological system relies almost entirely on information as to how that system functions. Research is the progenitor of this information. Great strides have been made in marine grassbed and mangrove ecology, yet large gaps remain in understanding the functions of the

various components of these systems and how they interact with one another. Information on the constituents and functions of hardbottom associations is also poorly documented. The goals for research will be directed toward primarily applied research programs, rather that basic or theoretical research, to aid in effective management of the preserve's resources.

The goals of the research program are: (1) to gain a better understanding of those factors that are essential to the continued biological integrity of the major habitats within the aquatic preserve, and (2) to gain a better understanding of those factors that govern the continued survival and propagation of designated species that use the aquatic preserve for any portion of their life cycle.

GOAL C.1: MAINTAIN OR ENHANCE THE FUNCTIONAL INTEGRITY OF HABITATS

Objective C.1.1: To determine the primary factors that affect the survival of grassbeds and algal beds.

Task C.1.1.1: Pursue and support research directed toward identifying physical, chemical and pathogenic factors that affect marine grassbeds.

Task C.1.1.2: Pursue, at the Department level, funding to conduct research on the effects of dock/pier shading on the various species of marine grasses and algae in the preserve.

Task C.1.1.3: Pursue, at the Department level, funding to conduct research on the effects of turbidity on submerged vegetation.

Task C.1.1.4: Whenever possible, participate in research on the biology and ecology of the marine grass and algal species present.

Task C.1.1.5: Pursue, review and support, where deemed practical, research directed toward protecting or restoring marine grassbeds.

Objective C.1.2: To determine the primary factors that affect the distribution, survival and productivity of mangrove species.

Task C.1.2.1: Promote and support research on the physical, chemical, and pathogenic factors that influence mangrove species.

Task C.1.2.2: Pursue, at a Department level, funding for and/or support of research directed toward restoration of artificially altered mangrove systems.

Task C.1.2.3: Whenever possible, participate in research on the biology and ecology of the mangrove species present.

Task C.1.2.4: Pursue, at the Bureau level, funding to conduct research on the effects of mangrove trimming.

Objective C.1.3: To determine the primary and secondary factors that affect species of the hardbottom community.

Task C.1.3.1: Promote and support research that identifies the physical, chemical and pathogenic factors that influence invertebrate distribution, growth, recruitment and mortality in harbottom communities.

Task C.1.3.2: Seek at a Departmental level, funding for research on the effects of fish and invertebrate collecting on the species, size range, distribution, density, and diversity of populations in hardbottom systems.

Task C.1.3.3: Seek, at a Department level, funding for research on the effects of turbidity and sedimentation upon sedentary species of the hardbottom association.

Task C.1.3.4: Seek, at a Departmental level, funding for research on the effects of sponge harvesting on hardbottom communities.

Task C.1.3.5: Whenever possible, participate in research on the biology and ecology of the hardbottom species present.

Objective C.1.4: To determine the primary factors that affect the functioning of tidal flats and banks.

Task C.1.4.1: Whenever possible, participate in compiling an inventory of the benthic infauna present in tidal flats and banks.

Task C.1.4.2: Whenever possible, participate in research on the changes in configurations of tidal flats and banks.

Task C.1.4.3: Whenever possible, participate in research on the colonization, distribution and density of vegetation and hardbottom organisms on tidal flats and banks.

GOAL C.2: DETERMINE THE FACTORS WHICH AFFECT SURVIVAL AND PROPAGATION OF DESIGNATED SPECIES

Objective C.2.1: To determine those factors or habitat requirements that are critical to designated species survival.

Task C.2.1.1: Maintain a data base of designated species sightings, condition, habitat, life history, and information on their biology and ecology.

Task C.2.1.2: If additional information is necessary, establish a system of seasonal monitoring sites to determine which areas of the preserve are used by designated species, particularly by birds.

Task C.2.1.3: Encourage research and monitoring of nesting success and behavior patterns in designated bird species that may be adversely impacted by human activities in the preserve (e.g., nest flushing, interrupted feeding activity, et.).

Objective C.2.2: To determine the patterns and trends in manatee use of the aquatic preserve.

Task C.2.2.1: Whenever possible, participate in research on the factors that affect the continued survival of manatees.

Task C.2.2.2: Coordinate with and, if necessary, lend assistance on a local level to the Division of Marine Resources' manatee research and protection program.

Objective C.2.3: To determine the species composition, distribution, abundance, seasonality, and size classes of marine turtles that utilize the aquatic preserve.

Task C.2.3.1: Whenever possible, participate in research on the biology and life history of marine turtles and the factors affecting their use of the aquatic preserve.

Task C.2.3.2: Collect data and report marine turtle standings and activities to the Division of Marine Resources' marine turtle research and conservation program.

Task C.2.3.3: Ensure that preserve staff and volunteers who participate in turtle strandings and salvage activities are properly trained and permitted and that they maintain accurate records and make timely reports of all activities in the preserve.

Objective C.2.4: To determine distribution, abundance, size class and reproductive success of the American crocodile in the preserve.

Task C.2.4.1: Coordinate and communicate with U.S. Fish and Wildlife Service and the Florida Game and Freshwater Fish Commission monitoring programs and report all sightings of crocodiles and/or their nests.

Task C.2.4.2: Coordinate with appropriate agencies when contemplating resource management projects (invasive exotic plant or fill removal, etc.) that may potentially affect crocodile nesting habitat.

Objective C.2.5: To encourage propagation and preservation of indigenous, designated plant species.

Task C.2.5.1: Encourage the preservation of wild genetic stocks of indigenous, designated plant species as a source of natural seed production and dispersal.

Task C.2.5.2: Encourage the utilization of indigenous, designated plant species for revegetation and/or landscaping within and adjacent to the aquatic preserve.

D. ENVIRONMENTAL EDUCATION

Public awareness and involvement is potentially the most valuable tool a resource management program may utilize. The public is often not aware of the resources of the preserve nor of the various impacts that human activities have upon those resources. The 'public' may be students, property owners, user groups (e.g., divers, fishing enthusiasts, boaters, etc.), special interest groups (realtors, developers and contractors), conservation or preservation organizations, and local, regional and state government agencies that are involved in making planning or regulatory decisions affecting the preserve.

The many values derived from marine environments, including water quality, viable fisheries, endangered species habitat, recreation and open space, attract many visitors and residents to the preserve area. These same values may be irreparably harmed or impoverished, if the public is not environmentally sensitive and informed.

The overall goal of the environmental education element is to instruct individuals as to the importance of preserving natural and cultural resources so they may consider all issues prior to making decisions that affect these resources. One of

the primary aims of the aquatic preserve program will be to educate the public as to the importance of the resources and to enlist public support and participation in the protection and conservation of those resources for present and future generations to enjoy.

GOAL D.1: EDUCATE THE PUBLIC TOWARD WISE RESOURCE USE

Objective D.1.1: To provide information to existing environmental education programs at public and private schools and to coordinate with other local educational centers.

Task D.1.1.1: Notify the county School Boards of the aquatic preserve's environmental education efforts and the availability of its staff to assist or provide guidance for their existing educational programs.

Task D.1.1.2: Participate in the development and utilization of the Monroe County Environmental Story and the Dade County Environmental Story teaching aids for public and private schools in the counties.

Task D.1.1.3: Encourage teachers to conduct off-site classroom instruction and field trips in the preserve.

Task D.1.1.4: Conduct or assist in informal seminars, classes, and field trips to discuss resource management issues, projects and goals for the preserve.

Task D.1.1.5: Encourage development of community college or university level class projects or field trips that offer detailed study of the preserve's resources.

Objective D.1.2: To produce educational programs, literature and materials that inform the adult public of the preserve's natural and cultural resources and the importance of preserving and protecting these resources.

Task D.1.2.1: Seek funding to develop brochures, displays, pamphlets, and/or booklets that describe to the public; (1) the purpose of and activities conducted at the aquatic preserve and (2) general information on the preserve's ecosystem. If feasible, this task will include video presentations.

Task D.1.2.2: Upon Department approval, submit newspaper articles or radio announcements designed to educate the general public about the ecological functions and economic importance of the natural resources within a preserve. This approach may be the vehicle with which to disseminate the findings of recent research efforts to the public.

Task D.1.2.3: Coordinate with other resource management agencies and, where appropriate, co-sponsor exhibits, programs or other public contact activities.

Task D.1.2.4: Conduct and participate in workshops for public discussion of current resource management issues, resource utilization, and regulatory activities. Public forums such as these may involve private and public interests.

Task D.1.2.5: Coordinate and communicate with commercial organizations, associations and user groups to disseminate information and educate participants in wise use and conservation of the preserve's resources.

Objective D.1.3: To provide informal workshops to instruct other environmental educators on the preserve's natural resources.

Task D.1.3.1: Seek funding to schedule instructional workshops designed to teach other environmental educators.

Task D.1.3.2: Encourage aquatic preserve staff and volunteers to attend conferences and seminars to further teaching skills and become familiar with other environmental education programs.

Objective D.1.4: To establish an on-site environmental education displays for the preserve.

Task D.1.4.1: Pursue, at the bureau level, the necessary funds to construct an environmental education display adjacent to the preserve.

(NOTE: Two DNR publications, Environmental Education in Florida: Needs and Goals, and A Guide for Environmental Education, are available references to aid in accomplishing many of the goals outlined in this section.)

CHAPTER VIII

MANAGEMENT COORDINATION NETWORK

This chapter presents a general overview of the various federal, state, regional, and local agencies that regulate or hold any interest in the management or use of the Card Sound portion of Biscayne Bay Aquatic Preserve. A reference matrix of these regulatory programs and their jurisdictions is presented in Table 11. One function of the aquatic preserve program is to coordinate with these agencies to achieve common goals relevant to aquatic preserve management.

It should be noted that many of the following federal, state and local agencies with jurisdiction in the preserves may impose additional permit requirements on activities previously outlined in Chapter V of this plan.

A. FEDERAL AGENCIES

A number of federal agencies have property interests, construction activities, regulation programs, research activities, and land/wildlife management programs that deal either directly or indirectly with the aquatic preserves.

In accordance with the federal consistency review process, the Bureau of Submerged Lands and Preserves reviews many of the federal programs and activities as to their affect on the management objectives of the aquatic preserve programs. This review is coordinated through the Florida Department of Environmental Regulation's Office of Coastal Management in order to enforce the provisions of the Federal Coastal Zone Management Act of 1972, as amended. These federal agencies include: U.S. Department of the Interior, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Geological Survey, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service.

Among other functions, the **U.S. Department of the Interior (DOI)** overseas administration and management of lands and waters in Biscayne and Everglades National Parks. Biscayne National Park adjoins the preserve boundary to the north. State owned submerged lands were conveyed to the National Park but all rights in oil, gas, other minerals, rights to fish and rights to impose and collect state excise taxes on the sales of alcohol or tobacco are retained by the state (Chapter 258.39 (2)(c)1-4, F.S.). Fisheries and other regulations apply to all lands and resources within the park. Proposals and

activities that would affect resources or management objectives of the park should be coordinated through the park manager.

The **U.S. Army Corps of Engineers (COE)** has jurisdiction over inland navigable waters under the Rivers and Harbors Act of 1899. A revision of the Rivers and Harbors Act in 1968 extended the Corps' jurisdiction, allowing the agency to consider the fish and wildlife, conservation, pollution, aesthetics, ecology, and other relevant factors of a project. The Corps Regulatory Program was expanded in 1972 to include the Federal Water Pollution Control Act Amendments, now known as the Clean Water Act (CWA). Section 404 of this act requires the Corps to control dredge and fill activities. In 1977, amendments to the CWA extended this jurisdictional responsibility to wetlands. The Corps also contributes 50% of the funds reimbursed to the Water Management Districts by the Department of Natural Resources for aquatic plant control.

Card Sound is monitored by the **U.S. Coast Guard (USCG)** for boating safety (including search and rescue operations) and navigational problems, and to enforce maritime laws. The Coast Guard Auxiliary, an organization of volunteers, performs boating safety inspections, conducts boating classes and assists in search and rescue operations.

The **U.S. Environmental Protection Agency (EPA)** has jurisdiction over surface waters in the state. Enforcement authority was given under the Clean Water Act of 1968 and broadened under the 1977 revision. In general, the EPA is responsible for pollution control and abatement, including: air, water, noise, solid waste, toxic waste, and radiation. Under Section 104 of the Comprehensive Environmental Response, compensation, and Liability Act of 1980 (CERCLA), as amended by the superfund Amendments and Reauthorization Act of 1986 (SARA), EPA may initiate studies, clean-up, and pursue restitution of incurred expenses for pollution violations and damages. Authority is divided between EPA and USCG regarding the discharge of oil or hazardous substances into surface water. The agency also reviews permits issued by the Department of Environmental Regulation for the treatment, disposal, and storage of hazardous wastes.

The **U.S. Geological Survey (USGS)** performs surveys and research pertaining to topography and water resources of the United States. USGS also collects and publishes water resources data.

The **U.S. Fish and Wildlife Service (USFWS)** is responsible for fish and wildlife and their habitat as authorized in: the Coastal Barrier Resources Act (COBRA), National Environmental Protection Act, Migratory Bird Act, Endangered Species Act, and the Fish and Wildlife Coordination Act (FWCA). Under provision of the FWCA, USFWS must be consulted before COE can submit a plan for Congressional approval. The USFWS comments on the impacts of proposed projects on endangered species, migratory birds, and other fish and wildlife and their habitats. They are directed to prepare environmental impact assessments or statements for proposed projects by the COE and are authorized to issue "Jeopardy Opinion" against any proposed project which will negatively affect an endangered species (Barile et al., 1987).

The USFWS currently owns 6,522 acres of the Crocodile Lakes National Wildlife Refuge on Key Largo. Land acquisition is on going and deemed necessary to protect the endangered crocodile. Close coordination with the refuge staff will enhance opportunities for habitat management in the preserve.

The **National Marine Fisheries Service (NMFS)**, under the Department of Commerce, is involved with fisheries management, including recording commercial fish landings, enforcing national fishery laws and protecting vital fishery habitat. Areas north of the Dade/Monroe county line area included within the Atlantic Region for species landings quotas, while those south and west of the line are included in the Gulf Region. Under the Endangered species Act, this agency may regulate activities and enforce marine turtle and mammal protection legislation.

The **National Oceanic and Atmospheric Administration (NOAA)**, under the Department of Commerce Office of Coastal Zone Management, administers two local programs of interest. The National Marine Sanctuaries (NMS) program oversees the management of Key Largo and Looe Key National Marine Sanctuaries. The recently designated Florida Keys National Marine Sanctuary will encompass all federal waters surrounding the Keys and may include the existing sanctuaries, national parks, aquatic preserves, and John Pennekamp Coral Reef State Park under the larger protection of the federal system. Scoping and planning meetings are currently underway and will continue to solicit input in management of the Sanctuary. Participation and coordination with this process will ensure that the provisions of this plan are considered while formulating the long term management plan for the larger system.

B. STATE AGENCIES

Eight state agencies have programs that affect the resources or regulate activities within the aquatic preserves: Department of Natural Resources, Department of Environmental Regulation, Department of Health and Rehabilitative Services, Game and Freshwater Fish Commission, Department of Community Affairs, Marine Fisheries Commission, Department of State, and the Department of Transportation.

Although not a state agency, the Office of Planning and Budgeting of the Governor's Executive Office, in conjunction with the DER's Office of Coastal Management, is responsible for administering project reviews applicable to Florida's Coastal Management Program Federal Consistency evaluation process. This process includes all projects in the state that involve federal permitting, federal assistance or control federal activities. Each project must undergo this additional review to determine if the project is consistent with established programs, policies, and rules of the State, including aquatic preserves.

The **Department of Natural Resources (DNR)** has several Divisions that perform various functions of administration, regulation and enforcement of laws and programs related to natural resources and/or their use.

The Division of Marine Resources has several programs beneficial to the management of aquatic preserves. Resource mapping, fishery habitat utilization studies, state fisheries statistics, conch reintroduction programs and spiny lobster research are a few of the programs administered by this Division. It is also administers the manatee protection program and marine turtle data collection.

The Division of State Lands, under the provisions of Chapters 253 and 258, F.S., performs the staff duties related to the acquisition, administration and disposition of public lands on behalf of and with the approval of the Governor and Cabinet, sitting as the Board of the Internal Improvement Trust Fund. Staff duties include review and recommendations to the Board regarding applications for the use, sale, lease or transfers of all state owned lands and enforcement of the provisions for unauthorized use of those lands. Under Chapter 18-21, F.A.C>, the Division is charged with management of sovereignty submerged lands and spoil islands.

Aquatic preserves were established under Chapter 258, F.S. Originally administered by the Division of Recreation and Parks, the administration of aquatic preserves was transferred to the Division of State Lands in 1988. Specific management

policy, standards and criteria for the aquatic preserves is contained in Chapters 18-20 and 18-8, F.A.C.

The Division of Recreation and Parks administers and manages John Pennekamp Coral Reef State Park and more than 2,000 acres of tropical hardwoods and wetlands in the North Key Largo Hammocks State Botanical Site. The hammock lands were purchased under the authority the Conservation and Recreational Lands program (CARL). The CARL program was established under Chapter 253, F.S. This program is the primary vehicle for the acquisition of private lands that are deemed to be environmentally sensitive or that may serve as potential lands for future recreational needs of the state. Recent passage of the Preservation 2000 Trust Fund legislation will greatly enhance acquisition of targeted purchases.

