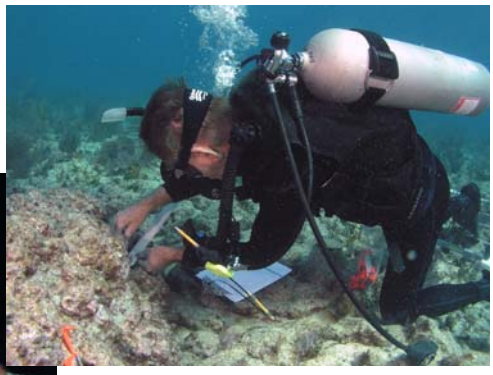
Florida Keys
National Marine Sanctuary
Revised Management Plan



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Atmospheric Administration

National Ocean Service

National Marine Sanctuary Program

This document is the revised management plan for the Florida Keys National Marine Sanctuary. It replaces the management plan that was implemented in 1996 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:

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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) 809-4700 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 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 1996 *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 in 1996; 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 recreation and livelihoods for approximately 80,000 residents.

The Sanctuary is 2,900 square nautical miles of coastal waters, including the 2001 addition of the Tortugas Ecological Reserve. The Sanctuary overlaps four national wildlife refuges, six state parks, three state aquatic preserves and has incorporated two of the earliest national marine sanctuaries to be designated, Key Largo and Looe Key National Marine Sanctuaries. Three national parks have separate jurisdictions, and share a boundary with the Sanctuary. The region also 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 vessel groundings, pollution, and overfishing. Threats to the Sanctuary also include indirect human impacts, which are harder to identify but are 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.

Management Plan Organization

Within this document, the tools that the Sanctuary uses to achieve its goals are presented in 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 1996 *Management Plan* generally retain their designations in this document. As in the 1996 plan, two or more action plans may share a strategy where their goals and aims converge. The 1996 plan can be accessed on the Sanctuary's Web site floridakeys.noaa.gov

Accomplishments and Highlights

The Sanctuary's programs and projects have made significant progress since the original management plan was implemented 1996. An overview of these accomplishments is provided in the Introduction. In addition, each action plan contains bulleted lists of accomplishments since the 1996 management plan was adopted.

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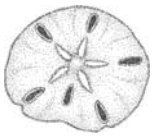
Acronyms

ACHP	Advisory Council on Historic Preservation
AGRRA	Atlantic and Gulf Rapid Reef Assessment Program
ASA	Abandoned Shipwreck Act
ATBA	Areas to Be Avoided
AWT	Advanced Wastewater Treatment
CAD	Computer Automated Dispatch
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERP	Comprehensive Everglades Restoration Plan
CFR	Code of Federal Regulations
CRCP	Coral Reef Conservation Program
DARP	Damage Assessment and Restoration Program
DEP	Florida Department of Environmental Protection
DTNP	Dry Tortugas National Park
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
F.S.	Florida Statues
FAC	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDCA	Florida Department of Community Affairs
FDHR	Florida Division of Historical Resources
FDOT	Florida Department of Transportation
FKNMS	Florida Keys National Marine Sanctuary
FKNMSPA	Florida Keys National Marine Sanctuary Protection Act
FPS	Florida Park Service
FR	Federal Register
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
FY	Federal Fiscal Year
GIS	Geographic Information System
GMD	Growth Management Division (Monroe County)
GMFMC	Gulf of Mexico Fishery Management Council
GPS	Global Positioning System
HAZMAT	Hazardous Materials
ICS	Incident Command Structure
ICW	Intra-coastal Waterway
IMO	International Maritime Organization
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

MRD	Marine Resources Division (Monroe County)
NCCOS	National Centers for Coastal Ocean Science
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMS	National Marine Sanctuary
NMSA	National Marine Sanctuary Act
NMSF	National Marine Sanctuary Foundation
NMSP	National Marine Sanctuary Program
NOAA	National Oceanic and Atmospheric Administration
NOAA/OLE	NOAA Office of Law Enforcement
NOS	National Ocean Service
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRDA	Natural Resource Damage Assessment Claims
NURC	National Undersea Research Center
OFW	Outstanding Florida Waters
OSDS	On-Site Disposal System
OSTDS	On-Site Sewage Treatment and Disposal System
PREP	National Prepared for Response Exercise Program
PSSA	Particularly Sensitive Sea Area
RECON	Reef Ecosystem Condition Program
REEF	Reef Environmental Education Foundation
RNA	Research Natural Area
RSMAS	University of Miami/Rosenstiel School of Marine and Atmospheric Science
SAFMC	South Atlantic Fishery Management Council
SAP	Science Advisory Panel
SAV	Submerged Aquatic Vegetation
SCR	Submerged Cultural Resources
SEFSC	Southeast Fisheries Science Center
SFWMD	South Florida Water Management District
SHIELDS	Sanctuary Hazardous Incident Emergency Logistics Database System
SPA	Sanctuary Preservation Area
SWIM	Surface Water Improvement and Management Act
SWM	Stormwater Management
TAC	Technical Advisory Committee
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
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAMS	Waterway Assessment and Marking System

