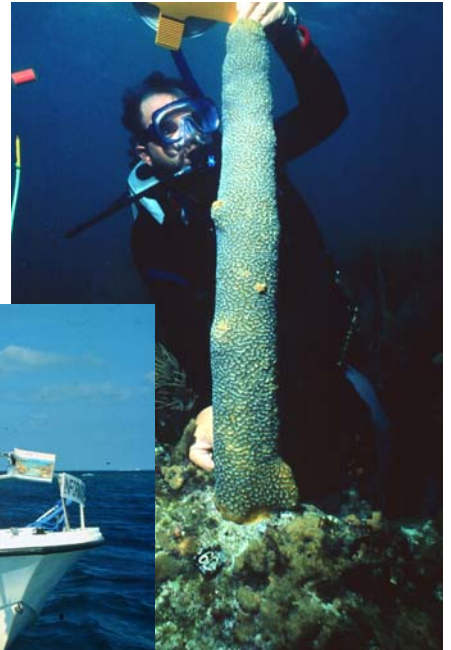


Florida Keys National Marine Sanctuary Draft Revised Management Plan



February 2005

U.S. Department of Commerce

National Oceanic and
Atmospheric Administration

National Ocean Service

National Marine Sanctuary Program

This document is the draft revised management plan for the Florida Keys National Marine Sanctuary. It replaces the management plan that was implemented in 1997 and will serve as the primary management document for the Sanctuary during the next five years.

Comments or questions on this management plan should be directed to:

Billy D. Causey
Superintendent
Florida Keys National Marine Sanctuary
P.O. Box 500368
Marathon, FL 33050
(305) 743-2437 x 26
billy.causey@noaa.gov

Note to Reader

In an effort to make this document more user-friendly, we have included references to the Florida Keys National Marine Sanctuary web site rather than including the entire text of many bulky attachments or appendices that are traditionally included in management plans. Readers who do not have access to the Internet may call the Sanctuary office at (305) 743-2437 to request copies of any documents that are on the Sanctuary's web site. For readers with Internet access, the Sanctuary's web site can be found at: <http://floridakeys.noaa.gov>.

ABOUT THIS DOCUMENT

This document is a report on the results of NOAA's five-year review of the strategies and activities detailed in the 1997 *Final Management Plan and Environmental Impact Statement* for the Florida Keys National Marine Sanctuary. It serves two primary purposes: 1) to update readers on the outcomes of successfully implemented strategies - in short, accomplishments that were merely plans on paper just five years ago; and, 2) to disseminate useful information about the Sanctuary and its management strategies, activities and products. The hope is that this information, which charts the next 5 years of Sanctuary management, will enhance the communication and cooperation so vital to protecting important national resources.

Sanctuary Characteristics

The Florida Keys National Marine Sanctuary extends approximately 220 nautical miles southwest from the southern tip of the Florida peninsula. The Sanctuary's marine ecosystem supports over 6,000 species of plants, fishes, and invertebrates, including the nation's only living coral reef that lies adjacent to the continent. The area includes one of the largest seagrass communities in this hemisphere. Attracted by this tropical diversity, tourists spend more than thirteen million visitor days in the Florida Keys each year. In addition, the region's natural and man-made resources provide livelihoods for approximately 80,000 residents.

The Sanctuary is 2,900 square nautical miles of coastal waters, including the recent addition of the Tortugas Ecological Reserve. The Sanctuary overlaps six state parks and three state aquatic preserves. Three national parks have separate jurisdictions, and share a boundary with the Sanctuary. In addition, the region has some of the most significant maritime heritage and historical resources of any coastal community in the nation.

The Sanctuary faces specific threats, including direct human impacts such as ship groundings, pollution, and overfishing. Threats to the Sanctuary also include indirect human impacts, which are harder to identify but seem to be reflected in coral declines and increases in macroalgae and turbidity. More information about the Sanctuary can be found in this document and at the Sanctuary's web site: <http://floridakeys.noaa.gov>.

Management Plan Organization

Within this document, the tools that the Sanctuary uses to achieve its goals, are presented under five management divisions: 1) Science; 2) Education, Outreach & Stewardship; 3) Enforcement & Resource Protection; 4) Resource Threat Reduction; and, 5) Administration, Community Relations, & Policy Coordination. Each management division contains two or more *action plans*, which are implemented through supporting *strategies* and *activities*. The strategies described in the 1997 *Management Plan* generally retain their designations in this document. As in the 1997 plan, two or more action plans may share a strategy where their goals and aims converge.

Accomplishments and Highlights

The Sanctuary's programs and projects have made significant progress since the original management plan was implemented 1997. An overview of these accomplishments is provided in the Introduction. In addition, each action plan contains bulleted lists of accomplishments since the 1997 management plan was adopted.

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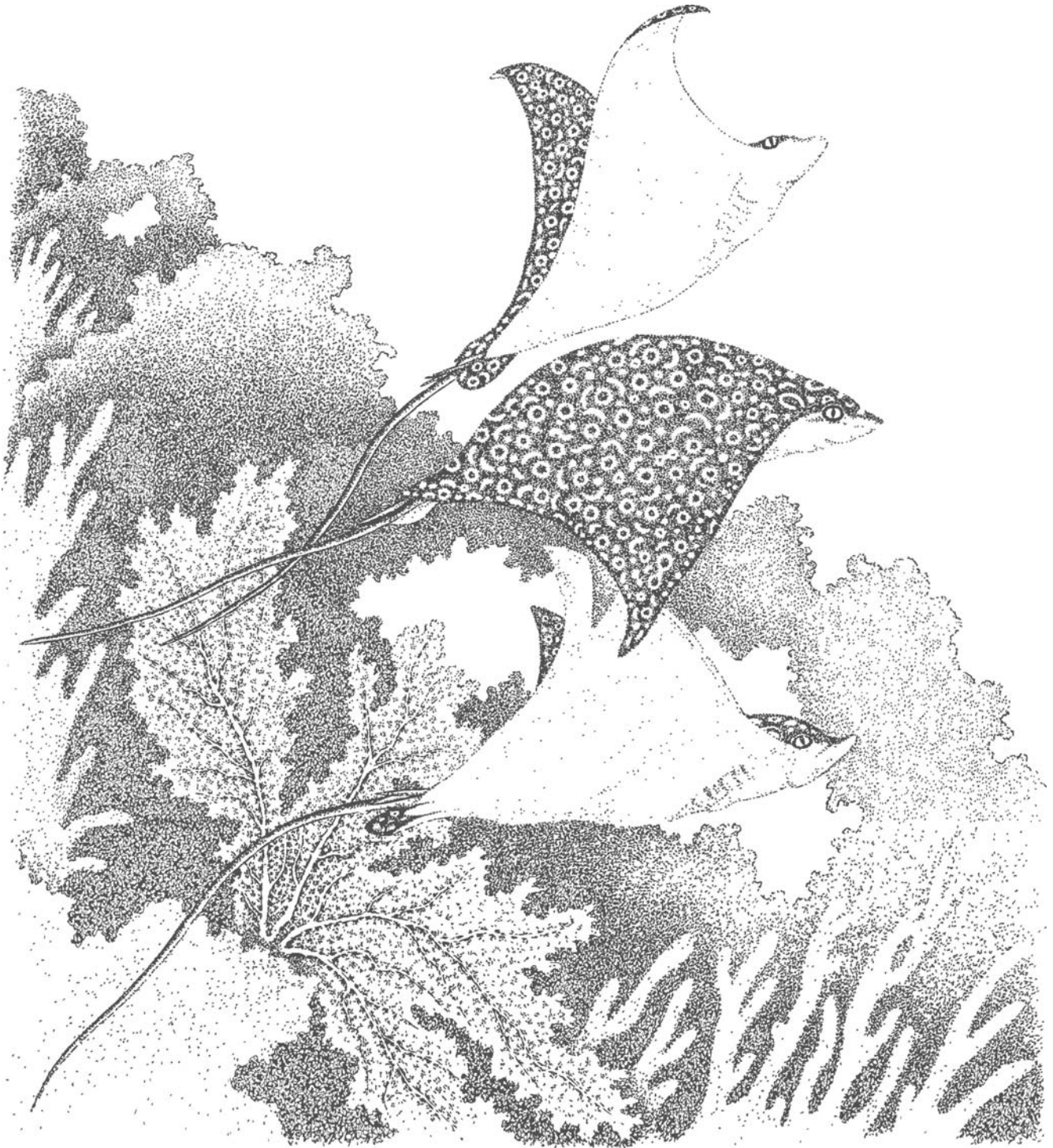
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Acronyms

ASA	Abandoned Shipwreck Act
ATBAs	Areas to Be Avoided
AWT	Advanced Wastewater Treatment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DARP	Damage Assessment and Restoration Program
DMR	Department of Marine Resources (Monroe County)
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F.S.	Florida Statutes
FAC	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDHR	Florida Division of Historical Resources
FDEP	Florida Department of Environmental Protection
FFWCC	Florida Fish and Wildlife Conservation Commission
FKNMS	Florida Keys National Marine Sanctuary
FKNMSPA	Florida Keys National Marine Sanctuary Protection Act
FPS	Florida Park Service
FWRI	Fish and Wildlife Research Institute
FWS	Fish and Wildlife Service
GIS	Geographic Information System
GPS	Global Positioning System
HAZMAT	Hazardous Materials
MBTA	Migratory Bird Treaty Act
MEERA	Marine Ecosystem Event Response and Assessment
MHR	Maritime Heritage Resources
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NEPA	National Environmental Protection Act
NGO	Non-governmental Organization
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMS	National Marine Sanctuary
NMSA	National Marine Sanctuary Act
NMSP	National Marine Sanctuary Program
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
OSDS	On-Site Disposal System
PSSA	Particularly Sensitive Sea Area

SAV	Submerged Aquatic Vegetation
SCR	Submerged Cultural Resources
SEFSC	Southeast Fisheries Science Center
SFWMD	South Florida Water Management District
SPA	Sanctuary Preservation Area
SWIM	Surface Water Improvement and Management Act
SWM	Stormwater Management
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDOC	U.S. Department of Commerce
USDOI	U.S. Department of Interior
USDOS	U.S. Department of State
USDOT	U.S. Department of Transportation
USGS	U.S. Geological Survey
WMA	Wildlife Management Area

1.0 INTRODUCTION



1.1 The National Marine Sanctuary Program (NMSP)

The National Marine Sanctuary Program (NMSP) is a network of 13 marine protected areas (Figure 1.1), encompassing marine resources from Washington State to the Florida Keys, and Lake Huron to American Samoa. The National Oceanic and Atmospheric Administration’s (NOAA) National Ocean Service (NOS) has managed the nation’s marine sanctuaries since passage of the Marine Protection, Research and Sanctuaries Act of 1972. Title III of that Act is now called the National Marine Sanctuaries Act (NMSA), which is found in Appendix A.

Today, the national marine sanctuaries contain deep-ocean gardens, near-shore coral reefs, whale migration corridors, deep-sea canyons, and underwater archaeological sites. They range in size from one-quarter square mile in Fagatele Bay, American Samoa, to more than 5,300 square miles off Monterey Bay, California – one of the largest marine protected areas in the world. Together, these sanctuaries protect nearly 18,000 square miles of coastal and open ocean waters and habitats. While some activities are managed to protect resources, certain multiple uses, such as recreation, commercial fishing, and shipping are allowed to the extent that they are consistent with a sanctuary’s resource protection mandates. Research, education, outreach, and enforcement activities are major components in each sanctuary’s program of resource protection.