The Division of Law Enforcement's Florida Marine Patrol, whose legal authority is granted under Chapter 370, F.S. enforces Florida laws related to marine resources, fisheries, boating safety, vessel titling/registration, contraband interdiction, and the protection of endangered and threatened species.

The Division of Resource Management, under Chapters 369.20 - 369.22, F.A.C., authorized the Bureau of Aquatic Plants to regulate various aquatic plant control programs, including permit review for mechanical, biological, and chemical control of aquatic plants. Permits are also necessary under Chapter 16C-52, F.A.C., "Aquatic Plant Importation, Transportation, Cultivation, and Possession", for any persons cultivating, revegetating, or collecting aquatic plants. This division is also responsible for management of mineral resources, oil and gas exploration, geologic studies, state Navigation Districts and the Canal Authority.

The **Department of Environmental Regulation (DER)** has a broad range of responsibilities and receives its authority from State Law and some is delegated from EPA. Generally, the DER administers programs regulating air, water, noise, watewater, stormwater, and hazardous waste pollution through a permitting and certification process. Chapter 376, F.S. directs DER to cooperate with DNR in offering consultation, enforcement, prosecution, and technical advise in pollutant discharge, control and removal.

These responsibilities are administered through the following regulatory mechanisms: (1) establishment of state standards designed to protect natural systems and prevent harmful pollutants from entering these systems; (2) application of these standards through the permitting of potential sources of pollution and monitoring discharges for compliance; and (3) initiation of enforcement action for non-compliance with these standards.

Chapter 403, F.S. enumerates the DER responsibilities in the areas of water and air quality, facilities siting, resource recovery and management, pollution control and wetland permitting. This chapter serves as the authority for the initiation of dredge and fill applications in conjunction with COE and DNR. The authority to regulate activities and protect water quality granted in Chapter 403 is facilitated by the Water Quality Standards established in Chapter 17-3, F.A.C. This chapter of the administrative code sets forth specific criteria for surface water classifications and permitting criteria for those classifications. The Special Protection, Outstanding Florida Waters (OFW) classification is assigned to the waters of the aquatic preserve and most waters of the Florida Keys. The OFW classification affords the highest protection for state waters when reviewing applications for structures and activities.

Chapter 17-4, F.A.C., addresses permit requirements and Chapter 17-312, F.A.C., covers dredge and fill activities. Section 253.77, F.S., as amended by the Warren S. Henderson Wetlands Protection Act of 1984, requires that any person requesting the use of state owned lands shall have prior approval of the Trustees. As a result of this amendment, an interagency agreement between DNR and DER provides for comments from DNR staff, on behalf of the Board of Trustees, into the DER permitting process for proposed activities in aquatic preserves.

The DER Coastal Zone Management Section is charged with coordinating activities related to coastal management and awards grants for research and management planning. The DER's Intergovernmental Coordination Section reviews federal actions for consistency with the Coastal Zone Management Program.

The **Department of Community Affairs (DCA)** and the Regional Planning Councils are authorized under Section 380.06, F.S., for administering the Development of Regional Impact (DRI) review program. The DRI process was established to provide a review and monitoring procedure for development projects potentially affecting the health, safety or welfare of citizens of more than one county.

Additionally, the DCA designates Areas of Critical State Concern (ACSC). These designations are intended to protect the areas of the state where development has endangered or may endanger resources of regional or statewide significance. Under an ACSC designation, the local governments are required to submit new or existing land development regulations to DCA for review and approval. According to Section 380.05, F.S., the entire land development process will require the state's supervision until that local government modifies its land

development practices to conform to the principles guiding development within an ACSC.

The Florida Keys portion of Monroe County was designated as an ACSC in 1979. In 1984, under authority granted in Chapter 380, F.S. and defined in Administrative Rule 27F-8, the Boundary and Principles for Guiding Development for the Florida Keys Area of Critical State Concern were adopted to conserve and protect the natural, environmental, historic and economic resources, and other values of the lands and waters of the Florida Keys. The ACSC designation and the Principles for Guiding Development are intended to remain in place until such time as Monroe County shall have developed a comprehensive growth management plan and future development regulations as required by Chapter 163, F.S. Such plan shall be consistent with the State Comprehensive Plan, State Statutes, Codes and rules. Compliance to the minimum criteria established in Chapter 9J-5, F.A.C., is also required.

The DCA also oversees the development of Local Government Comprehensive Plans (LGCP) for all counties and municipalities, as required by the Local Government Comprehensive Planning and Land Development Regulation Act, Chapter 163, Part II, F.S. Subsection 163.3203(5), F.S., provides that DCA shall adopt rules for the review of local government land development regulations. Within one year of submission for review by DCA, local governments are required to adopt land development regulations which are consistent with their comprehensive plans, pursuant to Subsection 163.3167(2), F.S. The two elements within these plans that most significant to the aquatic preserve program are the Coastal Zone Management Element and the Conservation Element.

Dade County has completed and adopted an LGCP. Monroe County is currently involved in this process but does not have an adopted plan, as of this writing.

The **Department of Health and Rehabilitative Services (HRS)** has responsibilities to protect the public's health by overseeing functions that involve water supply, onsite sewage disposal, septic tank cleaning, solid waste control, and hazardous wastes. Authority for these responsibilities is found in Chapters 154, 381, and 386, F.S., and in the 10D Series of F.A.C., known as the "Sanitary Code." Within each county, HRS functions as the county's health department and oversees these jurisdictional responsibilities.

HRS administers the permitting and placement of septic tanks under Chapter 10D-6, F.A.C. This chapter establishes standards for onsite sewage disposal systems (OSDS). Part II of that chapter establishes specific standards for OSDS installation,

operation and monitoring in the Key Largo Limestone or Miami (Oolite) rock formations.

HRS is also responsible for arthropod (mosquito) control activities under Chapter 388, F.S. and may delegate that authority to a local mosquito control district (MSD). The Monroe County MSD administers the local program through ground and aerial application of larvicides and adulticides. Chapter 10D-54, F.A.C. requires that any arthropod control activities conducted by local MSDs on environmentally sensitive public lands, such as parks, aquatic preserves and similar properties be coordinated in advance by the responsible mosquito control agency with the Executive Director of DNR, GFC, and the regional director of the USFWS. This chapter also establishes areas, types, rates, timing and equipment standards for control activities.

The **Department of State (DOS), Division of Historical Resources (DHR)** has the responsibility granted under Chapter 267, F.S., regarding the preservation and management of Florida's archaeological and historical resources. This responsibility includes those cultural resources located on state-owned lands, including aquatic preserves. All activities that may potentially affect a known or suspected resource must be coordinated with and/or approved by the DRH.

The **Department of Transportation (DOT)** has responsibilities that include right-of-way and surface water runoff in the areas of roads, bridges, and causeways. The DOT also updates a state-wide aerial photographic survey every four years, rotating on a district basis.

The **Game and Fresh Water Fish Commission (GFC)** authority is provided in the rules and regulations of Chapters 39.101 and 39.102, F.A.C. This authority involves the implementation of specific regulations and their enforcement for protecting all wildlife and their habitats. As such, the GFWFC is the state coordinator for species designated for protection in Florida.

The **Marine Fisheries Commission (MFC)** was established as a rule making authority pursuant to Section 370.027, F.S. The seven members appointed by the Governor are delegated full rulemaking authority over marine life (subject to approval by the Trustees), with the exception of endangered species. This authority covers the following areas: (a) gear specifications, (b) prohibited gear, (c) bag limits, (d) size limits, (e) species that may not be sold, (f) protected species, (g) closed areas, (h) quality control codes, (i) open/closed seasons, and (j) special considerations related to

egg-bearing individuals, and (k) relaying of clams and oysters. The MFC is also instructed to make annual recommendations to the Trustees regarding marine fisheries research priorities and changes to existing laws.

C. REGIONAL AGENCIES

At the regional level, the management coordination network includes the South Florida Water Management District and the South Florida Regional Planning Council. These organizations conduct activities that are on a broader scale than those of local governments.

The **South Florida Water Management District (SFWMD)** was created by Chapter 61-69, Laws of Florida, as a public corporation for carrying out Chapter 378, F.S., and is governed by provisions of Chapter 373, F.S. Chapters 40D-4 and 40D-40 were adopted to ensure continued protection of the water resources of the District including wetlands and other natural resources. The rules in these chapters are to implement the surface water management permit system mandated in Part IV of Chapter 373, F.S. The statutes resulted from passage of Chapter 84-79, Laws of Florida, the Warren G. Henderson Wetlands Protection Act of 1984.

SFWMD has jurisdiction over and administers the permitting program for consumptive water use, well construction, stormwater discharge, surface water management, groundwater withdrawals, water level control, regulation of artificial recharge facilities, and works of the district.

It is the intent of the Florida Legislature (Chapter 87-97, Section 1-6, Laws of Florida) through the Surface Water Improvement Management (SWIM) Act, that the water management districts "design and implement plans and programs for the improvement and management of surface water." The SFWMD had developed and implemented the Biscayne Bay SWIM plan in 1988. This document provides comprehensive programs for restoration of habitats and improving water quality that will benefit the preserve. Revisions to the SWIM Plan were approved by the Governing Board of the District in April 1989.

The SFWMD administers a second resource based program that is of immediate interest to management of the preserve. The Save Our Rivers 1991 Five Year Plan has identified 48,600 acres in the East Everglades and 29,643 acres in the C-111 canal and Model Land canal basins for purchase. Acquiring these lands will enable restoration and protection of water shed and recharge areas that influence the environmental integrity of the east Everglades, Florida Bay, Barnes and Card Sounds.

The **South Florida Regional Planning Council (SFRPC)** serves as a regional planning body for county and municipal governments. Its many functions include: (1) providing assistance to local governments with planning expertise, (2) serving as the regional representative for the DRI review process, (3) serving as a regional clearinghouse for state and federal projects and programs, (4) assisting local governments in securing grants, (5) conveying information from the local governments to the state and federal levels, and (6) preparing and administering the Regional Comprehensive Policy Plan.

D. LOCAL AGENCIES

The Card sound portion of Biscayne Bay Aquatic Preserve spans portions of Dade and Monroe counties. Lands adjoining the preserve are unincorporated and do not include any municipal governments. Local governments provide services and regulate building and zoning on adjacent private lands that may potentially affect the preserve.

Local governments are required by the Local Government Comprehensive Planning Act of 1975 (Section 163.3163, F.S.), as amended by Chapter 85-55, Laws of Florida, to the Local Government Comprehensive Planning and Land Development Regulation Act (LGCP), to have a management plan with elements relating to different governmental functions (i.e., housing, physical facilities, conservation, land use, coastal zone protection, etc.). Recent statutory amendments require these plans to be updated and for counties to adopt land development regulations and improve coastal management protection. The coastal management element of the LGCP, along with the land use and conservation elements, establishes long range plans for orderly, and balanced development, with particular attention to the identification and protection of environmental resources in the planning area. Conformance with the criteria, policies, and practices of a local government comprehensive plan is required for all development within the local government jurisdiction.

TABLE 11: MANAGEMENT COORDINATION NETWORK

LOCAL AGENCIES

LGT	Local Governments (Cities, Towns, Municipalities)
CGT	County Governments
LDD	Local Drainage Districts
MCD	Mosquito Control Districts
ICD	Inlet Commissions/Districts
SWC	Soil and Water Conservation Districts

STATE AGENCIES

DCA	Florida Department of Community Affairs
DER	Florida Department of Environmental Regulation
DNR	Florida Department of Natural Resources
GFC	Florida Game and Freshwater Fish Commission
HRS	Florida Department of Health and Rehabilitative Services
DOS	Florida Department of State
DOT	Florida Department of Transportation
FMP	Florida Marine Patrol
FSG	Florida Sea Grant
MFC	Marine Fisheries Commission
DAC	Florida Department of Agriculture and Consumer Services

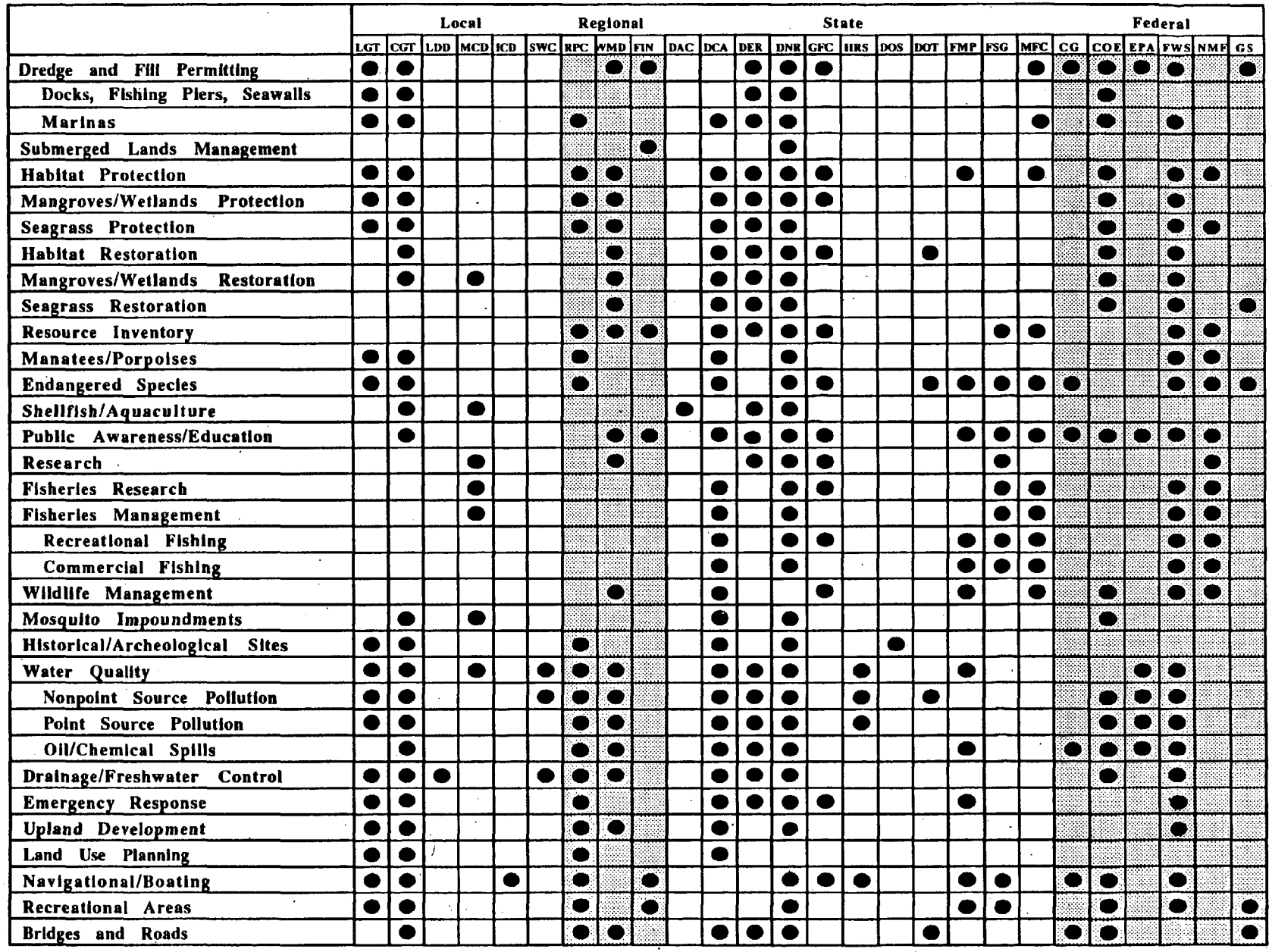
REGIONAL AGENCIES

RPC	Regional Planning Council
WMD	Water Management Districts
FIN	Florida Inland Navigation District

FEDERAL AGENCIES

CG	United States Coast Guard
COE	United States Army Corps of Engineers
EPA	United States Environmental Protection Agency
FWS	United States Fish and Wildlife Service
NMF	National Marine Fisheries Service
GS	United States Geological Survey

Source: modified from the Indian River Lagoon Joint Reconnaissance Report, 1987


Local
Regional
State
Federal
LGT CGT LDD MCD ICD SWC RPC WMD FIN DAC DCA DER DNR GFC HRS DOS DOT FMP FSG MFC CG COE EPA FWS NMF GS
Dredge and Fill Permitting
Docks, Fishing Piers, Seawalls
Marinas
Submerged Lands Management
Habitat Protection
Mangroves/Wetlands Protection
Seagrass Protection
Habitat Restoration
Mangroves/Wetlands Restoration
Seagrass Restoration
Resource Inventory
Manatees/Porpoises
Endangered Species
Shellfish/Aquaculture
Public Awareness/Education
Research
Fisheries Research
Fisheries Management
Recreational Fishing
Commercial Fishing
Wildlife Management
Mosquito Impoundments
Historical/Archeological Sites
Water Quality
Nonpoint Source Pollution
Point Source Pollution
Oil/Chemical Spills
Drainage/Freshwater Control
Emergency Response
Upland Development
Land Use Planning
Navigational/Boating
Recreational Areas
Bridges and Roads

CHAPTER IX

STAFFING AND FISCAL NEEDS

Historically, the Aquatic Preserve Program has been largely dependent upon federal coastal zone grant funds for the development of management plans, and very little of this funding has been allocated towards staffing. Consequently, the number of both field positions and central office positions have been limited.