The NMSP is recognized around the world for its commitment to management of marine protected areas within which primary emphasis is placed on the protection of living marine resources and our nation’s maritime heritage resources.

Figure 1.1. The National Marine Sanctuaries



The NMSP Vision:
People value marine sanctuaries as treasured places protected for future generations.

The NMSP Mission:
To serve as the trustee for the national system of marine protected areas to conserve, protect, and enhance their biodiversity, ecological integrity and cultural legacy.

1.2 The Florida Keys National Marine Sanctuary (FKNMS)

Historical Setting

Warning signs of the fragility and finite nature of the region's marine resources have been present in the Florida Keys for years. In 1957, a group of conservationists and scientists met at Everglades National Park to discuss the demise of the coral reef resources at the hands of those attracted by its beauty and uniqueness. The conference resulted in the 1960 creation of the world's first underwater park, John Pennekamp Coral Reef State Park. However, in the following decade, public outcry continued over pollution, overfishing, physical impacts, overuse, and user conflicts. The concerns continued to be voiced by environmentalists and scientists alike throughout the 1970s and into the 1990s.

As a result, additional management efforts were instituted to protect the Keys' coral reefs. In the Upper Keys, Key Largo National Marine Sanctuary was established in 1975 to protect 103 square nautical miles of coral reef habitat from north of Carysfort Lighthouse to south of Molasses Reef. In the Lower Keys, the 5.32 square nautical mile Looe Key National Marine Sanctuary was established in 1981.

Despite these efforts, oil drilling proposals and reports of deteriorating water quality occurred throughout the 1980s. At the same time, scientists were assessing coral bleaching and diseases, long-spined urchin die-offs, loss of living coral cover, a major seagrass die-off, and declining reef fish populations. Such threats prompted Congress to act. In 1988, Congress reauthorized the National Marine Sanctuary Program and ordered a feasibility study for possible expansion of Sanctuary sites in the Florida Keys - a directive that signaled that the health of the Keys ecosystem was of national concern.

The feasibility studies near Alligator Reef, Sombrero Key, and westward from American Shoal were overshadowed by several natural events and ship groundings that precipitated the designation of the Florida Keys National Marine Sanctuary (FKNMS). Three large ships ran aground on the coral reef during one 18-day period in the fall of 1989. Although people cite the ship groundings as the issue triggering Congressional action, it was, in fact, the cumulative degradation and the threat of oil drilling, along with the groundings. These multiple threats prompted Congressman Dante Fascell to introduce a bill into the House of Representatives in November of 1989. Congressman Fascell had long been an environmental supporter of South Florida and his action was very timely. Senator Bob Graham, also known for his support of environmental issues in Washington and as a Florida Governor, sponsored the bill in the Senate. Congress gave its bipartisan support, and on November 16, 1990, President George Bush signed the bill into law.

With designation of the Florida Keys National Marine Sanctuary in 1990, several protective measures were implemented immediately, such as prohibiting oil and hydrocarbon exploration, mining or otherwise altering the seabed, and restricting large shipping traffic. Additionally, protection to coral reef resources was extended by restricting anchoring on coral, touching coral, and collecting coral and live rock (a product of the aquarium trade). Discharges from within the Sanctuary and from areas outside the Sanctuary that could potentially enter and affect local resources were also restricted in an effort to comprehensively address water quality concerns.

Administration and Legislation

The Sanctuary uses an ecosystem approach to comprehensively address the variety of impacts, pressures, and threats to the Florida Keys marine ecosystem. It is only through this inclusive approach that the complex problems facing the coral reef community can be adequately addressed.

The goal of the Sanctuary is to protect the marine resources of the Florida Keys. It also aims to interpret the Florida Keys marine environment for the public and to facilitate human uses of the Sanctuary that are consistent with protection of this particular marine ecosystem. The Sanctuary is administered by NOAA and is jointly managed with the State of Florida under a co-trustee agreement. The Florida Governor and Cabinet, sitting as the Board of Trustees for the State of Florida, designated the Florida Department of Environmental Protection (FDEP) as the State's partner for Sanctuary management. Additionally, the Florida Fish and Wildlife Conservation Commission (FWC), created in 1999, enforces Sanctuary regulations in partnership with Sanctuary managers. FWC also houses the Fish and Wildlife Research Institute (FWRI), which conducts and coordinates scientific research and monitoring.

National Marine Sanctuaries are typically designated by the Secretary of Commerce through an administrative process established by the NMSA. However, recognizing the importance of the Florida Keys ecosystem and the degradation of the ecosystem due to direct and indirect physical impacts, Congress passed the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA) in 1990, (P.L. 101-605) (Appendix B) designating the Florida Keys National Marine Sanctuary. President George Bush signed the FKNMSPA into law on November 16, 1990.

The FKNMSPA requires the preparation of a comprehensive management plan and implementing regulations to protect Sanctuary resources. This draft *Revised Management Plan* responds to the FKNMSPA's requirements. The implementing regulations, effective as of 1 July 1997, are found at 15CFR922 and in Appendix C. The designation document for the FKNMS is found in Appendix D.

Sanctuary Boundaries

The Sanctuary's enabling legislation designated 2,800-square-nautical miles of coastal waters off the Florida Keys as the Florida Keys National Marine Sanctuary. The Sanctuary's boundary was amended in March 2001 when the Tortugas Ecological Reserve was designated, significantly increasing the marine resources requiring protection.

Currently, the boundary encompasses approximately 2,900 square nautical miles (9,800 square kilometers) of coastal and ocean waters and submerged land (Figure 1.2). The boundary extends southward on the Atlantic Ocean side of the Keys, from the northeastern-most point of the Biscayne National Park along the approximate 300-foot isobath for over 220 nautical miles to the Dry Tortugas National Park. The boundary extends more than 10 nautical miles to the west of the Park boundary, where it turns north and east. The northern boundary of the Sanctuary extends to the east where it intersects the boundary of the Everglades National Park. The Sanctuary waters on the north side of the Keys encompass a large area of the Gulf of Mexico and western Florida Bay. The boundary follows the Everglades National Park boundary and continues along the western shore of Manatee Bay, Barnes Sound, and Card Sound. The boundary then follows the southern boundary of Biscayne

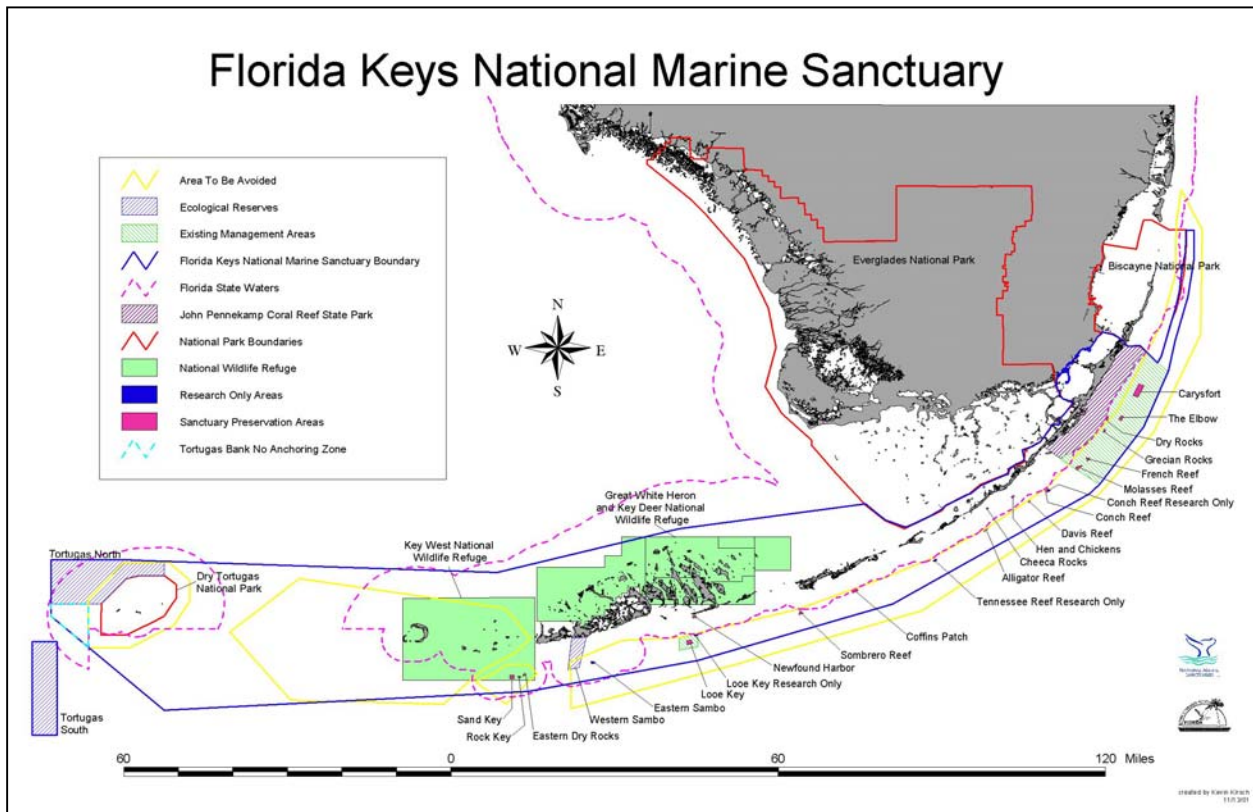
National Park and up its eastern boundary along the reef tract at a depth of approximately 60 feet until its northeastern-most point.

A separate, non-contiguous, 60 square nautical mile area off the westernmost portion of the Sanctuary is called the Tortugas Ecological Reserve South. The area’s shallowest feature is Riley’s Hump.

The Sanctuary boundary overlaps two previously existing National Marine Sanctuaries (Key Largo and Looe Key); four U.S. Fish and Wildlife Service (USFWS) refuges; six state parks, including John Pennekamp Coral Reef State Park; three state aquatic preserves; and other jurisdictions. Everglades National Park, Biscayne National Park and Dry Tortugas National Park are excluded from Sanctuary waters, but each shares a boundary with the Sanctuary.

The shoreward boundary of the Sanctuary is the mean high-water mark, except around the Dry Tortugas where it is the boundary of Dry Tortugas National Park. The Sanctuary boundary encompasses nearly the entire reef tract, all of the mangrove islands of the Keys, and a good portion of the region’s seagrass meadows.

Figure 1.2. The Florida Keys National Marine Sanctuary Boundaries



Socio-Economic Context

The environment and the economy are inextricably linked in the Florida Keys, making management and protection of existing resources and reducing impacts critical if the economy is to be sustained. Tourism is the number one industry in the Florida Keys, with over \$1.2 billion dollars being spent annually by over 3 million visitors. The majority of visitors participate in activities such as snorkeling, SCUBA diving, recreational fishing, viewing wildlife and studying nature. Recreational and commercial fishing are the next most important sectors of the local economy, annually contributing an estimated \$500 million and \$57 million respectively (<http://marineeconomics.noaa.gov>).

Because of the recreational and commercial importance of the marine resources of the Florida Keys, protecting these Sanctuary resources is valuable not only for the environment but also for the economy. The special marine resources of the region, which led to the area's designation as a National Marine Sanctuary, contribute to the high quality of life for residents and visitors. Without these unique marine resources, the quality of life and the economy of the Keys would decline.

1.3 The Management Plan Review Process

What is management plan review?

In 1992, when Congress reauthorized the NMSA, it required all National Marine Sanctuaries to review their management plans every five years in order to monitor and evaluate the progress of the national mission to protect national resources. The Florida Governor and Cabinet, as trustees for the State, also mandated a five-year review of the Florida Keys National Marine Sanctuary Management Plan in their January 28, 1997 resolution.