Currently there is one full-time environmental specialist position to oversee resource management, protection, education and field research projects for three spatially separated aquatic preserves in the Keys. Management plans similar to this one have been completed for Lignumvitae Key and Coupon Bight Aquatic Preserves. In order for these aquatic preserves to be managed in accordance with the goals, objectives and policies, set forth in these plans, adequate funding, staffing and equipment is essential.

It is anticipated that the management and administration of the three aquatic preserves in the Keys could be accomplished with one field office staffed with five full time employees. An annual review of the accomplishments of the program relative to the tasks listed in Chapter VII and the program monitoring in Chapter X will help to determine if the initial staffing estimate is adequate to meet the legislative intent of the program.

A budget covering projected staff time, equipment, travel and other expenses for this area, which would include Lignumvitae Key and Coupon Bight Aquatic Preserves is found in Table 12. The budget is required to fulfill the short range needs of the preserves as described in the management plans, and to accomplish the Department goal of on-site management for all aquatic preserves by 1991, as expressed in the Agency Functional Plan.

TABLE 12

ANTICIPATED TWO-YEAR BUDGET FOR THE FLORIDA KEYS AQUATIC PRESERVES (THE CARD SOUND PORTION OF BISCAYNE BAY, LIGNUMVITAE KEY AND COUPON BIGHT AQUATIC PRESERVES)

POSITION	SALARY	1ST YEAR	2ND YEAR
ES III	(with benefits)	$ 38,424	$ 39,577
ES II	(with benefits)	33,836	34,851
ES I	(with benefits)	28,224	29,071
Secretary	(with benefits)	17,255	17,773
OPS Environmental educator		22,391	23,063
Subtotal		$ 140,130	$ 144,335

OPERATING CAPITAL OUTLAY	
Vehicles (3 @ $12,000 each)	$ 36,000
Office equipment	11,000
Computer	5,000
Education materials	2,500
Subtotal	$ 55,000

OPERATING EXPENSES		
Office rental/fuel/ supplies/utilities	$ 28,000	$ 32,000
Education supplies	1,500	1,600
Subtotal	$ 29,500	$ 33,600

TOTAL COST	$ 246,630	$ 177,935

(NOTE: Figures presented are reflective of those calculated for three aquatic preserves and some figures were based on 1990 estimates.)

CHAPTER X

RESOURCE AND PROGRESS MONITORING PROGRAM

To ensure that this management plan is effectively implemented, it will be necessary to have a level of staffing to institute programs that will: (1) monitor changes in the biological resources, and (2) record use activities, and (3) track progress and accomplishments directed toward retaining the original integrity and values of the preserve.

A. RESOURCE MONITORING

To monitor changes in the natural resources, a geographic information system (GIS) will be required. A GIS is a computer-based system that is used to capture, edit, display, and analyze geographic information. The first GIS programs were developed about 20 years ago to manage large collections of natural resource and environmental information. Since their development, they have been used in other areas such as utilities mapping, inventory management, and land use planning; however, their most important function continues to be natural resource management.

Future use of a GIS system would include the periodic inventory, compilation, and analysis of temporal and spatial data concerning the present state of the natural resources within the preserve. Historical aerial photography could be computerized of comparison with later data to conduct a temporal analysis of resource abundance. Detailed monitoring of revegetation/restoration efforts could also be computer analyzed. The on-line access to these natural resource data bases will facilitate informed management decisions concerning the use and protection of lands and their resources. Cooperation and file sharing is possible with other agencies handling such data with identical and similar systems. Similar environments and relationships between various resources may be compared and analyzed to gain a more integrated approach to protection and management.

This technology is widely accepted and being used by various resource management agencies and local planning offices. Utilization of the best available technology will facilitate a better understanding of the historical and time line condition of the resource.

B. ACTIVITY MONITORING

As human interaction in and around the preserve increases, additional pressures are to be expected in the form of recreational and development activities. Monitoring the types of use and their compatibility, their frequency of occurrence, as well as, proven and expected detrimental effects on the preserve's natural resource, will provide a foundation for developing any additional future plan amendments and revisions required to protect these resources. Periodic boat counts, creel census, user questionnaires, and structure inventories are various methods that may be employed to gather relevant data on activities and user group profiles.

C. PROGRESS MONITORING

For this management plan to be effectively implemented and evaluated, it is necessary to monitor the accomplishments and progress of the plan on a regular basis. The purpose of this element is to detail the program's accomplishments in its pursuit of the objectives outlined in Chapter VII. This information, to be submitted in a report once every three years to the Bureau Chief, will include an update of the biological resources' status within the preserve as well as identifying current human activities. Monitoring will enable the aquatic preserve program to evaluate performance and effectiveness of the plan and identify successful strategies, as well as, areas that may require a more unified team approach to management. This report will detail the following:

1. The state of the natural environment of the aquatic preserve.

   a. Through the use of resource inventories and the GIS system, document the status of each biological resource (e.g., loss or gain of mangroves, grassbeds).

   b. Identify the current number of structures/activities either started or completed in the preserve. These structures/activities will be categorized as follows:
      1) authorized projects
      2) unauthorized projects, and
      3) projects not in compliance with the original authorization.

2. A list of accomplishments of those tasks outlined in Chapter VII.

   a. Each task will be listed and the activities required to complete that task will be detailed. If the task was not done or not completed, an explanation will be given. If the explanation was due to insufficient

funding/staff, then this fact will be detailed so that an update of Chapter IX can be made.

3. Any new goals and/or objectives will be reflected in an update of Chapter VII.

Review of this management plan for consistency with statute and administrative code changes, local government plans or amendments, water management and regional planning council plans, as well as, with various other agency plans and programs, will be required on at least an annual basis. In any event, field staff will forward written comments to appropriate DNR staff upon any agency's proposed actions or changes that will substantially affect the preserve or implementation of this management plan.

Current proposals that will ultimately require reevaluation of this plan and those for Coupon Bight and Lignumvitae Key Aquatic Preserves include, but are not limited to; 1) revisions and/or adoption of proposed Florida Administrative Code Chapter 18-25 (combining and revising Chapters 18-20 and 18-21, F.A.C.); 2) consistency and integration with the Florida Keys National Marine Sanctuary (which will tentatively include all waters surrounding the Keys, prohibit certain vessel traffic and activities, and requires a comprehensive water quality protection program in the sanctuary); and 3) reauthorization of the federal Coastal Zone Management Act (CZMA), which requires that federal agencies be consistent with provisions of the act and that coastal states develop a Coastal Nonpoint Pollution Control Program.

Various plans and programs may be instrumental in attaining many of the goals of resource management, resource protection and the conservation of the biological, scientific and aesthetic values for which the preserve was established. This management plan is seen as a mechanism for coordinating with these plans and programs, and identifying and providing guidance and management in those areas where additional direction and focus are needed.

REFERENCES

Almodovar, L.R. and R. Biebl. 1962. Osmotic resistance of mangrove algae around La Parguera, P.R. Rev. Algol. (N.S.) 6(3): 203-208.

Arendt, W.J., T.A. Vargas Mora, and J.W. Wiley. 1979. White-crowned pigeon: status rangewide and in the Dominican Republic. Proc. Ann. Conf. S.E. Assoc. Fish and Wildlife Agencies. 33: 111-122.

Bacon, P.R. 1970. The ecology of Caroni Swamp. Special Publication, Central Statistical Office, Trinidad. 68 pp.

Ballentine, D. and H.J. Humm. 1975. Benthic algae of the Anclote estuary I. Epiphytes of seagrass leaves. Fla. Sci. 38(3):150-162.

Barbour, D.B. and S.R. Humphrey. 1982. Status and habitat of the Key Largo woodrat and cotton mouse (Neotoma floridana smalliand Peromyscus gossypinus allapaticola). J. Mamm. 63:144-148.

Barnes, R.D. 1974. Invertebrate Zoology. Third Ed. W.B. Saunder Co., New York. 870 pp.

Beever, J.W., D. Simberloff, and L.L. King. 1979. Herbivory and predation by the mangrove tree crab, Aratus pisonii. Oecologia 43: 317-328.

Bent, A.C. 1932. Life histories of North American birds. U.S. Natl. Mus. Bul. 162 pp.

Brook, I. 1975. Some aspects of the trophic relationships among the higher consumers in a seagrass community (Thalassia testudinum) in Card Sound, Florida. Dissertation. University of Miami, Coral Gables, Florida. 133 pp.

Bullen, A.K. 1965. Tequestas. Pp. 317-349 IN C.W. Tebeau and R.L. Carson, Eds. Florida from Indian Trail to Space Age. Vol. I-III. Southern Publ. Co., Delray Beach, Florida.

Cairns, S.D. 1976. Guide to the commoner shallow-water gorgonians (sea whips, sea feathers and sea fans) of Florida, the Gulf of Mexico, and the Caribbean region. University of Miami Sea Grant Program (NOAA Sea Grant No. 04-5-158-14), Miami, Florida. 74pp.

Carr, A.W. and C.J. Goin. 1955. Reptiles, Amphibians and Freshwater Fishes of Florida. University of Florida, Gainesville. 341 pp.

Carr, W.E.S. and C.A. Adams. 1973. Food habits of juvenile marine fishes occupying seagrass beds in the estuarine zone near Crystal River, Florida. Trans. Am. Fish. Soc. 102(3): 511-540.

Carter, K.E. 1976. The Rumskudgeon: Housman, Wrecker of Indian Key. BPK Press, Hialeah, Florida. 125 pp.

Carter, M.R., L.A. Burus, T.R. Cavinder, K.R. Dugger, P.L. Fore, D.B. Hicks, H.L. Revells, and T.W. Schmidt. 1973. Ecosystem analysis of the Big Cypress Swamp and estuaries. U.S. Environmental Protection Agency Region IV, Atlanta.

Casagrande, D.J. and P.H. Given. 1975. Geochemistry of amino acids in some Florida peat accumulations. I. Analytical approach and total amino acid concentration. Geochim. Cosmochim. Acta 38:419-434.

Chapin, G.M. 1914. Florida 1513-1913, Past Present and Future. S.T. Clarke Pub. Co., Chicago. 628 pp.

Chapman, V.J. 1976. Coastal Vegetation. Pergamon Press, New York. 292 pp.

Cintron, G., A.E. Lugo, D.J. Pool, and G. Morris. 1978. Mangroves of arid environments in Puerto Rico and adjacent islands. Biotropica 10:110-121.

Coastal Coordinating Council. 1974. Florida Keys Coastal Zone Management Study. Florida Department of Natural Resources. 138 pp.

Conover, J.T. 1968. Importance of natural diffusion gradients and transport of substances related to benthic marine plant metabolism. Bot. Mar. 11(1-4): 1-9.

Corcoran, E.F., M.S. Brown, and A.D. Freay. 1984. The study of trace metals, chlorinated pesticides, polychlorinated biphenyles and phthalic acid esters in sediments of Biscayne Bay. University of Miami, Rosenstiel School of Marine and Atmospheric Science, Miami, Florida. 58 pp.

Courtney, C.M. 1975. Mangrove and seawall oyster communities at Marco Island, Florida. Bull. Am. Malacol Union Inc. 41: 29-32.

Dade County/Department of Environmental Resources Management. 1987. Biscayne Bay and Miami River: A water quality summary. Metropolitan Dade County, Florida. DERM Tech. Rep. 1987. 38 pp.

Davis, J.H., Jr. 1940. The ecology and geologic role of mangroves in Florida. Carnegie Institute, Washington, D.C. Publ. 517. Tortugas Lab Pap. 32:303-412.

Dean, L. 1982. Reef Lights. J.B. Klay and Sons, Tampa, Florida. 134 pp.

Duellman, W.E. and A. Schwartz. 1958. Amphibians and reptiles of southern Florida. Bull. Fla. State Mus. 3: 181-324.

Douglas, M.S. 1990. Dedication speech at Everglades National Park.

Earley, C.F. and H.G. Goodell. 1968. The sediments of Card Sound, Florida. Jour. Sed. Pet. 38:(4) 985-999.

Eldred, B., R.M. Ingle, K.D. Woodburn, R.F. Hutton, and J. Jones. 1961. Biological observations on the commercial shrimp, Penaeus duorarum Burkenwald, in Florida waters. Fla. State Board Conserve. Mar. Prof. Pap. Ser. 3: 1-139.

Eldred, B., C.R. Futch, and R.M. Ingle. 1972. Studies of juvenile spiny lobsters, Panulirus argus, in Biscayne Bay, Florida. Fla. Dept. Nat. Resour. Mar. Res. Lab. Spec. Sci. Rep. 35. 15 pp.

Emmel, T.C. 1986(a). Status survey and habitat requirements of Florida's endemic Schaus swallowtail butterfly. Florida Gameand Fresh Water Fish Commission, GFC-84-028. Tallahassee,FL. 122 pp.

Emmel, T.C. 1986(b). Pesticide effects on the survival of the Schaus swallowtail butterfly. Elizabeth Ordway Dunn Foundation, Inc., Miami. 56 pp.

Environmental Protection Agency. 1981. Effects of Baytex and malathion on early life stages of snook, Centropomus undecimalis. Surveillance and Analysis Division, Ecology Branch, Athens, Georgia. 7 pp.

Ernst, C.H. and R.W. Barbour. 1972. Turtles of the United States. University of Kentucky Press, Lexington. 299 pp.

Eyster, I.R. 1987. History and historic sites in the Florida Keys. Personal communication.

Fell, J.W., R.D. Cefalu, I.M. Master, and S.S. Tallman. 1975. Microbial activities in the mangrove (Rhizophora mangle) leaf detrital system. Pp. 661-679 IN G. Walsh, S. Snedaker and H. Teas, Eds. Proceedings of the International Symposium on the Biology and Management of Mangroves. University of Florida, Gainesville.

Fell, J.W., I.M. Master, and S.Y. Newell. 1980. Laboratory model of the potential role of fungi (Phytophthora spp.) in the decomposition of red mangrove (Rhizophora mangle) leaf litter. IN K.R. Tenore and B.C. Coull, Eds. Marine Benthic Dynamics. University of South Carolina Press, Columbia.

Florida Department of Environmental Regualtion. 1990. Unpublished water quality data for Card Sound Bridge Station 1989-90.

Florida Department of Environmental Regulation. 1991. Permit data for on-site sewerage disposal systems at Angler's Club and Ocean Reef Club on Key Largo and permit authorizations for reverse osmosis plant at Ocean Reef Club. Florida Keys Field Office Files, Marathon.

Florida Department of Natural Resources. 1990(a). Conservation and Recreation Lands (CARL) project updates provided by Jean Parks-Straub for the North Key Largo Hammocks State Botanical Site.

Florida Department of Natural Resources. 1990(b). Division of Marine Resources unpublished data on mortality of Florida manatees for 1989.

Florida Department of Natural Resources. 1990(c). Division of Marine Resources, Marine Fiseries Information Service unpublished preliminary landings statistics for selected species of fish and sponges for 1989.

Florida Game and Fresh Water Fish Commission. 1984. Endangered and Threatened Species Management and Conservation Plan, 1984 Update and Progress Report. Tallahassee, Florida. 33 pp.

Florida Game and Fresh Water Fish Commission. 1990. Endangered and Potentially Endangered Fauna and Flora in Florida, Official List. Tallahassee, Florida. 19 pp.

Goodyear, N.C. 198. Results of a study of Key Largo woodrats and cotton mice: Phase I, spring and summer, 1985. Pp. 1-76 IN North Key Largo Habitat Conservation Plan, 1989. Monroe County Growth Management Division, Key West, Florida.

Hammer, L. 1968. Anaerobiosis in marine algae and marine phanerogams. Pp. 414-419 IN K.Nisizawa, Ed. Proceedings of the 7th International Seaweed Symposium. University of Tokyo Press, Tokyo.

Harlin, M.M. 1971. Translocation between marine hosts and their epiphytic algae. Plant Physiol. 47: 41.

Hersch, S.L. 1981. Ecology of the Key Largo woodrat (Neotoma floridana smalli). J. Mamm. 62:201-206.

Hess, S.C. 1978. Guide to the commoner shallow-water asteroids (Starfish) of Florida, the Gulf of Mexico, and the Caribbean region. University of Miami Sea Grant Program (NOAA Sea Grant Program No. 04-5-158-14). Miami. 37pp.

Hoffman, M.S. (Editor) 1991. The World Almanac and Book of Facts. Pharos Books, Scripps Howard Co., New York. 960 pp.

Hoffmeister, J.E. 1974. Land from the Sea. Univ. of Miami Press. 143 pp.

Holle, D. 1991. Crocodile Lake National Wildlife Refuge. Current acreage purchased in Key Largo. Personnal communication.

Humphrey, S.R. and D.B. Barbour. 1979. Status and habitat of eight kinds of endangered and threatened rodents in Florida. Special Scientific Report No.2. Office of Ecological Services, Fla. State Mus. 17 pp.

Jacobsen, T. 1983. Crocodilians and islands: status of the American alligator and the American crocodile in the Lower Keys. Florida Field Naturalist 11: 1-24.

Japp, W.C. 1984. The ecology of the south Florida coral reefs: a community profile. U.S. Fish Wildl. Serv. FWS/OBS-82/08. 138 pp.

Kaplin, E.H. 1982. A Field Guide to Coral Reefs of the Caribbean and Florida. Peterson Field Guide Series. Houghton, Mifflin Co. Boston Mass. 289 pp.

King, W. and T. Krakauer. 1966. The exotic herpetofauna of southeastern Florida. Quart. J. Florida Acad. Sci. 29: 149-154.

King, W. and T. Krakauer. 1968. The ecology of the neotropical toad, Bufo marinus, in south Florida. Herptological 24: 214-221.