The Sanctuary's management plan review creates a road map for future actions based on past experience and outcomes. The review reevaluates the goals and objectives, management techniques, strategies, and actions identified in the existing management plan. It provides the opportunity to take a close and comprehensive look at outcomes and plan for future management of the Sanctuary.

The 1997 Florida Keys National Marine Sanctuary Management Plan

After the initial six-year FKNMS planning process, a comprehensive management plan for the Sanctuary was implemented in July 1997. The management plan focused on ten action plans which were largely non-regulatory in nature and involved educating citizens and visitors, using volunteers to build stewardship for local marine resources, appropriately marking channels and waterways, installing and maintaining mooring buoys for vessel use, surveying maritime heritage resources, and protecting water quality. In addition to action plans, the 1997 management plan designated five types of marine zones to reduce pressures in heavily used areas, protect critical habitats and species, and reduce user conflicts. The efficacy of the marine zones is monitored Sanctuary-wide under the Research and Monitoring Action Plan.

The implementing regulations for the FKNMS became effective July 1, 1997. The 1997 management plan was published in three volumes: Volume I is the Sanctuary management plan itself (which this document updates); Volume II describes the process used to develop the draft management alternatives, including environmental and socioeconomic impact analyses of the alternatives, and the environmental impact statement; Volume III contains appendices, including the texts of Federal and State legislation that designate and implement the Sanctuary. All three volumes of the 1997 management plan are available on the Sanctuary web site (<http://floridakeys.noaa.gov/>) and from the Sanctuary's Marathon office. Volume II is not being revised as part of this review. After public input, government review and final adoption of this five-year review and revised Management Plan, this document will replace Volumes I and III.

How does management plan review work?

Review of the 1997 management plan began in early 2001 with a meeting in Tallahassee, Florida, among Federal and state partners responsible for Sanctuary management and various FKNMS and NMSP staff. The review included the Sanctuary Advisory Council (SAC) and the general public in every step of the process.

In the late spring and summer of 2001, FKNMS staff, working closely with the SAC, held scoping meetings and re-convened working groups that had been created during development of the 1997 plan. The scoping meetings were held in Marathon, Key Largo, and Key West, and gave the public the opportunity to meet with SAC members, Sanctuary managers, and FKNMS staff. The meetings

included round-table discussions on every action plan, and participants had the opportunity to move freely between the various topics being discussed at each table.

The scoping period for the revised management plan lasted from June 8 through July 20, 2001.

Approximately 30 comments were received - a sharp contrast to the more than 6000 public comments received during the comment period for the 1997 plan. In addition, the working groups held more than three dozen meetings between June and September 2001 to discuss, evaluate, revise and update action plans. SAC members and FKNMS staff who had served on the working groups presented the proposed revisions to the Sanctuary Advisory Council at three meetings in October 2001. The full advisory council recommended minor changes and approved each action plan in this document. The Advisory Council membership and Working Group membership lists are included in Appendix E.

The Role of Sanctuary Management as Facilitators

A Sanctuary management plan is designed to identify the best and most practical strategies to achieve common goals, while getting the most out of public investment. Achieving this aim cannot be accomplished solely through the authorities and resources of an individual Sanctuary management authority. It requires a broad partnership of programs, authorities, and resources, coordinated to meet the needs of both the sanctuary site and the broader region of which it is a part.

Consequently, the management plan review process first focuses on finding the most effective strategies to accomplish common goals. These strategies are the product of a process that brings together constituents, institutions, and interested parties in directed working groups to address specified problem areas. How these strategies are to be implemented – with whose authorities, investments, and personnel – is determined subsequently to developing the best strategies. While the Sanctuary program commits to carrying out specific strategies as budgets allow, in many cases implementation becomes the responsibility of other institutions such as state, Federal, or local partners, that have either the authorities, the appropriate program, and/or the resources required.

In this process, the sanctuary management plan becomes a framework in which the role of all partners is codified. The Sanctuary assumes the role of facilitator and integrator of a far larger body of activities and outcomes than are within the immediate authorities, programs, and resources of the site. This facilitation role provides the mechanism for continued implementation, evaluation, and adaptation of the partnership activities documented by the plan, ensuring its continuity and overall success.

1.4 Accomplishments

There have been many accomplishments in the sanctuary beginning with the authority established under the Florida Keys National Marine Sanctuary and Protection Act of 1990 and the implementation of the management plan in 1997. An overview of the Sanctuary's accomplishments is given here, and more details are provided within each Action Plan.

1. Area To Be Avoided. The "Area To Be Avoided" (ATBA) designation has resulted in a significant decrease in the number of major ship groundings on the coral reefs. As Figure 1.3 illustrates, prior to 1990 there was a major ship grounding involving vessels greater than 50 m in length, nearly every year, while only two have occurred since the creation of the ATBA. The International Maritime Organization agreed that the ATBA should be given additional strength as a Particularly Sensitive Sea Area (PSSA) in 2002 (see Accomplishment 5 below). The ATBA regulations are at 15 CFR Part 922, Subpart P, Appendix VII. Figure 1.4 shows the ATBA and the Sanctuary boundary.

Figure 1.3. Reef groundings of vessels greater than 50m before & after ATBA designation.

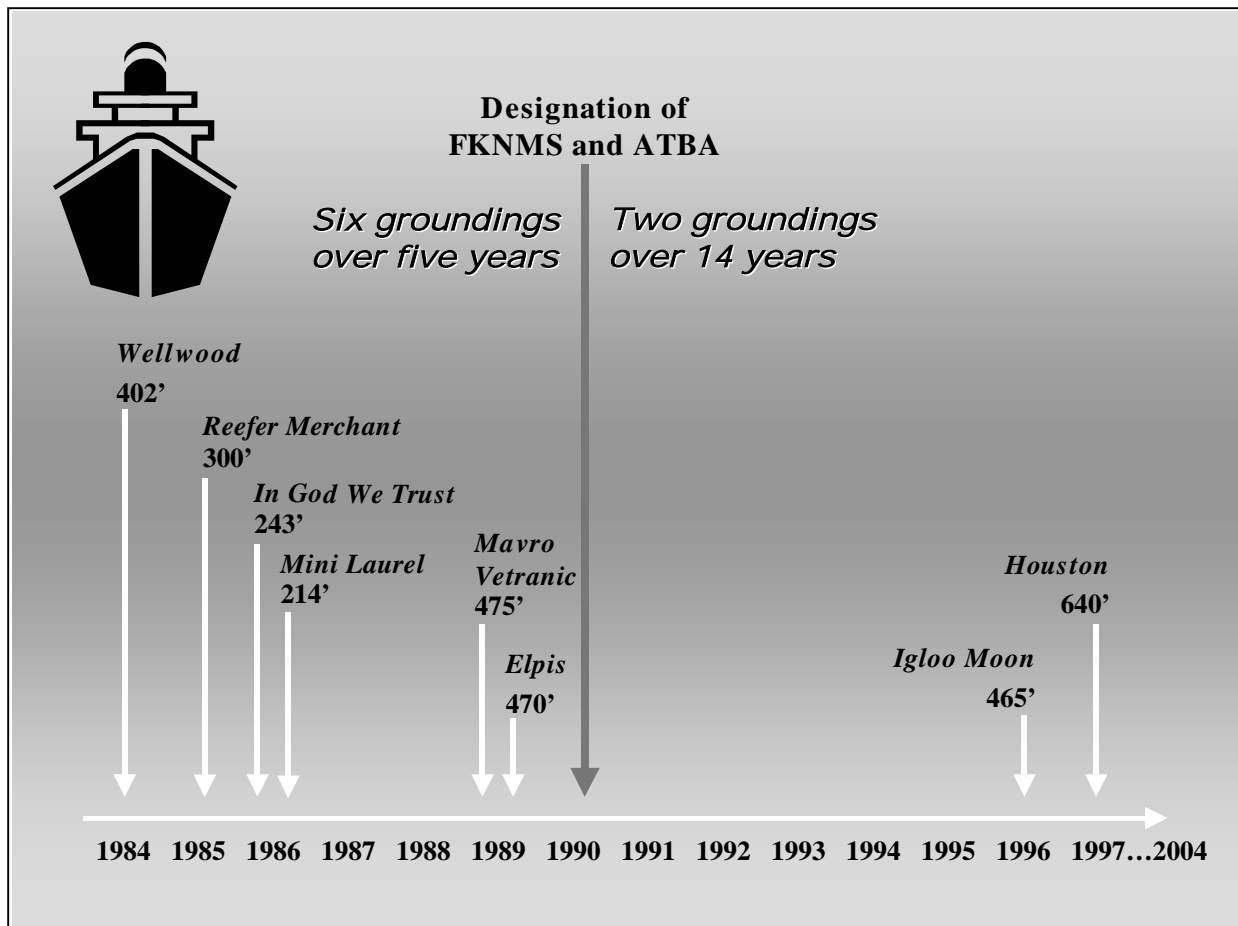
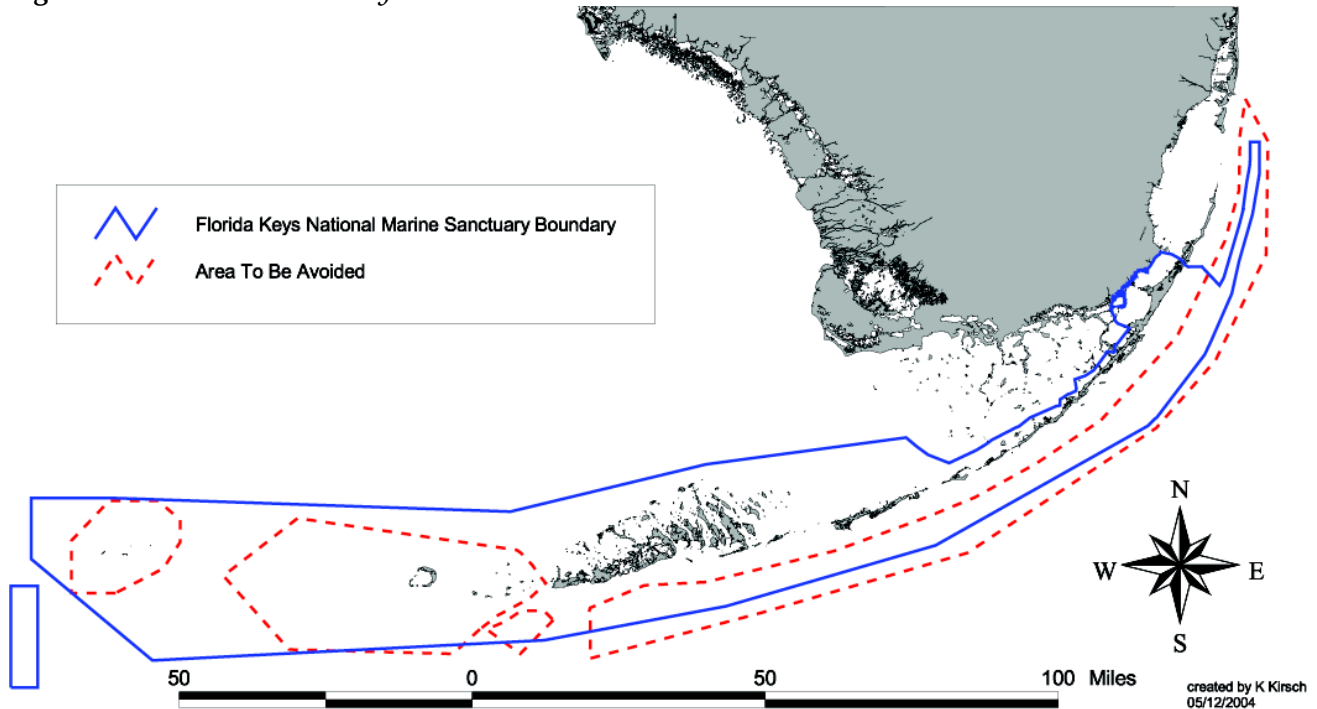


Figure 1.4. FKNMS boundary and ATBA



2. Oil Drilling and Hard Mineral Mining Ban. A ban on these activities was established when the Sanctuary was created, and has prevented these activities from occurring in the Sanctuary.

3. The Water Quality Protection Program. This program has produced the first Water Quality Protection Program for a national marine sanctuary and has fully implemented 26 of 49 high-priority activities, many of which are carried out in cooperation with other action plans.

4. The Comprehensive Everglades Restoration Plan. The Sanctuary continues to participate in the Comprehensive Everglades Restoration Plan. Sanctuary staff have been active on this project since 1993, including chairing a working group for the South Florida Ecosystem Restoration Task Force and staffing its science and education committees. The Sanctuary's participation seeks to protect the ecosystem's water quality by eliminating catastrophic releases of freshwater into Florida Bay following rain events.

5. Designation of the Florida Keys as a Particularly Sensitive Sea Area. In November 2002, the United Nations International Maritime Organization approved designation of the Florida Keys as a PSSA. The designation is not accompanied by additional rules and regulations, but seeks to elevate public awareness of the threat of oil spills and hazardous materials to sensitive marine environments and will ensure that the previously mentioned ATBA is noted not only on U.S. charts but also on nautical charts worldwide.

6. Long-term and continuing progress in the Research and Monitoring and Zoning action plans.

Research and Monitoring has produced significant scientific data, hypothesis testing, mapping, trend documentation, and wide dissemination of these findings. Especially notable is the Keys-wide benthic map which provides valuable information for Sanctuary managers. In addition to the new protected zone in the Tortugas Ecological Reserve, the Sanctuary's zoning programs continue to provide invaluable data that crosses simple category boundaries.

7. Education, Public Outreach, Sanctuary Stewardship, and Volunteerism. Through these inter-related efforts, information is flowing from scientists to managers and then to educators, who reach the next generation. More than 120,000 volunteer hours, a \$1.8 million value, have been donated to the Sanctuary between 1996 and 2000. Even more valuable than the dollar worth of the program is the stewardship created through volunteerism, which uniquely contributes to the long-term effectiveness of the Sanctuary.

8. Enforcement and Regulations. Both the city of Key West and the State of Florida have declared Florida Keys waters under their jurisdictions as "no-discharge" zones. Additional accomplishments in implementing the Enforcement and Regulatory Action Plans are largely a tribute to the cooperative efforts among the State, the Florida Fish and Wildlife Conservation Commission, the Florida Park Service, the U.S. Coast Guard and NOAA. Notable among these is the cross-deputization of state-certified law enforcement officers, which allows them to enforce some Federal laws, including fisheries regulations.

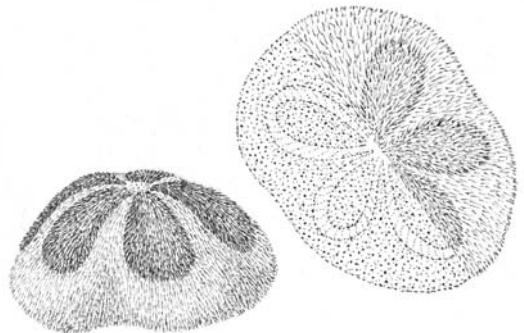
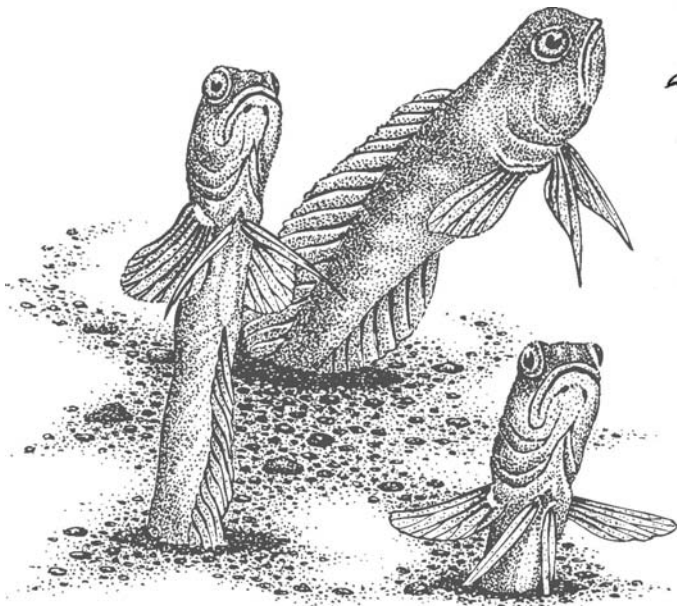
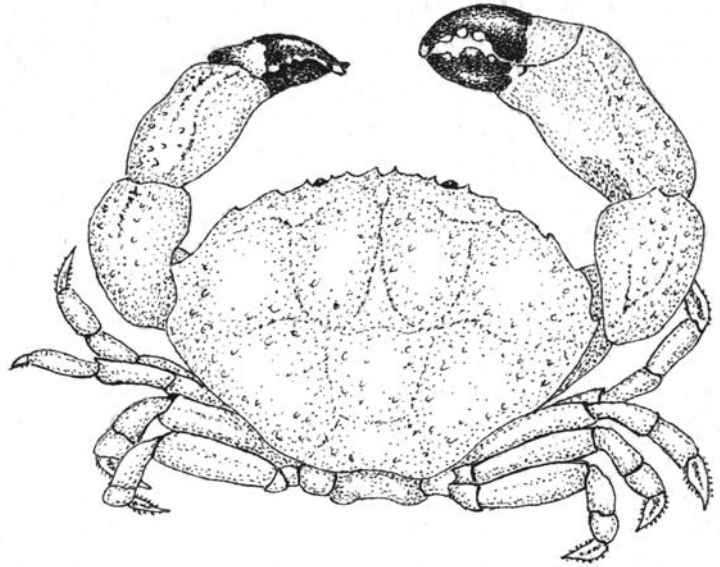
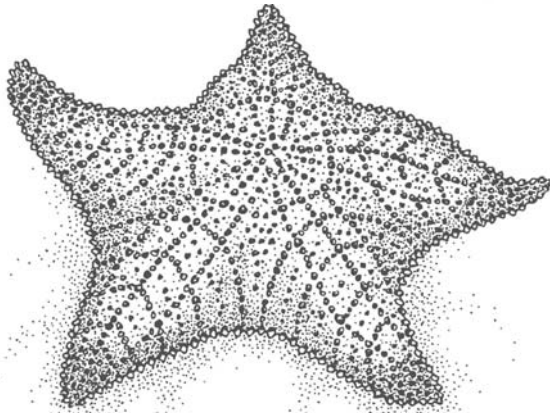
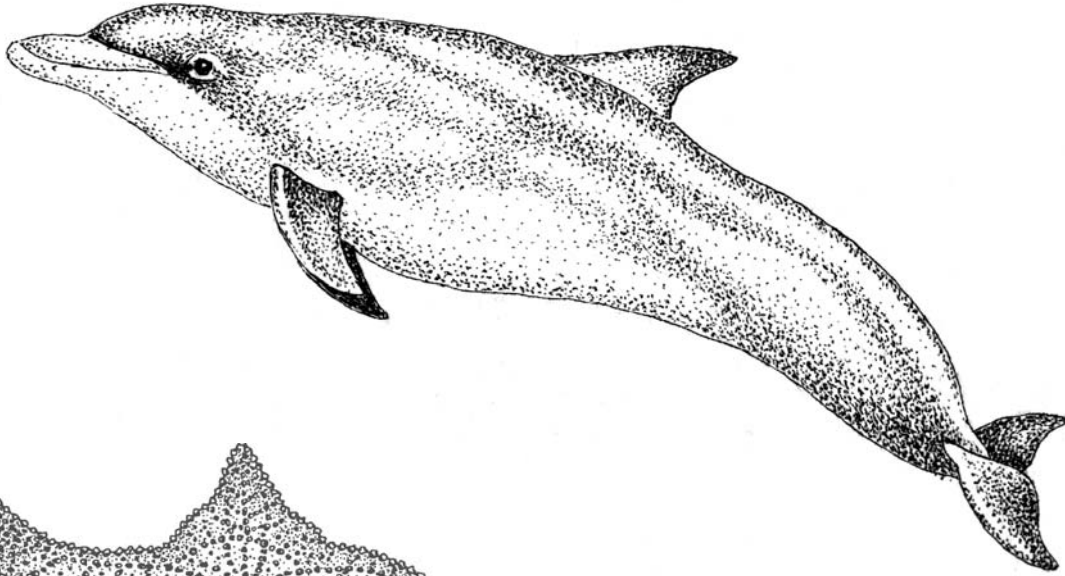
9. Damage Assessment and Restoration. The Damage Assessment and Restoration Action Plan is new to this document but is based on accumulated data and lessons learned since 1982. The cross-disciplinary strategies will prove useful in reducing the number of vessel groundings in Sanctuary waters as well as restoring Sanctuary resources damaged by vessels.

10. Maritime Heritage Resources. The Maritime Heritage Resources Action Plan includes a close partnership of the State, NOAA, and the Florida Advisory Council on Historic Preservation described in a 1998 programmatic agreement for resource management (see Appendix F). More recently, the 2002 discovery of a previously unknown wreck within the Sanctuary has brought about a community-endorsed research and interpretation plan for the site. Overall, the Action Plan represents excellent progress in balancing resource protection, investigation and interpretation.

11. Mooring Buoys and Waterway Management (formerly Channel Marking). The Mooring Buoy and Waterway Management Action Plans have implemented simple but effective strategies for reducing vessel damage to the coral reef and to seagrass beds. The long-term success of these programs – mooring buoy strategies have been used in local Sanctuary waters since 1981 when they were introduced at the Key Largo National Marine Sanctuary – has largely been due to a unique interface of education, outreach, enforcement, and research and monitoring activities.

12. Operations. Since 1997, the Sanctuary has integrated the administrative functions of two former sanctuaries – at Key Largo and Looe Key – into a single headquarters umbrella with two regional offices. This integration streamlined delivery of human resources, community relations, and policy development. It also resulted in a series of accomplishments, ranging from an updated electronic financial reporting system to the 130-episode television series, *Waterways*.

2.0 THE SANCTUARY ENVIRONMENT: A SUBTROPICAL ECOSYSTEM



2.1 Introduction

Adjacent to the Keys' land mass is a complex marine ecosystem that supports a variety of spectacular, unique, and nationally significant seagrass meadows, mangrove islands, and extensive living coral reefs. This ecosystem is the marine equivalent of a tropical rain forest in that it supports high levels of biological diversity, is fragile and easily susceptible to damage from human activities, and possesses great value to humans if properly conserved. The ecosystem supports over 6,000 species of plants, fishes, and invertebrates, including the nation's only coral reef that lies adjacent to the continent, and one of the largest seagrass communities in this hemisphere.

2.2 Living Marine Resources

The Florida Keys ecosystem contains one of North America's most diverse assemblages of flora and fauna. The Florida peninsula and Florida Keys serve as a partial barrier between the temperate waters of the Gulf of Mexico and the tropical to subtropical waters of the Atlantic Ocean, resulting in a unique distribution of marine organisms.