Krakauer, T. 1970. The invasion of the toads. Fla. Nat. 44: 12-14.

Kushlan, J.A. 1978. Feeding ecology of wading birds. Pp. 249-297. IN A. Sprunt IV, J. Ogden, and S. Wicker, Eds. National Audubon Society Res. Rep. 7. New York.

Layne, J.N. 1974. The land mammals of south Florida. Miami Geol. Soc. Mem. 2: 386-413.

Lazell, J.D. 1989. Wildlife of the Florida Keys: A Natural History. Island Press, Washington, D.C. 250 pp.

Lee, T.N. and C. Rooth. 1972. Exchange processes in shallow estuaries. University of Miami: Sea Grant Bulletin No. 4. 33 pp.

Lewis, R.R. and R.C. Phillips. 1980. Occurrence of seeds and seedlings of Thalassia testudinum Banks EX Konic in the Florida Keys (USA). Aquatic Bot. 9: 377-380.

Lewis, R.R., R.C. Phillips, D.J. Adamek, and J.C. Cato. 1981. Draft final report on seagrass revegatation studies in M o n r o e County. Report by Continential Shelf Associates to the Florida Department of Transportation. 65 pp.

Lineback, J.A. 1968. Macrofaunal and floral distributions and controls in Coupon Bight, Lower Florida. Ohio Acad. Sci. Meeting. Toledo, Ohio. (Abst.)

Lugo, A.E. and S.C. Snedaker. 1974. The ecology of mangroves. Annu. Rev. Ecol. Syst. 5:39-64.

Lugo, A.E., G. Evink, M.M. Brinson, A. Broce, and S.C. Snedaker. 1975. Diurnal rates of photosynthesis, respiration and transpiration in mangrove forests in South Florida. Pp. 335-350 IN F. Golley and G. Medina, Eds. Tropical Ecological Systems. Academic Press, New York.

Lugo, A.E., R.R. Twilley, and C. Patterson-Zucca. 1980. The role of black mangrove forests in the productivity of coastal ecosystems in South Florida. Report to E.P.A. Corvallis Environmental Research Laboratory. Carvallis, Oregon. 281 pp.

Lund, F. 1978. Atlantic ridley turtle. Pp. 25-26 IN Rare and Endangered Biota of Florida, Vol. 3, Amphibians and Reptiles. E.W. McDiarmid, Ed. University Presses of Florida, Gainesville.

Lutz, P.L. and Dunbar-Cooper, A. 1982. The nest environment of the American crocodile (Crocodylus acutus). Everglades National Park, South Florida Research Center Report T-671. 39 pp.

Marszalek, D., G. Babashoff, M. Noel, and P. Worley. 1977. Reef distribution in south Florida. Pp. 223-230 IN Proceedings: Third International Coral Reef Symposium, Vol. 2. University of Miami, Florida.

Martin, S.W. 1949. Florida's Flagler. University of Georgia Press, Athens, Georgia. 280 pp.

Marx, J.M. Settlement of spiny lobster, Panulirus argus, Pueruli in south Florida: an evaluation from two perspectives. Canadian Jour. of Fisheries and Aquatic Sciences 43(11): 2221-2227.

Mattox, N.T. 1949. Studies on the biology of the edible oyster, Ostrea rhizophorae, Guilding, in Puerto Rico. Ecol. Monogr. 19: 339-356.

McGill, J.T. 1959. Coastal Classification Maps. Pp. 1-22 IN R.J. Russel, Ed. Second Coastal Geography Conference. Coastal Studies Instit. Louisiana State University, Baton Rouge, Louisiana.

McMillan, C. 1971. Environmental factors affecting seedling establishment of the black mangrove on the Central Texas Coast. Ecology. 52:927-930.

Meylan, A. 1988. Spongivory in hawksbill turtles: a diet of glass. Sci. News. 133(5): 70.

Moler, P. 1991. Current nesting activity of the American crocodile in Florida. Personal communication.

Monroe County. 1986. Florida Keys Comprehensive Plan. Vol. I-III. Planning Department, Key West.

Monroe County. 1989. North Key Largo Habitat Conservation Plan. Growth Management Division, Key West. 97 pp.

Morris, A.M. (Ed.) 1989. The Florida Handbook 1989-1990. Peninsular Publ. Co. Tallahassee, Florida. 728 pp.

Multer, H.G. 1977. Field Guide to Some Carbonate Rock Environments-Florida Keys and Western Bahamas. Kendall/Hunt Publ. Co. Dubuque, Iowa. 425 pp.

National Marine Fisheries Service. 1986. Unpublished data Florida fish landings (Monroe and Dade counties). National Marine Fisheries Service, Southeast Fisheries Center. Virginia Key, Florida. 6 pp.

Odum, W.E. 1970. Pathways of energy flow in a South Florida estuary. University of Miami Sea Grant Bull. 7. 162 pp.

Odum, W.E. 1971. Fundamentals of Ecology. Saunders Publ. Co. Philadelphia, Pa. 574 pp.

Odum, W.E. and E.J. Heald. 1972. Trophic analysis of an estuarine mangrove community. Bull. Mar. Sci. 22: 671-738.

Odum, W.E. and E.J. Heald. 1975. The detritus-based food web of an estuarine mangrove community. PP. 265-268 IN Estuarine Research. Academic Press, New York.

Odum, W.E., C.G. McIvor, and T.J. Smith, III. 1982. The mangroves of South Florida: A community profile. U.S. Fish and Wildlife Service, Office of Biological Services. Washington, D.C. FWS/OBS-8/24. 144 pp.

Ogden, F.C. 1978. Status and nesting biology of the American crocodile, Crocodylus acutus (Reptilia, Crocodilidae) in Florida. J. Herp. 12(2):183-196.

Onuf, C.P., J.M. Teal, and I. Valiela. 1977. Interactions of nutrients, plant growth and herbivory in a mangrove ecosystem. Ecology 58: 514-526.

Opresko, D. 1973. Abundance and distribution of shallow-water gorgonians in the area of Miami, Florida. Bull. Mar. Sci. 23(3): 535-558.

Opresko, L.K., R. Thomas, and F.M.Bayer. 1976. Guide to the larger marine gastropods of Florida, the Gulf of Mexico, and the Caribbean region. Univ. of Miami Sea Grant Program, NOAA Sea Grant No. 04-6-158-44005. Miami. 54pp.

Orpurt, P.A. and L.L. Boral. 1964. The flowers, fruits, and seeds of Thalassia testudinum Konig. Bull. Mar. Sci. Gulf Carib. 14: 296-302.

Paulson, D.R. 1968. Variation in some snakes from the Florida Keys. Quart. Jour. Florida Acad. Sci. 29(4); 294-308.

Phillips, R.C. 1960. Observations on the ecology and distribution of the Florida sea grasses. Prof. Pap. Ser. Fla. Board of Conservation (2): 1-72.

Rehm, A.E. 1974. A study of the marine algae epiphytic on the prop roots of Rhizophora mangle L. from Tampa to Key Largo, Florida. Dissertation. University of South Florida, Tampa. 183 pp.

Rehm, A.E. 1976. The effects of the wood-boring Isopod, Sphaeroma terebans, on the mangrove communities of Florida. Environ. Conserv. 3:47-57.

Robertson, W.B. 1978. Southern bald eagle. Pp. 27-30 IN H.W Kale, II, Ed. Rare and Endangered Biota of Florida, Vol. 2, Birds. University Presses of Florida, Gainesville.

Robertson, W.B., Jr. and J.A. Kushlan. 1974. The southern Florida avifauna. Miami Geol. Soc. Mem. 2: 414-452.

Sand-Jensen, K. 1977. Effect of epiphytes on eelgrass photosynthesis. Aquat. Bot. 3: 55-63.

Schmahl, G.P. and J.T. Tilmant. 1980. An initial characterization of macroinvertebrate populations associated with patch reefs of Biscayne National Monument. Fla. Sci. Vol. 43 suppl. I. (Abstr).

Scoffin, T.P. 1970. The trapping and binding of subtidal carbonate sediments by marine vegetation in Bimini Lagoon, Bahamas. J. Sediment Petrol. 40(1): 249-273.

Schreiber, R.W. 1978. Eastern brown pelican. Pp. 23-25 IN H.W. Kale, II, Ed. Rare and Endangered Biota of Florida, Vol. 2, Birds. University Presses of Florida, Gainesville.

Sherman, H.G. 1955. Description of a new race of woodrat from Key Largo, Florida. J. Mamm. 36:113-120.

Sheryen, A.H. (Editor). 1989. Florida Statistical Abstract. Bureau of Economic and Business Research. University of Florida. University Presses of Florida. Gainsville. 718 pp.

Sholander, P.F. 1968. How mangroves desalinate seawater. Physiol. Plant. 21:258-268.

Simberloff, D. 1976. Experimental zoogeography of islands: effects of island size. Ecology 57: 629-648.

Simberloff, D. and E.O. Wilson. 1969. Experimental zoogeography of islands: the colonization of empty islands. Ecology 50: 278-296.

Snyder, H. 1978. Peregrine falcon. Pp. 7-9 IN H.W. Kale, II, Ed. Rare and Endangered Biota of Florida, Vol. 2, Birds. University Presses of Florida, Gainesville.

South Florida Water Management District. 1988. Surface Water Management Plan, Interim Plan for Biscayne Bay, Florida. South Florida Water Management District for Florida Department of Environmental Regulation. 118 pp.

South Florida Water Management District. 1989. Surface Water Improvement and Management Plan (SWIM) for Biscayne Bay. 118 pp.

Spencer, M. 1967. Bahama Deep Test. Bul Amer. Assoc. Pet. Geol. 51:(2)263-268.

Sprunt, A., Jr. 1954. Florida Bird Life. Coward-McCann, Inc. New York. 527 pp.

Sprunt, A., Jr. 1986. Habits and habitat of the white-crowned pigeon. Personal communication.

Stevely, J.M., J.C. Thompson, and R.E. Warner. 1978. The biology and utilization of Florida's commercial sponges. Technical Paper No. 8. University System of Florida Sea Grant Program. Univ. of Florida, Gainesville. 45 pp.

Swakon, E.A. and J.D. Wang. 1977. Modeling of tide and wind induced flow in South Biscayne Bay and Card Sound. University of Miami Sea Grant Bulletin No. 37.

Tabb, D.C., D.L. Dubrow, and R.B. Manning. 1962. The ecology of northern Florida Bay and adjacent estuaries. Florida Board of Conservation. Tech. Serv. 39. 79 pp.

Taylor, W.R. 1960. Marine Algae of the Eastern Tropical and Subtropical Coasts of the Americas. University of Michigan Press, Ann Arbor. 879 pp.

Teas, H. 1977. Ecology and restoration of mangrove shorelines in Florida. Environ. Conserv. 4:51-57.

Teas, H. 1979. Silviculture with saline water. Pp. 117-161 IN A. Hollaender, Ed. The Biosaline Concept. Plunum Publ. Corp.

Tebeau, C.W. and R.L. Carson. 1965. Florida From Indian Trail to Space Age. Vol I. Southern Publ. Co. Delray Beach, Florida. 350 pp.

Thorhaug, A. and B. Austin. 1976. Restoration of seagrasses with economic analysis. Enviro. Conserve. 3: 259-267.

Thorhaug, A., R.D. Stearns, and S. Pepper. 1972. Effect of heat on Thalassis testudinum in Biscayne Bay. Pp. VIII-1 - VIII-35. IN R.G. Bader and M.A. Roessler, Eds. An ecological study of South Biscayne Bay and Card Sound, Florida. Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami.

Tomlinson, P.B. 1980. The Biology of Trees Native to Tropical Florida. Harvard University Printing Office, Allston, Mass. 480 pp.

United States Fish and Wildlife Service. 1984. Endangered and Threatened Wildlife and Plants. Department of the Interior. 24 pp.

van de Kreeke, J. and J.D. Wang. 1984. Hydrography of North Biscayne Bay. Part I: Results of field measurements. Miami: University of Miami Rosenstiel School of Marine and Atmospheric Science.

Voss, G.L. 1976. Seashore Life of Florida and the Caribbean. E.A. Seemann Publ. Co. Inc. Miami, Florida. 168 pp.

Voss, G.L. and N.A. Voss. 1955. An ecological survey of Soilder Key, Biscayne Bay, Florida. Bull. Mar. Sci. Gulf Caribb. 5(3): 203-229.

Voss, G.L. 1988. Coral Reefs of Florida. Pineapple Press, Sarasota, Florida. 168 pp.

Voss, G.L., L. Opresko, and R. Thomas. 1973. University of Miami Sea Grant Program (NOAA Sea Grant No. 04-3-158-27). Miami. 33 pp.

Waisel, Y. 1972. Biology of Halophytes. Academic Press, New York. 395 pp.

Walsh, G.E. 1967. An ecological study of a Hawaiian mangrove swamp. Pp. 420-431 IN G.H. Lauff, Ed. Estuaries. American Association for the Advancement of Science Publ. 83. Washington, D.C.

Wanless, H.R. 1969. Sediments of Biscayne Bay-Distribution and depositional history. Tech. Rep. 69-2. Institute of Marine Science, Miami, Florida. 260 pp.

Warzeski, E.R. 1976. Storm sedimentation in the Biscayne Bay region. Pp 33-38 IN Biscayne Bay Symposium I. Univ. of Miami Sea Grant Special Rep. No. 5.

Wheaton, J.L. 1989. The marine life fishery for "live-rock": biological and ecological assessment of the product and implications for harvest. Florida Marine Research Institute, St. Petersburg, Florida. Unpublished report. 18 pp.

White, B. (Editor). 1988. Monroe County, Florida Statistical Abstract. Monroe County Industrial Development Authority. Marathon, Florida. 205 pp.

Wiley, J.W. 1979. The white-crowned pigeon in Puerto Rico: status, distribution and movements. J. Wildl. Manage. 3(2): 402-413.

Williams, S.L. 1981. Caulerpa cupressoides: the relationship of the uptake of sediment ammonium and of algal decomposition for seagrass bed development. Ph. D. Dissertation. University of Maryland.

Windom, H.L. 1977. Trace elements in the continental shelf waters of the southeastern United States. Pp. 148-158 IN Proceedings of First American-Soviet Symposium on Chemical Pollution in the Marine Environment. U.S. Energy Resources and Development Administration. Odessa, USSR.

Windom, H.L. and R.G. Smith, Jr. 1984. Factors influencing the concentrations and distribution of trace metals in the South Atlantic Bight. J. Geophys. Res.

Windom, H.L., K. Beck, and R. Smith. 1971. Transport of trace metals to the Atlantic Ocean by southeastern rivers. Southeast Geolog. 12: 169-181.

Windom, H.L., G. Wallace, R. Smith, N. Dudeck, M. Maeda, R. Dulmage and F. Storti. 1983. Behavior of copper in the Southeastern United States estuaries. J. Marine Chem. 12: 183.

Wofenden, S.L. 1978. Snowy plover. Pp. 8-10 IN H.W. Kale, II, Ed. Rare and Endangered Biota of Florida, Vol. 2, Birds. University Presses of Florida, Gainesville.

Wood, E.J.F. 1965. Marine Microbial Ecology. Reinhold Publ. Corp. New York. 243 pp.

Young, F.A. 1989. Communication to P. McVety of Florida Department of Natural Resources regarding live-rock industry in south Florida.

Young, F.N. 1960. Color pattern variations amoung snails of the genus Liguus on the Florida Keys. Bull. Fla. St. Mus. 5:259-266.

Zieman, J.C. 1976. The ecological effects of physical damage from motorboats on turtle grass beds in southern Florida. Aquat. Bot. 2: 127-139.

Zieman, J.C. 1982. The ecology of the seagrasses of south Florida: a community profile. U.S. Fish and Wildlife Service, Office of Biological Servies, Washington, D.C. FWS/OBS-82/25. 158 pp.

Zieman, J.C. and R.G. Wetzel. 1980. Methods and rates of productivity in seagrasses. Pp. 87-116 IN R.C. Phillips and C.P. McRoy, Eds. Handbook of Seagrass Biology. Garland STMP Press, New York.

Zischke, J.A. 1977. Checklist of macroflora, invertebrates and fishes of Pigeon Key. Pp. 27-30 IN H.G. Multer, Ed. Field Guide to Some Carbonate Rock Environments. Kendall/Hunt Publ. Co. Dubuque, Iowa.

CHAPTER 18-20
FLORIDA AQUATIC PRESERVES

Library References: Riparian rights to navigable waters. I. Henry Dean, 55 Fla. Bar J. 247, 250 (Mar., 1981).

18-20.001 Intent.

(1) All sovereignty lands within a preserve shall be managed primarily for the maintenance of essentially natural conditions, the propagation of fish and wildlife, and public recreation, including hunting and fishing where deemed appropriate by the board, and the managing agency.

(2) The aquatic preserves which are described in 73-534, Laws of Florida, Sections 258.39, 258.391, 258.392 and 258.393, Florida Statutes, future aquatic preserves established pursuant to general or special acts of the legislature, and in Rule 18-20.002, Florida Administrative Code, were established for the purpose of being preserved in an essentially natural or existing condition so that their aesthetic, biological and scientific values may endure for the enjoyment of future generations.