The coral reef tract, arching in a southwesterly direction for 220 miles, comprises one of the largest communities of its type in the world. It is the only emergent coral reef system off the continental U.S. All but the northernmost extent of the reef tract lies within the sanctuary.

The reef tract is a bank-barrier system comprised of an almost continuous reef community. One of its most noticeable features is its seaward-facing spur-and-groove formation. Over 6000 patch reefs, circular to oval in shape, lie in nearshore to offshore areas.

The ecosystem also supports one of the world's largest seagrass beds, among the richest, most productive, and most important submerged coastal communities. Seagrasses provide food and habitat for commercially and recreationally important species of fish and invertebrates. Without the seagrass community, the coral reef community would likely collapse.

Mangroves form an important component of the ecosystem, fringing most of the more than 1600 islands and 1800 miles of shoreline. Mangroves provide important ecological functions such as habitat for juvenile fishes and invertebrates, sediment traps, and surface area for attached organisms such as oysters, sponges, and algae.

The Florida Keys coral reef ecosystem is highly biologically diverse, and includes:

- 520 species of fish, including over 260 species of reef fish
- 367 species of algae
- 5 species of seagrasses
- 117 species of sponges
- 89 species of polychaete worms
- 128 species of echinoderms
- 2 species of fire coral
- 55 species of soft corals
- 63 species of stony corals

Coral Reefs and Coral Health

The reefs of Florida have undergone change for millennia due to sea-level changes, storms, and other natural occurrences. More recently, human impacts have directly and indirectly damaged the reef structure and reef communities, and as a result corals are under stress.

In the Florida Keys, a decrease in coral cover and species diversity and an alarming increase in coral diseases and coral bleaching have been recorded in the Coral Reef/Hard-bottom Monitoring Project conducted by Florida's Fish and Wildlife Research Institute (FWRI). The project records biodiversity, coral condition (including diseases and bleaching), and coral cover at stations located in various habitat types. Since 1996, over 66 percent of the monitored sites have exhibited losses in stony coral

diversity, although some positive trends were noted in the 1999-2000 survey period. Significant gains and losses of several stony coral species have occurred both between years and over the entire sampling period, indicating fluctuations in coral species richness but no loss of species Sanctuary-wide.

In addition, FWRI monitoring has shown a declining trend in stony coral cover from 1996 to 2000, with the greatest relative change occurring in the Upper Keys. A reprieve from this decline has recently been observed and may be attributable to the lack of significant events such as bleaching, tropical storms, or hurricanes. As with species diversity, scientists find that coral cover is highly variable by both habitat type and region.

Recruitment (settlement of new individuals) of stony corals is an important factor in overall community dynamics. Two monitoring programs that are evaluating coral recruitment trends find that differences exist in coral recruitment among habitat types and regions. Juvenile corals in the lower Keys suffered significant mortality in 1998 due to a direct strike from Hurricane Georges.

Coral diseases increasingly threaten the overall health and vitality of reef systems in the Sanctuary. While over ten coral diseases are believed to exist at this time, only three pathogens have been positively identified. The monitoring project has documented increases in the number of research stations that contain diseased coral, the number of coral species with disease, and the number of diseases themselves. Regional differences in disease incidence have also been documented, with the highest concentration observed in the Key West and Lower Keys region.

Over the past 20 years, coral bleaching events in the Sanctuary have increased in frequency and duration. Massive coral bleaching was first recorded in the Lower Keys in 1983 along the outer reef tract, where shallow fore-reef habitats were the most affected areas. Bleaching expanded and intensified with events in 1987 and 1990, and culminated with massive coral bleaching in 1997 and 1998 that targeted inshore and offshore reefs throughout the Keys. Coral bleaching is undoubtedly responsible for some of the dramatic declines in stony coral cover observed Sanctuary-wide in the last five years. Similar observations of bleaching have been made regionally and internationally since 1987, and it is widely recognized that 1997 and 1998 were the worst coral bleaching years on record, causing significant loss of corals worldwide.

Algae, Seagrasses, and Other Benthic Organisms

Monitoring of benthic, or bottom, communities by the National Undersea Research Center at the University of North Carolina at Wilmington has documented that algae of various species dominate bottom habitats at all sites throughout the Sanctuary. Sponges and soft corals cover a much smaller percentage of the sea floor (from about 10 percent to 20 percent). Like algae, they are highly variable, depending on the region being surveyed and the time of year.

Seagrasses are comprehensively monitored by Florida International University as part of the Sanctuary's Water Quality Protection Program. Data indicate approximately 12,800 square kilometers of seagrass beds lie within and adjacent to the Sanctuary. Some variability in seagrass cover and abundance has been identified, although populations seem relatively stable. Continued monitoring will be invaluable for detecting human impacts on the seagrass communities.

Reef Fish

Monitoring fish populations occurred for many years before the Sanctuary's designation and continues to this day. From 1979 through 1998, a total of 263 fish species representing 54 families were observed. Over half of all fish observed were from just ten species. Relatively few fish of legal size have been seen, which is consistent with several studies that indicate reef fish in the Florida Keys are highly overexploited.

Despite population declines throughout much of the Sanctuary, fish numbers in fully protected zones (Sanctuary Preservation Areas, Ecological Reserves, and Special-use and Research-only areas) are increasing to some degree. Years of data from one monitoring program show that the number of individuals of three exploited species are higher in protected zones than in fished sites. Researchers have also seen an overall increase in the average abundance of three snapper species at several sites after the sites were protected.

Mobile Invertebrates

FWRI monitors mobile invertebrates, such as spiny lobster and queen conch. Spiny lobsters continue to be more abundant in the fully protected Sanctuary Preservation Areas and Ecological Reserves than outside these areas. Researchers have found their average size is larger and catch rates (number of lobsters per trap) are higher than in reference areas during both the open and closed fishing seasons.

Queen conch populations have remained low for the last decade despite a prohibition on their collection since 1985. Attempts to supplement wild populations with laboratory reared stock and experiments aimed at improving their reproduction are designed to ameliorate the long-term decline in queen conch populations in the region.

Sea urchins are also in very low abundances, especially the long-spined urchin, suggesting poor recovery of this species since its massive Caribbean-wide die-off in 1983. Two research efforts underway are exploring means by which populations of this key species may be restored.

2.3 Non-living Marine Resources

Maritime Heritage Resources

The waters of the Florida Keys have some of the most significant maritime heritage and historical resources of any coastal community in the nation. Because of its unique geographical position on the European and American trade routes, shipwrecks in the Keys contain a record of the 500-year history of the Americas. Key West has been the crossroads of the Caribbean, and the sea has remained the common thread through the region's cultural and historic sites. The relative inaccessibility of underwater cultural sites has ensured that many delicate artifacts remain undisturbed. The importance of the region's maritime heritage resources is great, and the possibility exists for discovering some of the earliest archaeological sites in North America. A detailed description of the cultural and historical resources of the Florida Keys is contained in the "Description of the Affected Environment," of the Environmental Impact Statement (see Volume II of the Florida Keys Management Plan at <http://floridakeys.noaa.gov>).

Water Quality

Many water-quality parameters have been monitored Sanctuary wide by Florida International University's Southeast Environmental Research Center since 1995 as part of the Water Quality Protection Program. Thus far, results indicate that some elements (dissolved oxygen, total organic nitrogen, and total organic carbon) are present in higher concentrations in surface waters, while other indicators (salinity, turbidity, nitrite, nitrate, ammonium, and total phosphorus) are higher in bottom waters.

Geographic differences in water quality include higher nutrient concentrations in the Middle and Lower Keys and lower nutrient concentrations in the Upper Keys and Dry Tortugas. Also, declining inshore-to-offshore trends across Hawk Channel have been noted for some parameters (nitrate, ammonium, silicate, total organic carbon and nitrogen, and turbidity).

Probably the most interesting findings thus far show increases over time in total phosphorus for the Dry Tortugas, Marquesas Keys, Lower Keys, and portions of the Middle and Upper Keys, and increases in nitrate in the Southwest Florida Shelf, Dry Tortugas, Marquesas Keys, and the Lower and Upper Keys. In contrast, total organic nitrogen decreased somewhat, mostly in the Southwest Florida Shelf, the Sluiceway, and the Lower and Upper Keys. These trends may be driven by regional circulation patterns arising from the Loop Current and Florida Current, and have changed as the period of record has increased.

Stationary instruments along the reef tract continuously monitor seawater parameters and ocean states. The data are analyzed by Florida Institute of Oceanography's SEAKEYS program and periodically transmitted to satellites and made available on the Internet. Additionally, water temperature data are recorded every two hours from a series of thermographs that the Sanctuary has maintained for the past ten years.

2.4 Threats to the Ecosystem

The deterioration of the marine ecosystem in South Florida is no longer a matter of debate. Visitors, residents and scientists alike have noted the precipitous decline in the health of the coral reef ecosystem. The threats causing these visible signs of decline are numerous and often complex, ranging from direct human impacts to global climate changes.

Direct human impacts include vessel groundings, anchor damage, destructive fishing, and damage to corals as a result of divers and snorkelers standing on them. Boat propellers and large ships have damaged over 30,000 acres of seagrasses and more than 20 acres of coral reef habitat in the Sanctuary.

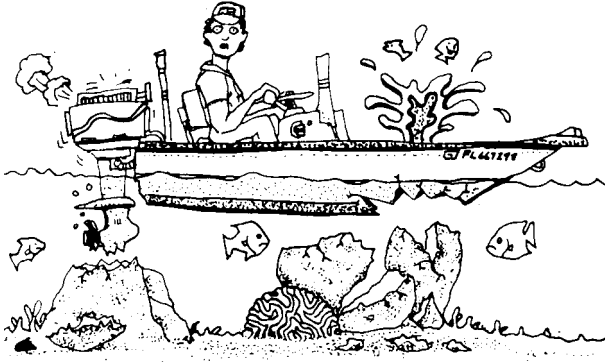
Most pressures stem from the 5 million annual visitors and 80,000 year-round residents. Their high levels of use in the Sanctuary have significant direct and indirect effects on the ecosystem. Sanctuary visitors primarily seek water-related recreation, including fishing, diving, snorkeling, and boating.

Although less immediate than direct physical damage to the corals, other stressors also significantly affect the Florida Keys ecosystem. Overfishing has dramatically altered fish and other animal populations on the coral reef, contributing to an imbalance in ecological relationships that are critical to sustaining a diversity of organisms. Eutrophication (an outcome of excess nutrients in the water, such as fertilizers) of nearshore waters is a documented problem. Wastewater and stormwater treatment and solid-waste disposal facilities are highly inadequate, directly affecting nearshore water quality. Some solutions to water quality problems are being implemented, but given the scope of the problem, more action is required.

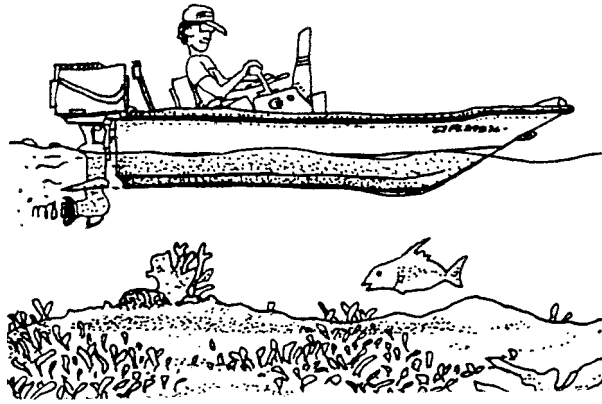
In Florida Bay, reduced freshwater flow has increased plankton blooms, sponge and seagrass die-offs, and fish kills. Since Florida Bay and nearshore waters provide important nursery and juvenile habitat for a variety of reef species, the declines in these areas affect the overall health and structure of offshore coral reefs. Therefore, regional strategies to address the quantity, quality, timing, and distribution of freshwater flows into the South Florida ecosystem and Florida Bay through the Comprehensive Everglades Restoration Plan are critical.

In addition, seasonal and yearly seawater temperature fluctuations, increasing solar radiation, and atmospheric changes all affect the ecosystem. The impacts are seen in coral disease and bleaching, which have increased in frequency, duration and range, coinciding with the ten warmest years on record. Under normal conditions, corals and reef organisms would be expected to tolerate and recover from sporadic events such as temperature variation. However, additional human-induced stresses are likely affecting the ability of these organisms to adequately recover from climate fluctuations.

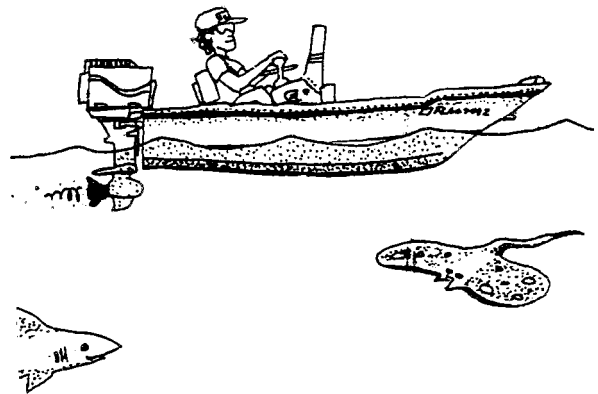
3.0 ACTION PLANS



BROWN, BROWN, RUN AGROUND



GREEN, GREEN, NICE AND CLEAN



BLUE, BLUE, SAIL ON THROUGH

What Are Action Plans?

Action plans are the means by which the Sanctuary identifies and organizes the wide variety of management tools it employs to manage and protect its marine resources. “Road maps” for management, action plans articulate the programs and projects used to address the resource issues identified in the Sanctuary and to fulfill the purposes and policies of the NMSA. Each action plan is composed of *strategies* sharing common management objectives and *activities*, which are the specific actions the Sanctuary and its partners will take to implement the strategies.

What Are The Action Plans In This Document?

The following chapters are the action plans that guide every aspect of sanctuary management. Readers should note that the 1997 *Final Management Plan* for the Sanctuary included ten action plans, presented in alphabetical order to address management needs related to:

- Channel/Reef Marking
- Education and Outreach
- Enforcement
- Mooring Buoys
- Regulatory
- Research and Monitoring
- Submerged Cultural Resources
- Water Quality
- Volunteer
- Zoning

In this revised management plan, four new action plans have been added: Science Management and Administration Action Plan, Damage Assessment and Restoration Action Plan, Operations Action Plan, and, Evaluation Action Plan. The Submerged Cultural Resources Action Plan has been changed to the Maritime Heritage Resources Action Plan, while the Channel/Reef Marking Action Plan has been renamed to more accurately reflect the intent, which is “Waterway Management”, and the word “Marine” has been added to the Zoning Action Plan to clarify the title.

Management Divisions

In this revised management plan, the individual action plans have been grouped into five management divisions. This was done to both improve the organization of the plan as well as to highlight the management goals for each of the plans. The individual action plans for the Sanctuary are organized in the following divisions:

Sanctuary Science

- Science Management and Administration Action Plan
- Research and Monitoring Action Plan

Education, Outreach and Stewardship

- Education and Outreach Action Pan
- Volunteer Action Plan

Enforcement and Resource Protection

- Regulatory Action Plan
- Enforcement Action Plan
- Damage Assessment and Restoration Action Plan
- Maritime Heritage Resources Action Plan

Resource Threat Reduction

- Marine Zoning Action Plan
- Mooring Buoy Action Plan
- Waterway Management Action Plan
- Water Quality Action Plan

Administration, Community Relations and Policy Coordination

- Operations Action Plan
- Evaluation Action Plan

Implementing Action Plans

The FKNMS defines a place where many governmental and non-governmental organizations work in partnership to achieve the Sanctuary’s goals: protect resources and their conservation, recreational, ecological, historical, research, educational, or aesthetic values through comprehensive long-term management. This management plan describes these collective efforts, and its implementation relies on resources and efforts from a variety of partners. Table 3.1 describes the extent to which each of the action plans and strategies within this revised management plan can be implemented under three funding scenarios. Funding from both NOAA and other partners, (e.g. EPA, Monroe County, etc.) is considered in ranking the level of implementation.

Table 3.1 Action Strategy Implementation Over Five Years Under Three Funding Scenarios

Implementation* with NOAA Funding	Implementation* with Partner Funding	Scenario 1: Level Funding	Scenario 2: 5% per year increase	Scenario 3: 10% per year increase
● - High ⊙ - Medium ○ - Low	◆ - High ◇ - Medium ◇ - Low			
Sanctuary Science				
Science Management and Administration Action Plan				
	Strategy B.11 – Issuance of Sanctuary Research Permits	●	●	●
	Strategy W.29 – Dissemination of Findings	⊙	⊙	●
	Strategy W.32 – Maintaining a Technical Advisory Committee	●	●	●
	Strategy W.34 – Regional Science Partnerships and Reviews	⊙	⊙	●
	Strategy W.35 – Data Management	◇	◇	◆
Research and Monitoring Action Plan				

* Implementation ranking considers the priority of each strategy as well as the percentage of activities that could be initiated, maintained, and/or completed under differing funding scenarios.

	Strategy W.33 - Ecological Research and Monitoring	⊙◇	⊙◇	●◆
	Strategy Z.6 - Marine Zone Monitoring	⊙	⊙	●
	Strategy W.36 - Conducting Socioeconomic Research	●	●	●
	Strategy F.3 - Researching Queen Conch Population Enhancement Methods	●◆	●◆	●◆
	Strategy F.7 - Researching Impacts from Artificial Reefs	⊙◇	⊙◇	●◆
	Strategy F.6 - Fisheries Sampling	⊙◇	⊙◇	●◆
	Strategy F.11 - Evaluating Fishing Gear/Method Impacts	○◇	○◇	⊙◇
	Strategy F.15 - Assessing Sponge Fishery Impacts	⊙◇	⊙◇	●◆
	Strategy W.18 - Conducting Pesticide Research	○◇	○◇	⊙◇
	Strategy W.22 - Assessing Wastewater Pollutants Impacts	●◆	●◆	●◆
	Strategy W.23 - Researching Other Pollutants and Water Quality Issues	⊙◇	⊙◇	●◆
	Strategy W.24 - Researching Florida Bay Influences	⊙◇	⊙◇	●◆
	Strategy W.21 - Developing Predictive Models	⊙◇	⊙◇	●◆
Education, Outreach and Stewardship				
Outreach and Education Action Plan				
	Strategy E.4 - Developing Training, Workshops and School Programs	○	⊙	⊙
	Strategy E.6 - Continuing the Education Working Group	●	●	●
	Strategy E.10 - Establishing Public Forums	⊙	⊙	●
	Strategy E.11 - Participating in Special Events	⊙	⊙	●
	Strategy E.1 - Printed Product Development and Distribution	○	○	⊙
	Strategy E.2 - Continued Distribution of Audio-Visual Materials	⊙	●	●
	Strategy E.3 - Continue Development of Signs, Displays, Exhibits, and Visitor Centers	⊙	⊙	⊙
	Strategy E.5 - Applying Various Technologies	⊙	⊙	⊙
	Strategy E.12 - Professional Development of Outreach and Education Staff	○	○	⊙
Volunteer Action Plan				
	Strategy V.1 - Maintaining Volunteer Programs	⊙	⊙	⊙
	Strategy V.2 - Working with Other Organization/ Agency Volunteer Programs	○	○	○
	Strategy V.3 - Providing Support for Volunteer Activities	○	○	⊙
Enforcement and Research Protection				
Regulatory Action Plan				
	Strategy R.1 - Maintaining the Existing Permit Program	⊙	⊙	●
	Strategy R.2 - Regulatory Review	⊙	⊙	●
Enforcement Action Plan				
	Strategy B.6 - Acquiring Additional Enforcement Personnel	●	●	●
Damage Assessment and Restoration Action Plan				
	Strategy B.18 - Injury Prevention	○	○	⊙
	Strategy B.19 - Implementing DARP Notification and Response Protocols	○	○	⊙
	Strategy B.20 - Damage Assessment and Documentation	⊙◇	⊙◇	●◇
	Strategy B.21 - Case Management	◆	◆	◆
	Strategy B.22 - Habitat Restoration	◇	◇	◆
	Strategy B.23 - Data Management	○	⊙	⊙
Maritime Heritage Resources Action Plan				

	Strategy MHR.1 - MHR Permitting	●◆	●◆	●◆
	Strategy MHR.2 - Establishing an MHR Inventory	○◆	○◆	◎◆
	Strategy MHR.3 - MHR Research and Education	○◇	○◇	◎◆
	Strategy MHR.4 - Ensuring Permit Compliance through Enforcement	●◆	●◆	●◆
	Strategy MHR.5 - Ensuring Interagency Coordination	●◆	●◆	●◆
Resource Threat Reduction				
Marine Zoning Action Plan				
	Strategy Z.1 - Wildlife Management Areas	○	◎	●
	Strategy Z.2 - Ecological Reserves	◎	●	●
	Strategy Z.3 - Sanctuary Preservation Areas	○	◎	●
	Strategy Z.4 - Existing Management Areas	●	●	●
	Strategy Z.5 - Special-use Areas	○	◎	●
Mooring Buoy Action Plan				
	Strategy B.15 - Mooring Buoy Management	●	●	●
Waterway Management Action Plan				
	Strategy B.1 - Boat Access	◆	◆	◆
	Strategy B.4 - Waterway Management/Marking	◆	◆	◆
Water Quality Action Plan				
	Strategy W.19 - Florida Bay Freshwater Flow	●◆	●◆	●◆
	Strategy W.3 - Addressing Wastewater Management Systems	◇	◇	◆
	Strategy W.5 - Developing and Implementing Water Quality Standards	◇	◇	◇
	Strategy W.7 - Resource Monitoring of Surface Discharges	◆	◆	◆
	Strategy W.11 - Stormwater Retrofitting	◇	◇	◆
	Strategy W.14 - Instituting Best Management Practices	◆	◆	◆
	Strategy B.7 - Pollution Discharges	◎◆	◎◆	●◆
	Strategy L.1 - Elimination of Wastewater Discharge from Vessels	◎◆	◎◆	●◆
	Strategy L.3 - Marina Operations	◆	◆	◆
	Strategy L.7 - Assessing Solid Waste Disposal Problem Sites	◇	◇	◆
	Strategy W.15 - HAZMAT Response	○◆	○◆	◎◆
	Strategy W.16 - Spill Reporting	○◆	○◆	◎◆
	Strategy L.10 - HAZMAT Handling	◇	◇	◆
	Strategy W.17 - Refining the Mosquito Spraying Program	◇	◇	◆
	Strategy W.10 - Addressing Canal Water Quality	◇	◇	◆
Administration				
Operations Action Plan				
	Strategy OP.1 - Addressing Administrative Policy Issues	◎	◎	◎
	Strategy OP.2 - Addressing Resource Policy Issues	◎	◎	◎
	Strategy OP.3 - Addressing Legal Issues	◎	◎	●
Evaluation Action Plan				
	Strategy EV.1 - Measuring Sanctuary Performance Over Time	●	●	●

3.4 RESOURCE THREAT REDUCTION

Resource protection and conservation can be achieved with non-regulatory tools such as those action plans bundled in this management division. Those action plans include: the Marine Zoning Action Plan; the Mooring Buoy Action Plan; the Waterway Management Action Plan; and the Water Quality Action Plan. Each of these action plans contains tools that allow managers to directly protect and conserve Sanctuary resources through the implementation of various management strategies. These action plans when implemented provide very targeted means of protecting resources whether it is by establishing marine zones to conserve Sanctuary resources or by providing mooring buoys to eliminate anchor damage to corals in high-use areas. The effective marking of channels and waterways to aid in the prevention of vessel groundings is yet another non-regulatory approach to protecting Sanctuary resources.