(3) The preserves shall be administered and managed in accordance with the following goals:

(a) To preserve, protect, and enhance these exceptional areas of sovereignty submerged lands by reasonable regulation of human activity within the preserves through the development and implementation of a comprehensive management program;

(b) To protect and enhance the waters of the preserves so that the public may continue to enjoy the traditional recreational uses of those waters such as swimming, boating, and fishing;

(c) To coordinate with federal, state, and local agencies to aid in carrying out the intent of the Legislature in creating the preserves;

(d) To use applicable federal, state, and local management programs, which are compatible with the intent and provisions of the act and these rules, and to assist in managing the preserves;

(e) To encourage the protection, enhancement or restoration of the biological, aesthetic, or scientific values of the preserves, including but not limited to the modification of existing manmade conditions toward their natural condition, and discourage activities which would degrade the aesthetic, biological, or scientific values, or the quality, or utility of a preserve, when reviewing applications, or when developing and implementing management plans for the preserves;

(f) To preserve, promote, and utilize indigenous life forms and habitats, including but not limited to: sponges, soft coral, hard corals, submerged grasses, mangroves, salt water marshes, fresh water marshes, mud flats, estuarine, aquatic, and marine reptiles, game and non-game fish species, estuarine, aquatic and marine invertebrates, estuarine, aquatic and marine mammals, birds, shellfish and mollusks;

(g) To acquire additional title interests in lands wherever such acquisitions would serve to protect or enhance the biological, aesthetic, or scientific values of the preserves;

(h) To maintain those beneficial hydrologic and biologic functions, the benefits of which accrue to the public at large.

(4) Nothing in these rules shall serve to eliminate or alter the requirements or authority of other governmental agencies, including counties and municipalities, to protect or enhance the preserves provided that such requirements or authority are not inconsistent with the act and this chapter.

Specific Authority 120.53, 258.43(1) FS. Law Implemented 258.35, 258.36, 258.37, 258.39, 258.393 FS. Chapter 80-280 Laws of Florida. History—New 2-23-81. Amended 8-7-85, Formerly 16Q-20.01, Transferred from 16Q-20.001.

18-20.002 Boundaries and Scope of the Preserves.

(1) These rules shall only apply to those sovereignty lands within a preserve, title to which is vested in the board, and those other lands for which the board has an appropriate instrument in writing, executed by the owner, authorizing the inclusion of specific lands in an aquatic preserve pursuant to Section 2(2) of Chapter 73-534, Laws of Florida, Sections 258.40(1) and 258.41(5), Florida Statutes, future aquatic preserves established through general or special acts of the legislature, and pursuant to Rule 18-20.008, Florida Administrative Code. Any publicly owned and maintained navigation channel authorized by the United States Congress, or other public works project authorized by the United States Congress, designed to improve or maintain commerce and navigation shall be deemed to be excluded from the

provisions of this chapter, pursuant to Subsection 258.40(2), Florida Statutes. Furthermore, all lands lost by avulsion or by artificially induced erosion shall be deemed excluded from the provisions of this chapter pursuant to Subsection 258.40(3), Florida Statutes.

(2) These rules do not apply to Boca Ciega Bay, Pinellas County or Biscayne Bay Aquatic Preserves.

(3) These rules are promulgated to clarify the responsibilities of the board in carrying out its land management functions as those functions apply within the preserves. Implementation and responsibility for environmental permitting of activities and water quality protection within the preserves are vested in the Department of Environmental Regulation. Since these rules are considered cumulative with other rules, a person planning an activity within the preserves should also consult the other applicable department rules (Chapter 18-21, Florida Administrative Code, for example) as well as the rules of the Department of Environmental Regulation.

(4) These rules shall not affect previous actions of the board concerning the issuance of any easement or lease; or any disclaimer concerning sovereignty lands.

(5) The intent and specific provisions expressed in 18-20.001(e) and (f) apply generally to all existing or future aquatic preserves within the scope of this chapter. Upon completion of a resource inventory and approval of a management plan for a preserve, pursuant to 18-20.013, the type designation and the resource sought to be preserved may be readdressed by the Board.

(6) For the purpose of clarification and interpretation, the legal description set forth as follows do not include any land which is expressly recognized as privately owned upland in a pre-existing recorded mean high water line settlement agreement between the board and a private owner or owners. Provided, however, in those instances wherein a settlement agreement was executed subsequent to the passage of the Florida Coastal Mapping Act, the determination of the mean high water line shall be in accordance with the provisions of such act.

(7) Persons interested in obtaining details of particular preserves should contact the Bureau of State Lands Management, Department of Natural Resources, 3900 Commonwealth Blvd., Tallahassee, FL 32303 (telephone 904-488-2297).

(a) The preserves are described as follows:

1. Fort Clinch State Park Aquatic Preserve, as described in the Official Records of Nassau County in Book 108, pages 343-346, and in Book 111, page 409.

2. Nassau River — St. Johns River Marshes Aquatic Preserve, as described in the Official Records of Duval County in Volume 3183, pages 547-552, and in the Official Records of Nassau County in Book 108, pages 232-237.

3. Pellicer Creek Aquatic Preserve, as described in the Official Records of St. Johns County in Book 181, pages 363-366, and in the Official Records of Flagler County in Book 33, pages 131-134.

4. Tomoka Marsh Aquatic Preserve, as described in the Official Records of Flagler County in Book 33, pages 135-138, and in the Official Records of Volusia County in Book 1244, pages 615-618.

5. Wekiva River Aquatic Preserve, as described in Section 258.39(30), F.S.

6. Mosquito Lagoon Aquatic Preserve, as described in the Official Records of Volusia County in Book 1244, pages 619-623, and in the Official Records of Brevard County in Book 1143, pages 190-194.

7. Banana River Aquatic Preserve, as described in the Official Records of Brevard County in Book 1143, pages 195-198, less those lands dedicated to the U. S. A. prior to the enactment of the act, until such time as the U. S. A. no longer wishes to maintain such lands for the purpose for which they were dedicated, at which time such lands would revert to the board, and be managed as part of the preserve.

8. Indian River — Malabar to Sebastian Aquatic Preserve, as described in the Official Records of Brevard County in Book 1143, pages 199-202, and in the Official Records of Indian River County in Book 368, pages 5-8.

9. Indian River — Vero Beach to Fort Pierce Aquatic Preserve, as described in the Official Records of Indian River County in Book 368, pages 9-12, and in the Official Records of St. Lucie County in Book 187, pages 1083-1086.

10. Jensen Beach to Jupiter Inlet Aquatic Preserve, as described in the Official Records of St. Lucie County in Book 218, pages 2865-2869.

11. North Fork, St. Lucie Aquatic Preserve, as described in the Official Records of Martin County in Book 337, pages 2159-2162, and in the Official Records of St. Lucie County in Book 201, pages 1676-1679.

12. Loxahatchee River — Lake Worth Creek Aquatic Preserve, as described in the Official Records of Martin County in Book 320, pages 193-196, and in the Official Records of Palm Beach County in Volume 1860, pages 806-809.

13. Biscayne Bay — Cape Florida to Monroe County Line Aquatic Preserve, as described in the Official Records of Dade County in Book 7055, pages 852-856, less, however, those lands and waters as described in Section 258.165, F. S., (Biscayne Bay Aquatic Preserve Act of 1974), and those lands and waters within the Biscayne National Park.

14. Lignumvitae Key Aquatic Preserve, as described in the Official Records of Monroe County in Book 502, pages 139-142.

15. Coupon Bight Aquatic Preserve, as described in the Official Records of Monroe County in Book 502, pages 143-146.

16. Cape Romano — Ten Thousand Islands Aquatic Preserve, as described in the Official Records of Collier County in Book 381, pages 298-301.

17. Rookery Bay Aquatic Preserve, as described in Section 258.39(31), FS.

18. Estero Bay Aquatic Preserve as described in Section 258.39(28), Florida Statutes.

19. Pine Island Sound Aquatic Preserve, as described in the Official Records of Lee County in Book 648, pages 732-736.

20. Matlacha Pass Aquatic Preserve, as described in the Official Records of Lee County in Book 800, pages 725-728.

21. Gasparilla Sound — Charlotte Harbor Aquatic Preserve, as described in Section 258.392, F.S.

22. Cape Haze Aquatic Preserve, as described in Section 258.39(29), F.S.

23. Cockroach Bay Aquatic Preserve, as described in Section 258.391, F.S.

24. St. Martins Marsh Aquatic Preserve, as described in the Official Records of Citrus County in Book 276, pages 238-241.

25. Alligator Harbor Aquatic Preserve, as described in the Official Records of Franklin County in Volume 98, pages 82-85.

26. Apalachicola Bay Aquatic Preserve, as described in the Official Records of Gulf County in Book 46, pages 77-81, and in the Official Records of Franklin County in Volume 98, pages 102-106.

27. St. Joseph Bay Aquatic Preserve, as described in the Official Records of Gulf County in Book 46, pages 73-76.

28. St. Andrews State Park Aquatic Preserve, as described in the Official Records of Bay County in Book 379, pages 547-550.

29. Rocky Bayou State Park Aquatic Preserve, as described in the Official Records of Okaloosa County in Book 593, pages 742-745.

30. Yellow River Marsh Aquatic Preserve, as described in the Official Records of Santa Rosa County in Book 206, pages 568-571.

31. Fort Pickens State Park Aquatic Preserve, as described in the Official Records of Santa Rosa County in Book 220, pages 60-63, in the Official Records of Escambia County in Book 518, pages 659-662, less the lands dedicated to the U. S. A. for the establishment of the Gulf Islands National Seashore prior to the enactment of the act, until such time as the U. S. A. no longer wishes to maintain such lands for the purpose for which they were dedicated, at which time such lands would revert to the board and be managed as part of the preserve.

32. For the purpose of this section the boundaries of the Lake Jackson Aquatic Preserve, shall be the body of water in Leon County known as Lake Jackson in Sections 1, 2, 3, 5, 10, 11 and 14, Township 1 North, Range 1 West and Sections 11, 12, 13, 14, 15, 21, 22, 23, 26, 27, 28, 29, 32, 33, 34, and 35, Township 2 North, Range 1 West lying below the ordinary high water line. Such lands shall include the submerged bottom lands and the water column upon such lands, as well as all publicly owned islands, within the boundaries of the preserve. Any privately held upland within the boundaries of the preserve shall be deemed to be excluded therefrom; provided that the Board may negotiate an arrangement with any such private upland owner by which such land may be included in the preserve.

33. Terra Ceia Aquatic Preserve, as described in Section 258.393, Florida Statutes.

34. Future aquatic preserves established pursuant to general or special acts of the legislature.

Specific Authority 120.53, 258.43(1), FS. Law Implemented 258.39, 258.391, 258.392, 258.393, 258.40, 258.41, 258.42, 258.43, 258.44, 258.45 FS. History—New 2-23-81, Amended 8-7-85, Formerly 16Q-20.02, Transferred from 16Q-20.002.

18-20.003 Definitions. When used in these rules, the following words shall have the indicated meaning unless the context clearly indicates otherwise:

(1) "Act" means the provisions of Section 258.35 through 258.46, F.S., the Florida Aquatic Preserve Act.

(2) "Activity" means any project and such other human action within the preserve requiring board approval for the use, sale, lease or transfer of interest in sovereignty lands or materials, or which may require a license from the Department of Environmental Regulation.

(3) "Aesthetic values" means scenic characteristics or amenities of the preserve in its essentially natural state or condition, and the maintenance thereof.

(4) "Applicant" means any person making application for a permit, license, conveyance of an interest in state owned lands or any other necessary form of governmental approval in order to perform an activity within the preserve.

(5) "Beneficial biological functions" means interactions between flora, fauna and physical or chemical attributes of the environment, which provide benefits that accrue to the public at large, including, but not limited to: nutrient, pesticide and heavy metal uptake; sediment retention; nutrient conversion to biomass; nutrient recycling and oxygenation.

(6) "Beneficial hydrological functions" means interactions between flora, fauna and physical geological or geographical attributes of the environment, which provide benefits that accrue to the public at large, including, but not limited to: retardation of storm water flow; storm water retention; and water storage, and periodical release;

(7) "Biological values" means the preservation and promotion of indigenous life forms and habitats including, but not limited to: sponges, soft corals, hard corals, submerged grasses, mangroves, saltwater marshes, fresh water marshes, mud flats, marine, estuarine, and aquatic reptiles, games and non-games fish species, marine, estuarine, and aquatic mammals, marine, estuarine, and aquatic invertebrates, birds and shellfish.

(8) "Board" means the Governor and Cabinet sitting as the Board of Trustees of the Internal Improvement Trust Fund.

(9) "Channel" means a trench, the bottom of which is normally covered entirely by water, with the upper edges of its sides normally below water.

(10) "Commercial, industrial and other revenue generating/income related docks" means docking facilities for an activity which produces income, through rental or any other means, or which serves as an accessory facility to other rental, commercial or industrial operations. It shall include, but not be limited to docking for: marinas, restaurants, hotels, motels, commercial fishing, shipping, boat or ship construction, repair, and sales.

(11) "Department" means the State of Florida Department of Natural Resources, as administrator for the board.

(12) "Division" means the Division of State Lands, which performs all staff duties and functions related to the administration of lands title to which is, or will be, vested in the board, pursuant to section 253.002, F.S.

(13) "Dock" means a fixed or floating structure, including moorings, used for the purpose of berthing buoyant vessels either temporarily or indefinitely.

(14) "Essentially natural condition" means those functions which support the continued existence or encourage the restoration of the diverse population of indigenous life forms and habitats to the extent they existed prior to the significant development adjacent to and within the preserve.

(15) "Extreme hardship" means a significant burden, unique to the applicant and not shared by property owners in the area. Self-imposed circumstances caused to any degree by actions of any person subsequent to the enactment of the Act shall not be construed as an extreme hardship. Extreme hardship under this act shall not be construed to include any hardship which arises in whole or in part from the effect of other federal, state or local laws, ordinances, rules or regulations. The term may be inherent in public projects which are shown to be a public necessity.

(16) "Fill" means materials from any source, deposited by any means onto sovereignty lands, either for the purpose of creating new uplands or for any other purpose, including spoiling of dredged materials. For the purpose of this rule, the placement of pilings or riprap shall not be considered to be filling.

(17) "Lease" means a conveyance of interest in lands, title to which is vested in the board, granted in accordance with specific terms set forth in writing.

(18) "Marina" means a small craft harbor complex used primarily for recreation.

(19) "Oil and gas transportation facilities" means those structures necessary for the movement of oil and gas from the production site to the consumer.

(20) "Person" means individuals, minors, partnerships, corporations, joint ventures, estates, trusts, syndicates, fiduciaries, firms, and all other associations and combinations, whether public or private, including governmental entities.

(21) "Pier" means a structure in, on, or over sovereignty lands, which is used by the public primarily for fishing, swimming, or viewing the preserve. A pier shall not include a dock.

(22) "Preserve" means any and all of those areas which are exceptional areas of sovereignty lands and the associated water body so designated in Section 258.39, 258.391, and 258.392, F.S., including all sovereignty lands, title to which is vested in the board, and such other lands as the board may acquire or approve for inclusion, and the water column over such lands, which have been set aside to be maintained in an essentially natural or existing condition of indigenous flora and fauna and their supporting habitat and the natural scenic qualities and amenities thereof.

(23) "Private residential single dock" means a dock which is used for private, recreational or leisure purposes for a single family residence, cottage or other such single dwelling unit and which is designed to moor no more than two boats.

(24) "Private residential multi-slip dock" means a docking facility which is used for private recreational or leisure purposes for multi-unit residential dwellings which shall include but is not limited to condominiums, townhouses, subdivisions and other such dwellings or residential areas and which is designed to moor three or more boats. Yacht clubs associated with residential developments, whose memberships or utilization of the docking facility requires some real property interest in the residential area, shall also be included.

(25) "Public interest" means demonstrable environmental, social, and economic benefits which would accrue to the public at large as a result of a proposed action, and which would clearly exceed all demonstrable environmental, social, and economic costs of the proposed action. In determining the public interest in a request for use, sale, lease, or transfer of interest in sovereignty lands or severance of materials from sovereignty lands, the board shall consider the ultimate project and purpose to be served by said use, sale, lease, or transfer of lands or materials.

(26) "Public navigation project" means a project primarily for the purpose of navigation which is authorized and funded by the United States Congress or by port authorities as defined by Section 315.02(2), F.S.

(27) "Public necessity" means the works or improvements required for the protection of the health and safety of the public, consistent with the Act and these rules, for which no other reasonable alternative exists.

(28) "Public utilities" means those services, provided by persons regulated by the Public Service Commission, or which are provided by rural cooperatives, municipalities, or other governmental agencies, including electricity, telephone, public water and wastewater services, and structures necessary for the provision of these services.

(29) "Quality of the preserve" means the degree of the biological, aesthetic and scientific values of the preserve necessary for present and future enjoyment of it in an essentially natural condition.

(30) "Resource management agreement" means a contractual agreement between the board and one

or more parties which does not create an interest in real property but merely authorizes conduct of certain management activities on lands held by the board.

(31) "Resource Protection Area (RPA) 1" — Areas within the aquatic preserves which have resources of the highest quality and condition for that area. These resources may include, but are not limited to corals; marine grassbeds; mangrove swamps; salt-water marsh; oyster bars; archaeological and historical sites; endangered or threatened species habitat; and, colonial water bird nesting sites.

(32) "Resource Protection Area 2" — Areas within the aquatic preserves which are in transition with either declining resource protection area 1 resources or new pioneering resources within resource protection area 3.

(33) "Resource Protection Area 3" — Areas within the aquatic preserve that are characterized by the absence of any significant natural resource attributes.