Water quality degradation is the primary issue that is affecting the health and vitality of Sanctuary resources. This management division includes the Water Quality Action Plan that is designed to identify the sources of water quality decline and to outline the various corrective management actions that need to be implemented to improve water quality.

3.4.3 Waterway Management Action Plan

Introduction

This action plan describes strategies that implement and maintain a comprehensive and effective waterway marking and management system for boaters within the FKNMS. Formerly known as the Reef/Channel Marking Action Plan, this plan was re-named to reflect the broader strategies and activities. In addition to markers, this plan incorporates several surveys and databases that aid in waterway management. Aids to Navigation (channel markers and informational markers) and regulatory markers (i.e. vessel exclusion, no motor, and preservation zones) are in place in many areas of the Sanctuary. Channel, shoal, and reef markings have reduced the damage to shallow-water resources; however, significant resource damage continues to occur in sensitive areas. Meanwhile, boating activities have increased dramatically since the plan was first developed necessitating the enhancement of waterway markings and management. This plan promotes standardized signage and a comprehensive marking plan, emphasizes long-term resource protection, and protects shallow-water resources such as seagrass banks, patch reefs and the bank reef crest.

Marking reefs, banks, and major passages to and from Florida Bay, the Gulf of Mexico, and the Atlantic Ocean improves navigation and minimizes the damage to shallow-water resources throughout the Sanctuary. At the same time, an effective waterway management system promotes boater safety by identifying and marking hazards to navigation. Properly delineated regulatory zones (as addressed in the Marine Zoning Action Plan) together with effective waterway management alert boaters of Special-use areas and promote compliance with sanctuary regulations, while well-marked zones also greatly enhance enforcement of sanctuary regulations.

Several inventories and databases are maintained to assess current levels of boating activity and evaluate trends in shallow-water resource damage. These inventories include several studies of propeller scar data, the location of all existing markers (permitted and unpermitted), the location and function of marine facilities, depth of entrance and exit channels from subdivisions throughout the Keys, and a vessel grounding database. In addition to the inventories, changes in boating activity are monitored as new marking systems are placed in sensitive areas. These inventories and databases, further described below, are maintained as tools for planners and resource managers to evaluate the effectiveness of waterway management. Full utilization of these tools will also lead to design improvements.

Through Damage Assessment and Restoration activities, the Sanctuary has conducted removal of grounded and sunken vessels and marine debris. The Sanctuary also works closely with Monroe County derelict vessel program that currently removes roughly 100 derelict vessels per year. Such debris threatens boater safety and has the potential to directly injure benthic resources and/or jeopardize water quality. Although state grant funds have dissolved in recent years, the county has directed Boating Improvement Funds to overcome this shortfall. Continued funding to remove derelict vessels and marine debris through alternative funding sources is critical for effective waterway management.

This action plan is inherently linked to and complimented by several other action plans. The Boat Access (strategy B.1) is included as a component of the Mooring Buoy Action Plan, however, the implementation scheme (description of activities and associated information) for the strategy is only included in this action plan. Waterway management/ marking activities (strategy B.4) such as the

vessel grounding database, prop-scar surveys, and derelict vessel removal are linked to the Damage Assessment and Restoration Action Plan. The planning and installation of regulatory markers are directly linked to the Regulatory and the Marine Zoning Action Plans. The regulations associated with the waterway marking/management strategy are included in the Regulatory Action Plan.

Goals and Objectives

The Sanctuary contains broad, shallow-water areas and significant reef tracts that require marking to improve navigation, increase boater safety, and therefore provide adequate resource protection.

Goals with respect to waterway marking-management include:

- Minimize resource damage from boating activities.
- Protect shallow-water resources.
- Provide reasonable and appropriate access while minimizing resource damage.
- Educating the public about safe and responsible boating practices.

To achieve these goals, the following objectives must be accomplished:

- Periodically assess the characteristics of boat use within the Sanctuary.
- Continually assess the extent and intensity of damage that occurs due to boating.
- Gain consensus on uniform aids to navigation, marking criteria, and regulatory marking systems.
- Promote and enhance a standardized waterway marking system.
- Develop waterway marking criteria that protect resources, ensure reasonable boating access, and allow for easy transit.
- Continue installing new markers and maintaining existing ones.
- Evaluate the effectiveness of the waterway marking system and regulatory zones.
- Educate the public about the waterway marking system.

Implementation

Responsible Institutions

The Monroe County Department of Marine Resources (DMR) has primary responsibility for implementing this action plan in State of Florida waters. USCG has primary responsibility for marking federal navigation channels, including the Intra-coastal Waterway, and shipping lanes. The Sanctuary is responsible for marking its regulatory zones. The Sanctuary also coordinates the Waterway Management/Marking Working Group and promotes cooperation among the different agencies. The success of the Action Plan depends on the cooperation of federal, state, county, local agencies, and the municipalities.

Personnel

About ten staff members from the Monroe County DMR and the assisting institutions were involved in the original implementation of the Waterway Management Action Plan. Two FWRI staff constructed the original GIS data layers. Three Monroe County DMR staff, including the county's Marine Planner, continue to be involved in developing this plan, submitting permit applications, developing installation and maintenance contracts, and directing the removal of derelict vessels and marine debris. Sanctuary staff is involved in the coordination of the Waterway Management Action Plan Working Group that includes Monroe County DMR, USCG, US Fish & Wildlife, and other

trustees. The Sanctuary mooring buoy team installs and maintains numerous regulatory markers addressed under this plan. FKNMS staff review permitting of markers and have recently been involved in the coordination of installing the 300-foot residential shoreline idle speed / no wake zones.

Contingency Planning for a Changing Budget

In December 2002, the County adopted a new ordinance that levies additional funds through the state vessel registration fee; about \$580,000 is available annually from Monroe County Boating Improvement Funds. State grants for the removal of derelict vessels were not renewed in recent years, so the county has used approximately \$150,000 of the Boating Improvement Funds to cover these activities in Monroe County. Many aids to navigation are funded, owned and maintained by the USCG, although recent changes in mission have limited resources available for waterway marking. The Sanctuary may purchase and install markers from vessel grounding settlements, but has not yet done so on a large-scale basis. The current level of funding will allow the program activities to be completed; additional funding simply shortens the time frame required.

Accomplishments

- Implemented a Channel Marking Master Plan, prepared by Monroe County Department of Marine Resources (DMR) and adopted by the Board of County Commissioners. The county portion of the plan is essentially complete, with over one hundred new markers installed, eight new channels marked and maintained, and three additional banks marked.
- Worked with owners of container vessel *M/V Houston*, USCG, and the Key West Propeller Club to place eight RACON beacons (also known as radar transponder beacons) on navigational aids along the reef tract from Loggerhead Key, in the Dry Tortugas National Park, to Fowey Rocks at the north end of Biscayne National Park. The beacons transmit a signal that is displayed on the radar screens of passing ships, warning them of the location of the coral reef tract. The Sanctuary used its authority to negotiate with the ship owners for funds to purchase 10 of these highly effective beacons. The remaining two beacons are being held as replacements for the existing beacons.
- Installed new danger markers in the Sambos Complex to protect Sanctuary Preservation Area reefs.
- Identified navigation problems in channels around Key West and the Middle Keys. As a result, an area north of Moser Channel through Red Bay Banks area has been remarked.
- Inventoried approximately 600 aids to navigation; included in a GIS database.
- Completed a boat-access survey of all marinas, boat ramps and docking facilities; data has been entered into a marine facilities GIS database.
- Surveyed entrance depths to all residential canals; available as GIS data layer.
- Provided updated waterway information to the *Upper Keys Boating Guide*, the locally produced *Teall's Guides*, and NOAA charts.
- Standardized, relocated, added, and when necessary, removed markers.
- Conducting on-going investigation of the root causes of prop scars in grass flats. Lignumvitae Key State Park seagrass banks have been assessed via aerial and ground surveys for vessel grounding trend analysis. A Statewide survey of prop scars has been published and a four-point action plan recommended channel marking, zoning, education, and enforcement.
- Streamlined permit process and marked residential subdivision shorelines as requested to delineate the 300 foot Sanctuary idle-speed-only/no-wake zone.

- Removed a dangerous obstruction at Marker 48 and determined that the pile at 9-foot stake is no longer a threat to navigation.
- Improved marking of shoal areas using 'Danger Reef' buoys at various reefs throughout the Sanctuary such as Newfound Harbor SPA, Looe Key back reef, Bicentennial Head.

Strategies

Waterway Management/Marking is comprised of two strategies, which are detailed below.

- Strategy B.1 Boat Access
- Strategy B.4 Waterway Management/Marking

Each of these strategies is detailed below. Table 3.13 provides estimated costs for implementation of these strategies over the next five years.

Table 3.13 Estimated Costs of the Waterway Management Action Plan.

Waterway Management Action Plan Strategies	Estimated Annual Cost (in thousands)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
B.1: Boat Access	-	-	-	50	-	50
B.4: Waterway Management/Marking+	335	352	370	390	408	1855
Total Estimated Annual Cost	335	353	370	440	408	1,905
* Contributions from outside funding sources also anticipated.						
+ Expenditures by the U.S. Coast Guard are not included in these estimates						

STRATEGY B.1 BOAT ACCESS

Strategy Summary

The purpose of this strategy is to conduct surveys to assess public and private boat access throughout the Sanctuary. By knowing these entry and exit sites, the team can ensure channel markings to and from these areas are adequate.

Activities (4)

(1) Periodically Update Marine Facilities Survey. A field survey of each boat access site in the Keys is periodically updated. Information includes the location, type of facility, services provided, intensity of use, and type of use.

Status: Implemented and on-going.

Implementation: Monroe County DMR completed the initial surveys in 1993¹ under contract with FWRI as part of the Channel Marking Project; a second survey was conducted in 1999². All data was turned over to FWRI for generation of GIS data layers. The inventory is updated by Monroe County DMR as marine facilities change or new ones come into existence. A comprehensive field survey will be conducted periodically.

(2) Survey Needs for Shallow-water Access. A survey³ was designed and completed that assessed the water depths at subdivision entrance points, and of shallow-water access impediments between the Atlantic Ocean, Florida Bay, and the Gulf of Mexico and subdivision entrances. The information collected is used to prioritize placement of corrective or additional markings.

Status: Implemented and on-going.

Implementation: Monroe County DMR completed the initial surveys under contract with FWRI as part of the Channel Marking Project. Florida DCA provides information on subdivisions and needs for shallow-water access. FKNMS provided boat support for some of the surveys.

(3) Input Survey Data into a GIS. Input all data developed through the on-site surveys into a GIS database to enable use of inventories for waterway management planning and by resource managers.

Status: Implemented.

Implementation: Monroe County DMR completed this activity for both databases under contract with FWRI. All data has been turned over to FWRI and is updated as data changes.

(4) Make Survey Results Available to Resource Managers and the Public. Initiate a process to make the information developed in the marine facilities survey and shallow water access survey available to resource managers in map, graphic, and written formats. As part of FWRI's obligation to maintain

¹ Marine Facility Survey conducted in 1993 by County DMR as part of Channel Marking Master Plan process. Also called the *Marinas* data layer.

² Fletcher survey. Data gathered, data entry on-going.

³ Survey of all subdivisions to determine which have four-foot access to bay and/or ocean. Conducted by DMR for Channel Marking Master Plan. Also referred to as *Subdivisions* GIS data layer.

data created as a result of activities carried out in the Sanctuary, this information will become more readily available over time.

Status: Implemented and on-going.

Implementation: Data is currently available through FWRI. Some of the data has been used for an *Upper Keys Boater's Guide*. (See Strategy W.28 in the Water Quality Action Plan.); additional data will be used by Monroe County DMR and FWRI for the Middle Keys and Lower Keys boater's guide.

STRATEGY B.4 WATERWAY MANAGEMENT/MARKING

Strategy Summary

The purpose of this strategy is to continue to promote and enhance a coherent waterway management and marking system throughout the Sanctuary to minimize resource damage from boating activities, promote safe navigation, and increase boater safety.

Activities (10)

(1) *Improve Coordination of the agencies involved in waterway management.*

Re-vitalize the Waterway Management Action Plan working group to renew active discussions of priorities in waterway marking and management.

Status: On-going.

Implementation: Working group was very active for several years after implementation of the Action Plan. Activity has tapered off in recent years; Sanctuary will coordinate the regular meeting and revitalization of this group.

(2) *Survey Damage from Propeller Scarring and Vessel Groundings.* Assemble aerial photography, visual observations, and databases of reported vessel grounding data to obtain a complete picture of damage to shallow water resources caused by prop-scars, keel grooves, blowholes, and vessel groundings. A database was assembled from published reports⁴. A statewide prop-scar survey was completed, compiled and published by FWRI in 1995⁵. NOAA, FWRI, FDEP and Monroe County have conducted additional aerial and on-water surveys. In addition, FWRI and the Sanctuary created the vessel grounding database⁶ from FWCC grounding citations. 'Hot spots' of resource damage can be illustrated by plotting the data. This data is then used to design/improve waterway marking schemes through partnering with USCG and Monroe County.

Status: Implemented and on-going.

Implementation: Propeller scar surveys have been compiled, and Monroe County, the Sanctuary and FDEP continue aerial and ground surveys of boating impacts. FWRI and the Sanctuary created the vessel grounding database and sanctuary staff update grounding data as they are reported. FWRI is the lead agency for propeller scarring surveys. Sanctuary maintains the vessel grounding database.

⁴ Kruer, C.R. 1994. Mapping Assessment of Vessel Damage to Shallow Seagrasses in the Florida Keys. A report to the Florida Dept. of Natural Resources and the Univ. of South Florida / F.I.O. 9p.

⁵ Sargent, F., T.J. Leary, D.W. Crewz, and C.R. Kruer 1995. Scarring of Florida's seagrasses: assessment and management options. FWRI technical report TR-1. 46p. Using low-level aerial surveys and photography, researchers characterized levels of light, moderate, and severe scarring. These areas were converted into a GIS data layer by FWRI.

⁶ Includes all seagrass and coral grounding cases that generated a FWCC citation; database maintained by FKNMS Damage Assessment and Restoration program.

(3) ***Inventory and Geo-reference Aids to Navigation and Regulatory Markers.*** A channel marker inventory⁷ has been designed to identify, characterize and geo-reference all known markers; information has been incorporated into a GIS data layer. Positions for aids to navigation maintained by local, state, and federal agencies are integrated into the database. Used in conjunction with the vessel-grounding database, an assessment can be made of where new markers may be needed and existing markers repositioned. Each agency has a separate inventory of regulatory markers they maintain; an effort to compile all regulatory markers will be made.

Status: Implemented and on-going. The inventory will take two years to update.

Implementation: The County DMR has this inventory as a GIS layer and verified all marker locations. Monroe County, NOAA, and USCG update the database to reflect changes in positions for aids to navigation.

(4) ***Enhance Channel Marking Aids to Navigation.*** This activity will enhance existing channel marking efforts. Based on much of the data collected and assessed as part of this plan, Monroe County implemented the Channel Marking Master Plan⁸, a comprehensive plan for all channels and markers in the county. The plan will be linked to channel marking schemes maintained by other local, state, and federal agencies. The DMR will continue to identify areas of concern and implement further enhancements as needed.

Status: This is an on-going activity. The county is funded for this activity through the Florida Boating Improvement Funds and other grants.

Implementation: Monroe County has essentially completed its portion of the Channel Marking Master Plan. This effort has greatly enhanced the channel marking within the county by installing over 100 new markers, maintaining eight new channels, and marking additional banks. Additional enhancements will be considered by DMR. Coordination of channel marking activities will be achieved through the Action Plan Working Group members participating in meetings of the local Marine and Port Advisory Committees, the SAC, and providing technical input to USCG.

(5) ***Assess Effectiveness of Channel Marking Master Plan.*** In addition to installing new channel markers, several studies have been designed to assess the effectiveness of newly marked channels. Assessment consists of three primary techniques: 1) using aerial photography to assess changes in benthic communities in discrete areas following modifications to a waterway marking scheme; 2) analysis of grounding information; and 3) numbers of complaints and/or other evidence that problems have been solved. Aerial overflights have been completed for several areas⁹ throughout the keys at various times and using a variety of methods. A coherent monitoring study was started by DMR in 1997 by gathering aerial photography for five study areas: Broad Creek, Tavernier Creek, Vaca Cut, Whale Harbor Channel, and Niles Channel. The channel markings for all of the study

⁷ Channel marker inventory compiled from USCG Light List and County data as part of the Channel Marking Master Plan. Existing channel markers were checked for exact location by Monroe County DMR. Data layer is referred to as the *ATONS* layer. In addition, an *Unpermitted Markers* data layer was compiled by Monroe County DMR during field surveys.

⁸ Channel Marking Master Plan for the Florida Keys, January 1998. Richard Jones, Channel Marking Planner. Submitted in fulfillment of DEP Agreement No. SWPP96-06 by the Monroe County Department of Marine Resources.

⁹ Areas that have aerial photographs gathered before 1996 include: the north end of Big Coppitt Key, Lower Sugarloaf Sound, Kemp Channel south of U.S. 1, the north end of Ramrod Key, and the Lignumvitae Aquatic Preserve area. Two of these areas, Lower Sugarloaf Sound and Lignumvitae, received channel markings.

areas, with the exception of Niles Channel, were improved between 1997 and 2000. Follow-up aerial surveys of the same areas are planned for 2005. The effectiveness of the new markings will be evaluated by changes in the shallow resources (mainly seagrasses) in these areas.

Status: Implemented and on-going.

Implementation: Monroe County is conducting pre- and post-project assessments of newly marked channels. Aerial overflights have been conducted in five areas. The vessel grounding database will also be used to assess the effectiveness of the plan.

(6) Enhance Reef Marking Aids to Navigation. Protection of the reef tract has been accomplished through several important marking improvements; however, significant and long lasting damage still occurs on the reef crest; further enhancements are needed. The Sanctuary staff will assist USCG in planning improvements and make recommendations based on trends in boating activity and resource damage. Continued coordination and enhancement of reef marking activities will be achieved through the Action Plan Working Group.

Status: Implemented and on-going.

Implementation: RACON beacons have been installed and have virtually eliminated large vessel groundings on the reef. At the request of FKNMS, reef markings were improved at Sambos complex by USCG. Further enhancements will be proposed through the Action Plan Working Group. The Sanctuary has lead responsibility to staff the working group and facilitate information exchange among agencies and citizen groups.

(7) Conduct Waterway Assessment and Marking System (WAMS) Survey. The US Coast Guard (USCG) has the primary responsibility for installing and maintaining markers in federally maintained channels, Hawk Channel, the old Intra-Coastal Waterway (ICW), on the bank reef crest, and shoal areas outside state waters. USCG has committed to conducting a WAMS study in the area to evaluate the effectiveness of federally maintained markers and management schemes. The Sanctuary staff will assist with the study however possible, and provide technical support such as output from the vessel grounding database.

Status: On-going.

Implementation: USCG has made several improvements in channel markings and reef crest markings. A formal WAMS process is in the planning stages. The County's Channel Marking Master Plan has several recommendations for improvements of federally maintained markers. Data from the survey will be used to plan future improvements to the marking system.

(8) Enhance use of Regulatory Markers and Information Signs. In addition to working with other agencies to mark channels, shoals and reefs with day boards, beacons and lights, the Sanctuary helps manage waterways through regulatory and zoning activities. The Sanctuary maintains over 100 wildlife management buoys (including some for other agencies), about a hundred preservation area and ecological reserve boundary buoys, and numerous danger markers near coral heads. Regulatory markers inform boaters of regulations for idle-speed/no-wake zones, vessel exclusion zones, and other zoning designations. In addition, several agencies install information signs at entry points to waterways throughout the Florida Keys.

Status: Implemented and on-going.

Implementation: The Sanctuary has the lead responsibility. Sanctuary staff install and maintain several hundred regulatory markers and numerous informational markers. The installation of regulatory markers is linked to the Marine Zoning and Regulatory Action Plans.

(9) Removal of Derelict Vessels, Marine Debris and other Waterway Obstructions. Another important activity for managing the waterways of the Florida Keys is the removal of abandoned vessels and marine debris that impede navigation, threaten public safety or harm the environment. Monroe County currently removes about 100 derelict vessels per year through an efficient removal program. USCG removes objects deemed to be hazards to navigation or significant threats of marine pollution. The Sanctuary works closely with both agencies to report and coordinate the removal of waterway obstructions. In some instances, particularly for problem projects where no agency has lead responsibility, the Sanctuary has located funds and contracted the removal of sunken vessels that were deemed to be a threat to sanctuary resources. This activity is related to the removal of grounded vessels under Damage Assessment and Restoration, Regulatory and Marine Zoning action plans.

Status: On-going.

Implementation: Monroe County has an efficient derelict vessel removal program. USCG is responsible for removing hazards to navigation. Sanctuary staff coordinate removal of debris and when needed reduce threat to sanctuary resources.

(10) Develop Guidelines for 100-Yard Idle-speed/No-wake Shoreline Markers. Guidelines will be developed for collecting information from homeowners and homeowner associations based on reporting requirements set forth by agencies involved in issuing permits to install regulatory markers in submerged lands. Permitting agencies include U.S. Army Corps of Engineers, FDEP and the U.S. Coast Guard. Sanctuary staff provides residential shoreline No-wake/Idle-speed permit information and requirements to homeowners and homeowner associations upon request. Sanctuary staff works with the public to seek the necessary approvals or exemptions from jurisdictional agencies. Generally, those desiring permits provide: approximate latitude and longitude coordinates for the area to be marked and the names, addresses and telephone numbers for adjacent homeowners. Permit requests are evaluated by need, resource impacts, and locations before being submitted for permit approval.

Sanctuary staff completes, files and pursues approvals from the agencies responsible for managing submerged lands, regulatory markers and regulations within the Sanctuary. Sanctuary staff seeks approvals/exemptions from jurisdictional agencies and works with agencies to complete permit application and obtain approvals. It is the responsibility of the homeowners and homeowner associations to initiate communications with contractors for buoy installation and maintenance.

Status: On-going.

Implementation: Currently, there are four permitted sites and 17 existing regulatory markers. The Upper Region resource manager and administrative staff are responsible for implementation of the activity.