(34) "Riparian rights" means those rights incident to lands bordering upon navigable waters, as recognized by the courts of this state and common law.

(35) "Sale" means a conveyance of interest in lands, by the board, for consideration.

(36) "Scientific values" means the preservation and promotion of certain qualities or features which have scientific significance.

(37) "Shore protection structure" means a type of coastal construction designed to minimize the rate of erosion. Coastal construction includes any work or activity which is likely to have a material physical effect on existing coastal conditions or natural shore processes.

(38) "Sovereignty lands" means those lands including, but not limited to: tidal lands, islands, sandbars, shallow banks, and lands waterward of the ordinary or mean highwater line, to which the State of Florida acquired title on March 3, 1845, by virtue of statehood, and of which it has not since divested its title interest. For the purposes of this rule sovereignty lands shall include all submerged lands within the boundaries of the preserve, title to which is held by the board.

(39) "Spoil" means materials dredged from sovereignty lands which are redeposited or discarded by any means, onto either sovereignty lands or uplands.

(40) "Transfer" means the act of the board by which any interest in lands, including easements, other than sale or lease, is conveyed.

(41) "Utility of the preserve" means fitness of the preserve for the present and future enjoyment of its biological, aesthetic and scientific values, in an essentially natural condition.

(42) "Water dependent activity" means an activity which can only be conducted on, in, over, or adjacent to, water areas because the activity requires direct access to the water body or sovereignty lands for transportation, recreation, energy production or transmission, or source of water and where the use of the water or sovereignty lands is an integral part of the activity.

Specific Authority 258.43(1) FS. Law Implemented 258.37, 258.43(1) FS. History—New 2-25-81, Amended 8-7-85, Formerly 16Q-20.03, Transferred from 16Q-20.003.

18-20.004 Management Policies, Standards and Criteria. The following management policies, standards and criteria are supplemental to Chapter 18-21, Florida Administrative Code (Sovereignty Submerged Lands Management) and shall be utilized in determining whether to approve, approve with conditions or modifications or deny all requests for activities on sovereignty lands in aquatic preserves.

(1) GENERAL PROPRIETARY

(a) In determining whether to approve or deny any request the Board will evaluate each on a case-by-case basis and weigh any factors relevant under Chapter 253 and/or 258, Florida Statutes. The Board, acting as Trustees for all state-owned lands, reserves the right to approve, modify or reject any proposal.

(b) There shall be no further sale, lease or transfer of sovereignty lands except when such sale, lease or transfer is in the public interest (see Section 18-20.004(2) Public Interest Assessment Criteria).

(c) There shall be no construction of seawalls waterward of the mean or ordinary high water line, or filling waterward of the mean or ordinary high water line except in the case of public road and bridge projects where no reasonable alternative exists.

(d) There shall, in no case, be any dredging waterward of the mean or ordinary high water line for the sole or primary purpose of providing fill for any area landward of the mean or ordinary high water line.

(e) A lease, easement or consent of use may be authorized only for the following activities:

1. a public navigation project;

2. maintenance of an existing navigational channel;

3. installation or maintenance of approved navigational aids;

4. creation or maintenance of a commercial/industrial dock, pier or a marina;

5. creation or maintenance of private docks for reasonable ingress and egress of riparian owners;

6. minimum dredging for navigation channels attendant to docking facilities;

7. creation or maintenance of a shore protection structure;

8. installation or maintenance of oil and gas transportation facilities;

9. creation, maintenance, replacement or expansion of facilities required for the provision of public utilities; and

10. other activities which are a public necessity or which are necessary to enhance the quality or utility of the preserve and which are consistent with the act and this chapter.

(f) For activities listed in paragraphs 18-20.004(1)(e)1.—10. above, the activity shall be

designed so that the structure or structures to be built in, on or over sovereignty lands are limited to structures necessary to conduct water dependent activities.

(g) For activities listed in paragraphs 18-20.004(1)(c)7., 8., 9. and 10. above, it must be demonstrated that no other reasonable alternative exists which would allow the proposed activity to be constructed or undertaken outside the preserve.

(h) The use of state-owned lands for the purpose of providing private or public road access to islands where such access did not previously exist shall be prohibited. The use of state-owned lands for the purpose of providing private or public water supply to islands where such water supply did not previously exist shall be prohibited.

(i) Except for public navigation projects and maintenance dredging for existing channels and basins, any areas dredged to improve or create navigational access shall be incorporated into the preempted area of any required lease or be subject to the payment of a negotiated private easement fee.

(j) Private residential multi-slip docking facilities shall require a lease.

(k) Aquaculture and beach renourishment activities which comply with the standards of this rule chapter and Chapter 18-21, Florida Administrative Code, may be approved by the board, but only subsequent to a formal finding of compatibility with the purposes of Chapter 258, Florida Statutes, and this rule chapter.

(l) Other uses of the preserve, or human activity within the preserve, although not originally contemplated, may be approved by the board, but only subsequent to a formal finding of compatibility with the purposes of Chapter 258, Florida Statutes, and this rule chapter.

(2) PUBLIC INTEREST ASSESSMENT CRITERIA

In evaluating requests for the sale, lease or transfer of interest, a balancing test will be utilized to determine whether the social, economic and/or environmental benefits clearly exceed the costs.

(a) GENERAL BENEFIT/COST CRITERIA:

1. any benefits that are balanced against the costs of a particular project shall be related to the affected aquatic preserve;

2. in evaluating the benefits and costs of each request, specific consideration and weight shall be given to the quality and nature of the specific aquatic preserve. Projects in the less developed, more pristine aquatic preserves such as Apalachicola Bay shall be subject to a higher standard than the more developed urban aquatic preserves such as Boca Ciega Bay; and,

3. for projects in aquatic preserves with adopted management plans, consistency with the management plan will be weighed heavily when determining whether the project is in the public interest.

(b) BENEFIT CATEGORIES:

1. public access (public boat ramps, boatslips, etc.);

2. provide boating and marina services (repair, pumpout, etc.);

3 improve and enhance public health, safety, welfare, and law enforcement;

4. improved public land management;

5. improve and enhance public navigation;

6. improve and enhance water quality;

7. enhancement/restoration of natural habitat and functions; and

8. improve/protect endangered/threatened/unique species.

(c) COSTS:

1. reduced/degraded water quality;

2. reduced/degraded natural habitat and function;

3. destruction, harm or harassment of endangered or threatened species and habitat;

4. preemption of public use;

5. increasing navigational hazards and congestion;

6. reduced/degraded aesthetics; and

7. adverse cumulative impacts.

(d) EXAMPLES OF SPECIFIC BENEFITS:

1. donation of land, conservation easements, restrictive covenants or other title interests in or contiguous to the aquatic preserve which will protect or enhance the aquatic preserve;

2. providing access or facilities for public land management activities;

3. providing public access easements and/or facilities, such as beach access, boat ramps, etc.;

4. restoration/enhancement of altered habitat or natural functions, such as conversion of vertical bulkheads to riprap and/or vegetation for shoreline stabilization or re-establishment of shoreline or submerged vegetation;

5. improving fishery habitat through the establishment of artificial reefs or other such projects, where appropriate;

6. providing sewage pumpout facilities where normally not required, in particular, facilities open to the general public;

7. improvements to water quality such as removal of toxic sediments, increased flushing and circulation, etc.;

8. providing upland dry storage as an alternative to wetslip; and

9. marking navigation channels to avoid disruption of shallow water habitats.

(3) RESOURCE MANAGEMENT

(a) All proposed activities in aquatic preserves having management plans adopted by the Board must demonstrate that such activities are consistent with the management plan.

(b) No drilling of oil, gas or other such wells shall be allowed.

(c) Utility cables, pipes and other such structures shall be constructed and located in a manner that will cause minimal disturbance to submerged land resources such as oyster bars and submerged grass beds and do not interfere with traditional public uses.

(d) Spoil disposal within the preserves shall be strongly discouraged and may be approved only

structures shall be constructed and located in a manner that will cause minimal disturbance to submerged land resources such as oyster bars and submerged grass beds and do not interfere with traditional public uses.

(d) Spoil disposal within the preserves shall be strongly discouraged and may be approved only where the applicant has demonstrated that there is no other reasonable alternative and that activity may be beneficial to, or at a minimum, not harmful to the quality and utility of the preserve.

(4) RIPARIAN RIGHTS

(a) None of the provisions of this rule shall be implemented in a manner that would unreasonably infringe upon the traditional, common law and statutory riparian rights of upland riparian property owners adjacent to sovereignty lands.

(b) The evaluation and determination of the reasonable riparian rights of ingress and egress for private, residential multi-slip docks shall be based upon the number of linear feet of riparian shoreline.

(c) For the purposes of this rule, a private, residential, single docking facility which meets all the requirements of Rule 18-20.004(5) shall be deemed to meet the public interest requirements of Rule 18-20.004(1)(b), Florida Administrative Code. However, the applicants for such docking facilities must apply for such consent and must meet all of the requirements and standards of this rule chapter.

(5) STANDARDS AND CRITERIA FOR DOCKING FACILITIES

(a) All docking facilities, whether for a single or multi-slip residential or commercial, shall be subject to the following standards and criteria:

1. no dock shall extend waterward of the mean or ordinary high water line more than 500 feet or 20 percent of the width of the waterbody at that particular location whichever is less;

2. certain docks may fall within areas of special or unique importance. These areas may be of significant biological, scientific, historic and/or aesthetic value and require special management considerations. Modifications may be more restrictive than the normally accepted criteria. Such modifications shall be determined on a case-by-case analysis, and may include, but shall not be limited to changes in location, configuration, length, width and height;

3. the number, lengths, drafts and types of vessels allowed to utilize the proposed facility may also be stipulated; and

4. where local governments have more stringent standards and criteria for docking facilities, the more stringent standards for the protection and enhancement of the aquatic preserve shall prevail.

(b) Private residential single docks shall conform to the following specific design standards and criteria:

1. any main access dock shall be limited to a maximum width of four (4) feet;

2. the dock decking design and construction will insure maximum light penetration, with full consideration of safety and practicality;

3. the dock will extend out from the shoreline no further than to a maximum depth of minus four (− 4) feet (mean low water);

4. when the water depth is minus four (− 4) feet (mean low water) at an existing bulkhead the maximum dock length from the bulkhead shall be 25 feet, subject to modifications accommodating shoreline vegetation overhang;

5. wave break devices, when necessary, shall be designed to allow for maximum water circulation and shall be built in such a manner as to be part of the dock structure;

6. terminal platform size shall be no more than 160 square feet; and

7. dredging to obtain navigable water depths in conjunction with private residential, single dock applications is strongly discouraged.

(c) Private residential multi-slip docks shall conform to the following specific design standards and criteria:

1. the area of sovereignty, submerged land preempted by the docking facility shall not exceed the square footage amounting to ten times the riparian waterfront footage of the affected waterbody of the applicant, or the square footage attendant to providing a single dock in accordance with the criteria for private residential single docks, whichever is greater. A conservation easement or other such use restriction acceptable to the Board must be placed on the riparian shoreline, used for the calculation of the 10:1 threshold, to conserve and protect shoreline resources and subordinate/waive any further riparian rights of ingress and egress for additional docking facilities;

2. docking facilities and access channels shall be prohibited in Resource Protection Area 1 or 2, except as allowed pursuant to Section 258.42(3)(e)1., Florida Statutes, while dredging in Resource Protection Area 3 shall be strongly discouraged;

3. docking facilities shall only be approved in locations having adequate existing water depths in the boat mooring, turning basin, access channels, and other such areas which will accommodate the proposed boat use in order to insure that a minimum of one foot clearance is provided between the deepest draft of a vessel and the bottom at mean low water;

4. main access docks and connecting or cross walks shall not exceed six (6) feet in width;

5. terminal platforms shall not exceed eight (8) feet in width;

6. finger piers shall not exceed three (3) feet in width, and 25 feet in length;

7. pilings may be utilized as required to provide adequate mooring capabilities; and

8. the following provisions of Rule 18-20.004(5)(d) shall also apply to private residential multi-slip docks.

(d) Commercial, industrial and other revenue generating/income related docking facilities shall conform to the following specific design standards and criteria:

1. docking facilities shall only be located in or near areas with good circulation, flushing and adequate water depths;

2. docking facilities and access channels shall be prohibited in Resource Protection Area 1 or 2, except as allowed pursuant to Sections 258.42(3)(c)1., Florida Statutes; while dredging in Resource Protection Area 3 shall be strongly discouraged;

3. the docking facilities shall not be located in Resource Protection Area 1 or 2; however, main access docks may be allowed to pass through Resource Protection Area 1 or 2, that are located along the shoreline, to reach an acceptable Resource Protection Area 3, provided that such crossing will generate minimal environmental impact;

4. beginning July 1, 1986 new docking facilities may obtain a lease only where the local governments have an adopted marina plan and/or policies dealing with the siting of commercial/industrial and private, residential, multi-slip docking facilities in their local government comprehensive plan;

5. the siting of the docking facilities shall also take into account the access of the boat traffic to avoid marine grassbeds or other aquatic resources in the surrounding areas;

6. the siting of new facilities within the preserve shall be secondary to the expansions of existing facilities within the preserve when such expansion is consistent with the other standards;

7. the location of new facilities and expansion of existing facilities shall consider the use of upland dry storage as an alternative to multiple wet-slip docking;

8. marina siting will be coordinated with local governments to insure consistency with all local plans and ordinances;

9. marinas shall not be sited within state designated manatee sanctuaries; and

10. in any areas with known manatee concentrations, manatee warning/notice and/or speed limit signs shall be erected at the marina and/or ingress and egress channels, according to Florida Marine Patrol specifications.

(c) Exceptions to the standards and criteria listed in Rule 18-20.004(5), Florida Administrative Code, may be considered, but only upon demonstration by the applicant that such exceptions are necessary to insure reasonable riparian ingress and egress.

(6) MANAGEMENT AGREEMENTS

The board may enter into management agreements with local agencies for the administration and enforcement of standards and criteria for private residential single docks.

(7) In addition to the policies, standards and criteria delineated in subsections (1) through (6), the provisions of the following management plans apply to specific aquatic preserves and are incorporated herein by reference. Where regulatory criteria in 18-20, F. A. C., may differ with specific policies in the management plans listed herein, the general rule criteria shall prevail.

	Date Adopted
Alligator Harbor	September 23, 1986
Banana River	September 17, 1985
Cockroach Bay	April 21, 1987
Estero Bay	September 6, 1983
Charlotte Harbor (Cape Haze, Gasparilla Sound-Charlotte Harbor, Matlacha Pass and Pine Island Sound)	May 18, 1983
Indian River-Malabar to Vero Beach	January 21, 1986
Indian River Lagoon (Vero Beach to Fort Pierce and Jensen Beach to Jupiter Inlet)	January 22, 1985
Loxahatchee River-Lake Worth Creek	June 12, 1984
Nassau River-St. Johns River Marshes and Fort Clinch State Park	April 22, 1986
North Fork of the St. Lucie River	May 22, 1984
St. Joseph Bay	June 2, 1987
St. Martins Marsh	September 9, 1987
Terra Ceia	April 21, 1987
Wekiva River	August 25, 1987

Specific Authority 258.43(1) FS. Law Implemented 258.41, 258.42, 258.43(1), 258.44 FS. History—New 2-25-81, Amended 6-7-85, Formerly 16Q-20.004, Transferred from 16Q-20.004, Amended 9-4-88.

18-20.005 Uses, Sales, Leases, or Transfer of Interests in Lands, or Materials, Held by the Board.

Specific Authority 258.43(1) FS. Law Implemented 253.02, 253.12, 258.42 FS. History—New 2-25-81, Repealed 6-7-85, Formerly 16Q-20.05, Transferred from 16Q-20.005.

18-20.006 Cumulative Impacts. In evaluating applications for activities within the preserves or which may impact the preserves, the department recognizes that, while a particular alteration of the preserve may constitute a minor change, the cumulative effect of numerous such changes often results in major impairments to the resources of the preserve. Therefore, the department shall evaluate a particular site for which the activity is proposed with the recognition that the activity may, in conjunction with other activities adversely affect the preserve which is part of a complete and interrelated system. The impact of a proposed activity shall be considered in light of its cumulative impact on the preserve's natural system. The department shall include as a part of its evaluation of an activity:

(1) The number and extent of similar human actions within the preserve which have previously affected or are likely to affect the preserve, whether considered by the department under its current authority or which existed prior to or since the enactment of the Act; and

(2) The similar activities within the preserve

which are currently under consideration by the department; and

(3) Direct and indirect effects upon the preserve and adjacent preserves, if applicable, which may reasonably be expected to result from the activity; and

(4) The extent to which the activity is consistent with management plans for the preserve, when developed; and

(5) The extent to which the activity is permissible within the preserve in accordance with comprehensive plans adopted by affected local governments, pursuant to section 163.3161, F.S., and other applicable plans adopted by local, state, and federal governmental agencies;

(6) The extent to which the loss of beneficial hydrologic and biologic functions would adversely impact the quality or utility of the preserve; and

(7) The extent to which mitigation measures may compensate for adverse impacts.

Specific Authority 258.43(1) FS. Law Implemented 258.36, 258.43, 258.44 FS. History—New 2-25-81. Formerly 16Q-20.006, Transferred from 16Q-20.006.

18-20.007 Protection of Riparian Rights.

Specific Authority 258.43(1) FS. Law Implemented 258.123, 258.124(8), 258.44 FS. History—New 2-25-81, Repealed 6-7-85, Formerly 16Q-20.07, Transferred from 16Q-20.007.

18-20.008 Inclusion of Lands, Title to Which Is Not Vested in the Board, in a Preserve.

(1) Lands and water bottoms which are within designated aquatic preserve boundaries, or adjacent thereto and which are owned by other governmental agencies, may be included in an aquatic preserve upon specific authorization for inclusion by an appropriate instrument in writing executed by the agency.

(2) Lands and water bottoms which are within designated aquatic preserve boundaries or adjacent thereto, and which are in private ownership, may be included in an aquatic preserve upon specific authorization for inclusion by an appropriate instrument in writing executed by the owner.

(3) The appropriate instrument shall be either a dedication in perpetuity, or a lease. Such lease shall contain the following conditions:

(a) The term of the lease shall be for a minimum period of ten years.

(b) The board shall have the power and duty to enforce the provisions of each lease agreement, and shall additionally have the power to terminate any lease if the termination is in the best interest of the aquatic preserve system, and shall have the power to include such lands in any agreement for management of such lands.

(c) The board shall pay no more than $1 per year for any such lease.

Specific Authority 258.43(1) FS. Law Implemented 258.40, 258.41 FS. History—New 2-25-81, Formerly 16Q-20.008, Transferred from 16Q-20.008.

18-20.009 Establishment or Expansion of Aquatic Preserves.

(1) The board may expand existing preserves or establish additional areas to be included in the aquatic preserve system, subject to confirmation by the legislature.

(2) The board may, after public notice and public hearing in the county or counties in which the proposed expanded or new preserve is to be located, adopt a resolution formally setting aside such areas to be included in the system.

(3) The resolution setting aside an aquatic preserve area shall include:

(a) A legal description of the area to be included. A map depicting the legal description shall also be attached.

(b) The designation of the type of aquatic preserve.

(c) A general statement of what is sought to be preserved.

(d) A statement that the area established as a preserve shall be subject to the management criteria and directives of this chapter.

(e) A directive to develop a natural resource inventory and a management plan for the area being established as an aquatic preserve.

(4) Within 30 days of the designation and establishment of an aquatic preserve, the board shall record in the public records of the county or counties in which the preserve is located a legal description of the preserve.

Specific Authority 258.43(1) FS. Law Implemented 258.41 FS. History—New 2-25-81, Formerly 16Q-20.09, Transferred from 16Q-20.009.

18-20.010 Exchange of Lands. The board in its discretion may exchange lands for the benefit of the preserve, provided that:

(1) In no case shall an exchange result in any land or water area being withdrawn from the preserve; and

(2) Exchanges shall be in the public interest and shall maintain or enhance the quality or utility of the preserve.

Specific Authority 258.43(1) FS. Law Implemented 258.41(5), 258.42(1) FS. History—New 2-25-81, Formerly 16A-20.10, Transferred from 16Q-20.010.

18-20.011 Gifts of Lands. The board in its discretion may accept any gifts of lands or interests in lands within or contiguous to the preserve to maintain or enhance the quality and utility of the preserve.

Specific Authority 258.43(1) FS. Law Implemented 258.42(5) FS. History—New 2-25-81, Formerly 16Q-20.11, Transferred from 16Q-20.011.

18-20.012 Protection of Indigenous Life Forms. The taking of indigenous life forms for sale or commercial use is prohibited, except that this prohibition shall not extend to the commercial taking of fin fish, crustacea or mollusks, except as prohibited under applicable laws, rules or regulations. Members of the public may exercise their rights to fish, so long as not contrary to other statutory and regulatory provisions controlling such activities.

Specific Authority 258.43(1) FS. Law Implemented 258.43(1) FS. History—New 2-25-81, Formerly 16Q-20.12, Transferred from 16Q-20.012.

18-20.013 Development of Resource Inventories and Management Plans for Preserves.

(1) The board authorizes and directs the division to develop a resource inventory and management plan for each preserve.

(2) The division may perform the work to develop the inventories and plans, or may enter into agreements with other persons to perform the work. In either case, all work performed shall be subject to board approval.

Specific Authority 258.43(1) FS. Law Implemented 253.03(7), 253.03(8) FS. History—New 2-25-81, Amended 6-7-85, Formerly 16Q-20.13, Transferred from 16Q-20.013.

18-20.014 Enforcement. The rules shall be enforced as provided in Section 258.46.

Specific Authority 258.43(1) FS. Law Implemented 258.46 FS. History—New 2-25-81, Formerly 16Q-20.14, Transferred from 16Q-20.014.

18-20.015 Application Form.

Specific Authority 253.43(1) FS. Law Implemented 258.43 FS. History—New 2-25-81, Repealed 6-7-85, Formerly 16Q-20.15, Transferred from 16Q-20.015.

18-20.016 Coordination with Other Governmental Agencies. Where a Department of Environmental Regulation permit is required for activities on sovereignty lands the department will coordinate with the Department of Environmental Regulation to obtain a copy of the joint Department of Army/Florida Department of Environmental Regulation permit application and the biological survey. The information contained in the joint permit application and biological assessment shall be considered by the department in preparing its staff recommendations to the board. The board may also consider the reports of other governmental agencies that have related management or permitting responsibilities regarding the proposed activity.

Specific Authority 253.43(1) FS. Law Implemented 258.43 FS. History—New 2-25-81, Formerly 16Q-20.16, Transferred from 16Q-20.016.

18-20.017 Lake Jackson Aquatic Preserve. In addition to the provisions of Rules 18-20.001 through 18-20.016, the following requirements shall also apply to all proposed activities within the Lake Jackson Aquatic Preserve. If any provisions of this Rule are in conflict with any provisions of Rules 18-20.001 through 18-20.016 or Chapter 73-534, Laws of Florida, the stronger provision for the protection or enhancement of the aquatic preserve shall prevail.

(1) No further sale, transfer or lease of sovereignty lands in the preserve shall be approved or consummated by the Board, except upon a showing of extreme hardship on the part of the applicant or when the board shall determine such sale, transfer or lease to be in the public interest.

(2) No further dredging or filling of sovereignty lands of the preserve shall be approved or tolerated by the Board of Trustees except:

(a) Such minimum dredging and spoiling as may be authorized for public navigation projects or for preservation of the lake according to the expressed intent of Chapter 73-534, Laws of Florida; and

(b) Such other alteration of physical conditions as may be necessary to enhance the quality or utility of the preserve.

(3) There shall be no drilling of wells, excavation for shell or minerals, and no erection of structures (other than docks), within the preserve, unless such activity is associated with activity authorized by Chapter 73-534, Laws of Florida.

(4) The Board shall not approve the relocations of bulkhead lines within the preserve.

(5) Notwithstanding other provisions of this act, the board may, respecting lands lying within the Lake Jackson basin:

(a) Enter into agreements for and establish lines delineating sovereignty and privately owned lands;

(b) Enter into agreements for the exchange and exchange sovereignty lands for privately owned lands;

(c) Accept gifts of land within or contiguous to the preserve.

Specific Authority 258.39(26) FS. Law Implemented 258.39(26), 258.43 FS. History—New 6-7-85, Formerly 16Q-20.017, Transferred from 16Q-20.017.

RULES

OF THE

BOARD OF TRUSTEES OF THE INTERNAL

IMPROVEMENT TRUST FUND

CHAPTER 18-18

BISCAYNE BAY AQUATIC PRESERVE

18-18.001 Intent.

(1) The Biscayne Bay Aquatic Preserve, the boundaries of which are fully described in 18-18.002, F.A.C., was established for the purpose of preserving and enhancing Biscayne Bay and all natural waterways tidally connected to the bay in an essentially natural condition so that its biological and aesthetic values may endure for the enjoyment of future generations.

(2) These rules shall apply to all lands public and private within the boundaries of the preserve. However, privately owned uplands shall be excluded from these rules except as otherwise provided for herein.

(3) In promulgating and implementing these rules, it is the intent of the department to construe the provisions of Sections 258.165 and 258.35 through 258.46, F.S., together and to apply the more stringent statutory provisions for the maintenance of the preserve.

(4) The preserve shall be administered and managed in accordance with the following goals:

(a) To preserve, protect, and enhance Biscayne Bay and all natural waterways tidally connected to the bay by reasonable regulation of human activity within the preserve through the development and implementation of a comprehensive management program;

(b) To protect and enhance the waters of the preserve so that the public may continue to enjoy the traditional recreational uses of those waters such as swimming, boating and fishing;

(c) To coordinate with federal, state, and local agencies to aid in carrying out the intent of the legislature in creating the preserve;

(d) To use applicable federal, state, and local management programs, which are compatible with the intent and provisions of the Act and these rules, to assist in managing the preserve;

(e) To encourage activities that protect or enhance the biological and aesthetic values of the preserve, including but not limited to the modification of existing manmade conditions towards their natural condition, when reviewing applications or developing and implementing management plans for the preserve;

(f) To preserve and promote indigenous life forms and habitats including but not limited to sponges, soft corals, hard corals, seagrasses, mangroves, mud flats, marine reptiles, game and non-game fish species, marine mammals, tropical marine invertebrates, birds and shellfish;

(g) To acquire additional title interests in land wherever such acquisitions would serve to protect or enhance the biological or aesthetic values of the preserve.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(1), 258.36, 258.165(2), 258.165(4), 258.39(27) FS. History—New 3-20-80. Formerly 16Q-18.01. Transferred from 16Q-18.001.

18-18.002 Boundaries and Scope of the Preserve.

(1) Biscayne Bay Aquatic Preserve shall be comprised of all publicly and privately owned submerged lands, the water column over such lands, and publicly owned islands within the following described boundary. The preserve boundary extends across the mouths of all artificial waterways, but includes all natural waterways tidally connected to Biscayne Bay.

(a) The preserve is described as follows: Biscayne Bay, the northern limit of which is N.E. 163 Street; the Oleta River north to its headwaters in the center of Section 33, Township 51 South, Range 42 East; Arch Creek to salinity control structure at N.E. 135 Street, 175 feet east of the Florida East Coast Railroad tracks; Little Arch Creek to salinity control structure LA-02, approximately 71 feet east of the center line of N.E. 128 Street; Little River to salinity control structure S-27 located at approximately N.E. 82 Terrace, 200 feet east of the Florida East Coast Railroad tracks; Miami River to salinity control structure S-26, located approximately 500 feet south of N.W. 36 Street; South Fork of the Miami River, also known as Comfort Canal, to salinity control structure S-25 located at N.W. 29 Avenue; Indian Creek south to and including Lake Pancoast, but excluding Collins Canal; Coral Gables Waterway to the intersection of Ingram Highway, Old Cutler Road, Sunset and S.W. 42 Avenue, also known as LeJeune; Black Creek to the most easterly salinity control structure located 0.5 miles upstream from the mouth in the eastern 1/2 of Section 21, near the boundary of Section 22, Township 56 South, Range 40 East; and other tidally flushed natural waterways in south Biscayne Bay which have no known name. Begin at the southwest intersection of the right-of-way of State Road 826 and the mean high water line of Biscayne Bay (Township 53 South, Range 42 East, Dade County), thence southerly along the westerly mean high water line of Biscayne Bay to its intersection with the right-of-way of State Road 905A, (Township 59 South, Range 40 East, Monroe County); thence easterly along such right-of-way to the easterly mean high water line of Biscayne Bay; thence northerly along the easterly mean high water line of Biscayne Bay following the westerly shores of the most easterly islands and Keys with connecting lines drawn

between the closest points of adjacent islands to the southeasterly intersection of the right-of-way of State Road 826 and the mean high water line of Biscayne Bay, thence westerly to the point of beginning.

(b) This description is not intended to exclude from the preserve any natural waterways tidally connected to the preserve, whether or not artificially altered, which are not identified in the above description.

(c) Excluded from the preserve are those submerged lands of the Biscayne National Monument.

(d) For the purpose of clarification and interpretation, the legal description set forth above does not include any land which is expressly recognized as privately owned upland in a pre-existing recorded mean high water line settlement agreement between the board and a private owner or owners. Provided, however, in those instances wherein a settlement agreement was executed subsequent to the passage of the Florida Coastal Mapping Act, the determination of the mean high water line shall be in accordance with the provisions of such act.

(2) The attached map shows the general location of the preserve. It is included for informational purposes only and is not intended to be, nor is it, an accurate depiction of the legal boundaries of the preserve.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(2) FS. History—New 3-20-80. Formerly 16Q-18.02. Transferred from 16Q-18.002.

18-18.003 Scope of This Chapter.

(1) These rules are promulgated to clarify the responsibilities of the department in carrying out its land management functions as those functions apply within the preserve. Implementation and responsibility for environmental permitting of activities in the preserve are vested in the Department of Environmental Regulation. Since these rules are considered cumulative with other rules, a person planning or conducting an activity within the preserve should also consult the other applicable department rules as well as applicable rules of the Department of Environmental Regulation.

(2) The rules are prospective in their application and shall not apply to activities for which applications have been submitted to the Trustees or the Department of Environmental Regulation prior to February 22, 1980; and shall not affect previous actions to the Trustees concerning the issuance of any easement or lease, or any disclaimer concerning sovereign lands.

Specific Authority 258.165(4), 258.43 FS. Law Implemented 258.165(4), 258.43 FS. History—New 3-20-80. Amended 1-4-81. Formerly 16Q-18.03. Transferred from 16Q-18.003.

18-18.004 Definitions.

(1) "Act" means the provisions of Section 258.165 and 258.35 through 258.46, F.S. Pursuant to the provisions of Section 258.39(27), F.S., where Sections 258.165 and 258.35 through 258.46, F.S., conflict, the stronger provision for the maintenance of the preserve shall prevail.

(2) "Activity" means any project and such other human action within the preserve which may require a license from the Department of Environmental Regulation.

(3) "Aesthetic values" means scenic characteristics or amenities of the preserve in its essentially natural state or condition, and the maintenance thereof.

(4) "Applicant" means any person making application for a permit, license, conveyance of an interest in state owned lands or any other necessary form of governmental approval in order to perform an activity within the preserve.

(5) "Biological values" means the preservation and promotion of indigenous life forms and habitats, including but not limited to, sponges, soft corals, hard corals, seagrasses, mangroves, mud flats, marine reptiles, game and non-game fish species, marine mammals, tropical marine invertebrates, birds and shellfish.

(6) "Board" means the Governor and Cabinet sitting as the Board of Trustees of the Internal Improvement Trust Fund.

(7) "Commercial/industrial dock" means a dock which is located on or over submerged lands and which is used to produce income, or which serves as an inducement to renting, purchasing, or using accompanying facilities including without limitation multi-family residential facilities. This term shall be construed to include any dock not a private dock.

(8) "Department" means the State of Florida Department of Natural Resources, as administrator for the board.

(9) "Dock" means a fixed or floating structure, including moorings, used for the purpose of berthing buoyant vessels either temporarily or indefinitely.

(10) "Essentially natural condition" means those conditions which support the continued existence or encourage the restoration of the diverse population of indigenous life forms and habitats to the extent they existed prior to the significant development adjacent to and within the preserve.

(11) "Extreme hardship" means a significant burden, unique to the applicant and not shared by property owners in the area. Self-imposed circumstances caused to any degree by actions of any person subsequent to the enactment of the Act shall not be construed as an extreme hardship. Extreme hardship under this act shall not be construed to include any hardship which arises in whole or in part from the effect of other federal, state or local laws, ordinances, rules, or regulations. The term may be inherent in public projects which are shown to be a public necessity.

(12) "Fill" means materials deposited by any means onto submerged lands or transitional zones or submerged lands below mean high water within the preserve.

(13) "Lease" means a conveyance of interest in lands, title to which is vested in the board, granted in accordance with specific terms set forth in writing.

(14) "Marine" means a small craft harbor complex used primarily for recreation.

(15) "Person" means individuals, minors, partnerships, corporations, joint ventures, estates, trusts, syndicates, fiduciaries, firms, and all other associations and combinations, whether public or private, including governmental entities.

(16) "Pier" means a structure on or over the submerged lands which is used by the public primarily for fishing, swimming, sunbathing, or viewing the bay. A pier shall not include a dock.

(17) "Preserve" means the Biscayne Bay Aquatic Preserve which is an exceptional area of submerged bay lands and natural waterways tidally connected to the bay, including all privately and publicly owned submerged lands, the water column over such other lands, all publicly owned islands, and such other lands as the board may purchase or approve for inclusion.

(18) "Private dock" means a dock located on or over submerged lands, which is used for private leisure purposes for a single family dwelling unit and does not produce income.

(19) "Project" means any human action within the preserve requiring the use, sale, lease or transfer of interest in sovereignty lands or severance of materials from sovereignty lands.

(20) "Public interest" means demonstrable environmental, social, and economic benefits which would

accrue to the public at large as a result of a proposed action, and which would clearly exceed all demonstrable environmental, social, and economic costs of the proposed action. In determining the public interest in a request for use, sale, lease, or transfer of interest in sovereignty lands or severance of materials from sovereignty lands, the board shall consider the ultimate project and purpose to be served by said use, sale, lease, or transfer or severance of materials.

(21) "Public navigation project" means a project primarily for the purpose of navigation which is authorized and funded by the United States Congress or by port authorities as defined by Section 315.02(2), F.S.

(22) "Public necessity" means works or improvements required for the protection of the health and safety of the public, consistent with the Act and these rules, for which no other reasonable alternative exists.

(23) "Quality of the preserve" means the degree of the biological and aesthetic values of the preserve necessary for present and future enjoyment of it in an essentially natural condition.

(24) "Resource management agreement" means a contractual agreement between the board and one or more parties which does not create an interest in real property but merely authorizes conduct of certain management activities on lands held by the board.

(25) "Riparian rights" means those rights incident to lands bordering upon navigable waters, as recognized by the courts of this state and common law.

(26) "Sale" means a conveyance of interests in lands, by the board, for consideration.

(27) "Spoil" means materials dredged from submerged lands which are redeposited or discarded, by any means, onto either submerged lands or uplands not for the purpose of creating new uplands.

(28) "Transfer" means the act of the board by which any interest in lands, including easements, other than sale or lease, is conveyed.

(29) "Upland canal" means an artificial waterway, irrespective of its purpose which is constructed above the mean high water line, and which is connected, or intended to be connected, to the waters of the preserve.

(30) "Utility of the preserve" means fitness of the preserve for the present and future enjoyment of its biological and aesthetic values in an essentially natural condition.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(4), 258.43 FS. History—New 3-20-80. Formerly 16Q-18.04. Transferred from 16Q-18.004.

18-18.005 General Management Criteria. Before the board approves the sale, lease of transfer of interest in state lands or severance of materials therefrom, or the Executive Director comments favorably concerning activities on private lands within the preserve, an applicant must affirmatively demonstrate, where applicable, that:

(1) Proposed dredging is the minimum necessary to accomplish the stated purpose and that the activity is designed to minimize the need for maintenance dredging;

(2) No new lands will be created by filling or spoiling unless no other alternative exists to accomplish the stated purposes, and project is designed to require the minimum filling to accomplish the stated purpose of the activity consistent with the protection of the preserve;

(3) Marina facilities over water are restricted to those water dependent activities necessary to service boats and allow for fishing or fish cleaning activities and are designed to allow the unimpeded flow of water and minimize bottom shading;

(4) Docks and piers are designed to allow the unimpeded flow of water and minimize bottom shading;

(5) Utility cables are placed within the bottom or laid on the bottom and located along a route in a manner which will cause minimum disturbance to the marine habitats;

(6) Dredged spoil materials are disposed of outside of the preserve unless the applicant affirmatively demonstrates that the spoil will not be harmful to or will benefit the quality or utility of the preserve.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(3),(4), 258.42 FS. History—New 3-20-80. Formerly 16Q-15.05. Transferred from 16Q-18.005.

18-18.006 Uses, Sales, Leases or Transfers of Interests in Lands or Materials Held by the Board.

(1) A use, sale, lease or transfer of sovereign lands or materials shall be subject to such terms, conditions or deed restrictions as the board deems necessary to protect the quality or utility of the preserve and further the intent of the Act and these rules. A condition of a sale, lease or transfer of sovereign land materials shall be the applicant's reimbursement for the department's cost of advertising and notification of adjacent property owners.

(2) The document which manifests a use, sale, lease or transfer of lands or materials shall state, with particularity, the projects to be conducted. Additional projects not expressly included in the document are prohibited and may be conducted only after further approval by the board.

(3) Uses, Sales, Leases, or Transfers of Interests in Lands.

(a) All projects to be conducted on lands held by the board shall require prior approval of the board in the form of a sale, lease, or transfer agreement, or a resource management agreement for the proposed use of such land.

(b) There shall be no further use, sale, lease, or transfer of interests in sovereignty submerged lands unless an applicant affirmatively demonstrates sufficient facts to support a finding by the board that:

(i) An extreme hardship exists for the applicant at the time the application is filed; and

(ii) The use, sale, lease, or transfer of interest and the project planned in conjunction with the use, sale, lease or transfer of interest is in the public interest; and

(iii) The project planned in conjunction with the use, sale, lease, or transfer of interest is consistent with these rules and management plans when developed for the preserve;

(iv) If there are to be structures constructed, or dredging and filling undertaken on the sovereignty submerged land, the project for which a use, sale, lease or transfer of interest of sovereignty submerged lands is sought shall be one of the following:

1. a public navigation project;
2. creation or maintenance of a commercial/industrial dock;
3. creation or maintenance of a marina;
4. creation or maintenance of a pier;
5. creation or maintenance of a shore protection structure;
6. installation or maintenance of approved navigational aids;
7. creation or replacement of structures required for the installation or expansion of public utilities; and
8. other projects which are a public necessity or which are necessary to enhance the quality or utility of the preserve and which are consistent with the Act and this chapter.

(v) In the case of the projects enumerated in 18-18.006(3)(b)(iv)1., 2., 3., 4., 5., and 6., F.A.C., the project is designed so that the structure or structures to be built in, on, or over submerged lands are limited to structures necessary to conduct water dependent activities; and no

other reasonable alternative exists which would allow the proposed project to be constructed or undertaken outside the preserve.

(c) A commercial/industrial dock on sovereignty lands shall require a lease. Private docks to be constructed and operated on sovereignty lands shall not require a lease of those lands.

(d) The failure of the board to affirmatively find that a project complies with the provisions of 18-18.006(3)(b), F.A.C., shall preclude a finding of consistency with these rules and management plans when developed for the preserve.

(4) Sales or Transfers of Materials to Be Severed.

(a) There shall be no severance of bottom sediment or rock unless an applicant affirmatively demonstrates sufficient facts to support a finding by the board that:

(i) Sales or transfer of materials to be severed and the project planned in conjunction with that sale or transfer is in the public interest; and

(ii) The sale or transfer of materials to be severed and the project planned in conjunction with the sale of transfer of those severed materials is consistent with these rules and the management plans when developed for the preserve.

(b) There shall be no excavation of shell or minerals.

(c) There shall be no sale or transfer of materials to be severed for the sole or primary purpose of providing fill or creating new lands.

(d) There shall be no drilling of wells within the preserve.

(e) Spoil disposal within the preserve is discouraged by the board. Spoil disposal will be approved within the preserve only where:

(i) the placement of spoil is on a self-contained upland site; or

(ii) the placement of spoil will enhance the quality or utility of the preserve.

(5) The failure of the board to affirmatively find that a project complies with the provisions of Section 18-18.006(3)(b), F.A.C., shall preclude approval of the project by the board.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(3), 258.42 FS. History—New 3-20-80. Formerly 16Q-18.06. Transferred from 16Q-18.006.

18-18.007 Activities Involving Lands and Materials Not Held by the Board.

(1) The applicant for activities on lands not owned by the board must be the owner of record, or his authorized agent. The applicant shall submit to the department evidence of ownership or other forms of legal entitlement as part of the application for activities on lands not owned by the board.

(2) Applications for activities on lands not owned by the board shall be reviewed by the department for consistency with these rules and management plans when developed for the preserve. The findings shall be forwarded in writing to the Department of Environmental Regulation by the Executive Director.

(3) Nothing in these rules shall be construed to impose any of the requirements set forth in (1) and (2) above upon development undertaken on upland portions of islands not owned by the board in the preserve that does not require a license pursuant to the water quality, dredge and fill and solid waste provisions of Chapter 253 or 403, F.S.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(2),(3),(4),(5) FS. History—New 3-20-80. Formerly 16Q-18.07. Transferred from 16Q-18.007.

18-18.008 Cumulative Impacts. In evaluating applications for activities within the preserve, the department recognizes that, while a particular alteration of the preserve may constitute a minor change, the cumulative effect of numerous such changes often results in major impairments to the resources of the preserve. Therefore, the department shall evaluate a particular site for which the activity is proposed with the recognition that the activity is part of a complete and interrelated system. The impact of a proposed activity shall be considered in light of its cumulative impact on the preserve's natural systems. The department shall include as a part of its evaluation of an activity:

(1) The number and extent of similar human actions within the preserve which have previously affected or are likely to affect the preserve, whether considered by the department under its current authority or which existed prior to or since the enactment of the Act; and

(2) The similar activities within the preserve which are currently under consideration by the department; and

(3) Direct and indirect effects upon the preserve which may be reasonably expected to result from the activity; and

(4) The extent to which the activity is consistent with management plans for the preserve when developed; and

(5) The extent to which the activity is permissible within the preserve in accordance with comprehensive plans adopted by affected local governments.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(1),(4), 258.36 FS. History—New 3-20-80. Formerly 16Q-18.08. Transferred from 16Q-18.008.

18-18.009 Exchange of Lands. The board in its discretion may exchange lands for the benefit of the preserve, provided that:

(1) In no case shall an exchange result in any land or water area being withdrawn from the preserve; and

(2) Exchange shall be in the public interest and shall maintain or enhance the quality or utility of the preserve.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(3)(e)(2), 258.41(6) FS. History—New 3-20-80. Formerly 16Q-18.09. Transferred from 16Q-18.009.

18-18.010 Gifts of Lands. The board in its discretion may accept any gifts of lands or interests in lands within or contiguous to the preserve to maintain or enhance the quality and utility of the preserve.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(3)(e)(3) FS. History—New 3-20-80. Formerly 16Q-18.10. Transferred from 16Q-18.010.

18-18.011 Agreements. The board may enter into written agreements with owners of lands lying within or contiguous to the boundaries of the preserve for any private or public use of such lands and for their management as part of the preserve.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(3)(e)(4) FS. History—New 3-20-80. Formerly 16Q-18.11. Transferred from 16Q-18.011.

18-18.012 Fishing.

(1) Fishing involving the use of seines or nets is prohibited in the preserve, except when the fishing is for shrimp or mullet.

(2) Taking of fin fish by fish traps, setting of fish traps, or causing such fish traps to be used within the preserve is prohibited, except that fish traps no larger than two (2) cubic feet with a maximum opening size of one (1) inch by four (4) inches may be used for obtaining bait, provided that such traps must be equipped with a biodegradable door or panel.

(3) Fishing activities from boats using seines or nets shall not be conducted within 1,000 feet of a bridge or fishing pier.

(4) Taking of indigenous life forms for sale or commercial use is prohibited, except that this prohibition

shall not extend to the taking of fin fish or crustacea which may be taken commercially under applicable laws, rules or regulations.

(5) Members of the public may exercise their rights to fish, subject to statutory and regulatory provisions controlling such activities.

Specific Authority 380.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(4)(c), 258.43(1) FS. History—New 3-20-80. Formerly 16Q-18.12, Transferred from 16Q-18.012.

18-18.013 Additional Provisions.

(1) Neither the establishment nor the management of the preserve shall operate to unreasonably infringe upon the riparian rights of upland property owners adjacent to or within the preserve.

(2) The board encourages the creation of further management criteria or plans to enhance or protect the preserve. A management plan, which includes an inventory of resources and a management scheme to further aid in the maintenance and enhancement of the biological and aesthetic qualities of the preserve, shall be developed for the preserve. This management plan shall be prepared by the department or by other public or private entities in cooperation with the department. Such criteria and plans, when developed, may be submitted to the board for consideration and inclusion in the board's management plan for the preserve.

(3) Nothing in these rules shall serve to eliminate or alter the requirements or authority of other governmental agencies, including counties and municipalities, to protect or enhance the preserve provided that such requirements or authority are not inconsistent with the Act and these rules.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(4), 258.43, 258.44 FS. History—New 3-20-80. Formerly 16Q-18.13, Transferred from 16Q-18.013.

18-18.014 Procedures.

(1) Applications for activities within the preserve shall be made to the Department of Environmental Regulation upon the application form specified in Chapter 17 and Section 16-18.016, F. A. C. These forms shall be available at the department and the Department of Environmental Regulation.

(2) The department shall review all information provided by the applicant to determine if the application supplies the information necessary to evaluate the applicant for matters within the purview of the department. Within 30 days of receipt of the application, the department shall notify the applicant in writing of any additional information it requires.

(3) No application shall be considered complete until the department receives the following:

(a) All information requested by the department in accordance with 16-18.014(2), F. A. C.

(b) The hydrographic and/or biological survey if required or performed by the Department of Environmental Regulation including the Department of Environmental Regulation evaluation thereof, if any.

(4) To be considered complete, applications for uses, sales, leases, or transfers of land held by the board shall include evidence of all necessary local government approvals. This provision shall not be construed to include local approvals which, by local ordinance or resolution, cannot be granted until state permits are issued or which are contingent upon approval of the board of the use, sale, lease, or transfer of interest in lands held by the board.

(5) Within 30 days of receipt of a completed application for sale, lease, or transfer of lands held by the board, or a request to dredge, fill, or spoil in the preserve, or perform an activity specified in Section 258.165(5), F.S., the department shall publish notice of the pending application and the public hearing thereon as specified below.

(6) All notices will be sent to the applicant and published in a newspaper of general circulation in the county in which the activity is located and in the Florida Administrative Weekly. Those individuals who requested, in writing, notices concerning the particular activity or all activity within the preserve shall also be notified.

(7) Notices shall include the name of the applicant, general location of the activity, type of activity, action requested of the board and the date, time and place of the proposed public hearing.

(8) Notices of requests for sale, lease or transfer of lands shall be published in accordance with Section 253.115, F.S. All other notices shall be published by a single newspaper publication at least 14 days prior to the hearing.

(9) Hearings on applications for dredge, fill, or spoil projects in the preserve or activities specified in Section 258.165(5), F.S., shall be held as specified in the notice. Hearings on applications for sale, lease or transfers of land shall only be held if the department is notified, in writing, that a hearing is requested. The request must be received by the department at least 7 days prior to the date for the hearing specified in the notice.

(10) All public hearings shall be held jointly with the Department of Environmental Regulation to the greatest extent possible.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(3)(4), 258.42, 253.03, 253.115 FS. History—New 3-20-80, Formerly 16Q-18.14, Transferred from 16Q-18.014.

18-18.015 Public Hearings.

(1) The provisions of this section shall apply to public hearings conducted pursuant to Section 253.115 and Section 258.165(3)(b), F.S. for activities within the preserve.

(2) The public hearings shall be conducted in accordance with the following:

(a) The hearing shall be conducted in the county in which the activity would occur by a hearing officer who is a department staff member or a hearing officer assigned by the Division of Administrative Hearings. The hearing officer may not participate in any other department consideration of the application apart from duties as a hearing officer.

(b) The public hearing shall be mechanically recorded and be transcribed by any person at his cost.

(c) The order of presentation of testimony shall be as follows:

(i) The applicant shall proceed first, presenting as a minimum the description of the project and surrounding land uses, its benefits or detriments to the preserve, the extreme hardship resulting from a failure to grant the relief sought and the public interest, if applicable.

(ii) The department staff shall proceed second and may present whatever information it wishes to present on matters concerning the application.

(iii) Representatives of other federal, state, or local agencies shall proceed third and may present whatever information they wish to present on matters concerning the application.

(iv) Any other interested persons or members of the public may make their presentation at the conclusion of the agencies' presentation.

(v) The hearing officer may permit any person to present testimony at times other than those specified above for the convenience of the applicant, agencies, or members of the public if the presentation would not disrupt the orderly flow of information.

(d) Written documents may be submitted to the hearing officer as long as the hearing record is held open.

(e) The hearing officer may allow limited questions of witnesses presenting factual or expert testimony, if, in the opinion of the hearing officer, the questions would add substantively to the information upon which the decision will be based. Questions may be allowed at the conclusion of the witnesses' testimony or at some later time during the hearing.

(f) Objections to testimony shall not be available to any person participating in the hearing; however, the hearing officer shall limit testimony to those matters which are relevant to the proceeding.

(3) The hearing officer shall prepare and submit a report to the department within 14 days from the completion of the hearing or preparation of the hearing transcript, if any, which ever later occurs.

(4) The Executive Director shall submit a recommendation concerning a project to the board for its consideration or comments to the Department of Environmental Regulation in accordance with Section 16-18.007, F. A. C.

(5) A copy of the agenda item shall be sent to each individual requesting a copy in writing. The agenda item with the department recommendation, and the consistency review shall contain a statement which allows substantially affected persons to request a hearing, pursuant to Section 120.57, F.S., within 14 days from receipt. The agenda item shall also contain any response to the request for comments on the activity from the Game and Fresh Water Fish Commission as well as from the county municipal governments in which the activity would occur. Failure to request a hearing during the time period shall bar such relief.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(3),(4), 258.43, 253.03, 253.115 FS. History—New 3-20-80, Formerly 16Q-18.15. Transferred from 16Q-18.015.

18-18.016 Enforcement. These rules shall be enforced as provided in Sections 258.165(7), 258.46, 370.021, and 775.082 or 775.083, F.S.

Specific Authority 370.021(1), 258.165(4), 258.43 FS. Law Implemented 258.165(7), 258.46, 370.021(1) FS. History—New 3-20-80, Formerly 16Q-18.16. Transferred from 16Q-18.016.

18-18.017 Application Form.

(1) The application form is comprised of the joint Department of Army/Florida Department of Environmental Regulation forms for activities in waters of the State of Florida [SAJ Form 983, eff. 7/77, available from Department of Environmental Regulation] and the department's application for activities within the Biscayne Bay Aquatic Preserve [eff. 3/80, available from Division of State Lands]. It is the intent of these rules to adopt a single form which shall be filed with the Department of Environmental Regulation to include all activities within the preserve. It is the further intent of the department to adopt any new Department of Environmental Regulation forms for activities within the preserve, as rules, when formally adopted by the Department of Environmental Regulation.

(2) Department of Natural Resources/Board of Trustees of the Internal Improvement Trust Fund Application for Activities in Biscayne Bay Aquatic Preserve [eff. 3/80, available from Division of State Lands].

Specific Authority 258.165(4), 258.43, 370.021 FS. Law Implemented 258.165, 258.35, 258.46 FS. History—New 3-20-80, Formerly 16Q-18.17, Transferred from 16Q-18.017.