WMA	Wildlife Management Area
WQPP	Water Quality Protection Program
WQSC	Water Quality Steering Committee



3.1 Sanctuary Science

The Sanctuary Science management division consists of two action plans: 1) Science Management and Administration and 2) Research and Monitoring. An effective science program requires management and administration that focuses on coordinating research and monitoring projects, working with partners to secure funding and other support, communicating findings of the program, advising Sanctuary managers of relevant findings both by the program and from other sources, and engaging in other regional science efforts. This coordination role is substantial because of participation by a large number of governmental, academic and non-governmental scientists. Permitting is a component of this action plan, along with other critical aspects of administering an effective and comprehensive science program.

The monitoring component of the Research and Monitoring Action Plan has established a baseline of information on spatial patterns and temporal trends in natural resources and other components of the ecosystem. Monitoring accrues value over time and requires long-term commitments of support. To improve our understanding of patterns and trends such as those documented by monitoring, research elucidates:

- Cause-and-effect relationships of specific ecological interactions;
- Processes that shape ecosystem structure and function; and,
- How management actions or other factors modify ecosystem processes.

Research and monitoring projects investigate fundamental processes and specific topics in support of science-based management. The resulting scientific findings are used to:

- Evaluate the effectiveness of the Sanctuary and its management actions;
- Distinguish between the effects of human activities and natural variability;
- Develop hypotheses about causal relationships that can then be investigated further; and,
- Validate models that guide management actions.

3.1.1 Science Management & Administration Action Plan

Introduction
Scientific research and monitoring in the FKNMS involves dozens of projects conducted by a wide range of academic institutions, state and federal agencies, and other organizations. It is essential to maintain overall coordination and management of this complex set of activities and the information it generates to achieve science-based management of Sanctuary resources and to effectively communicate findings of the science program to interested parties. In addition, many scientific studies require Sanctuary permits in order to proceed as they involve temporarily placing sampling apparatus on the sea floor.

Sanctuary managers regularly require technical advice on best-management practices of natural resources and other issues, and obtain this advice from a Technical Advisory Committee (TAC) comprised mainly of scientists conducting projects in the FKNMS. This advice has been of great value to managers. For instance comments from the TAC were essential to Sanctuary managers as they developed the FKNMS *Comprehensive Science Plan* (see Research and Monitoring Action Plan).

The Florida Reef Tract is a nationally significant ecosystem that lies at the southernmost margin of the greater South Florida ecosystem. "Upstream" management actions may impact Sanctuary resources, and FKNMS staff is responsible for including such considerations at a host of meetings and discussions. These include several major efforts in South Florida that are highly relevant to Sanctuary management such as the South Florida Ecosystem Restoration Task Force, the Comprehensive Everglades Restoration Plan, and the Florida Bay and Adjacent Marine Systems Science Program, which require participation by Sanctuary staff.

Goals and Objectives
The goal of the Science Management and Administration Action Plan is to define the elements of a coordinated science program that meets management objectives, informs the public about the state of Sanctuary resources, and provides relevant information for regional efforts such as Everglades restoration.

The objectives of this action plan are to:

- Facilitate and manage scientific and educational projects that entail prohibited activities;
- Broadly disseminate findings of the science program and use this information in regional science efforts;
- Utilize the technical expertise of the regional scientific community in Sanctuary decision-making; and
- Define the elements of a distributed data management strategy.

Implementation
The Science Management and Administration Action Plan will be implemented by the FKNMS, EPA, FWC, and DEP.

Accomplishments

There have been substantive accomplishments in scientific coordination, data collection and dissemination of findings since the 1996 management plan. Examples include:

- An independent Science Advisory Panel, convened in December 2000, to review the science program and make recommendations about future directions.
- *Florida Keys National Marine Sanctuary Comprehensive Science Plan*, addressing the Science Advisory Panel's recommendations and identifying research and monitoring priorities in support of specific management objectives (posted at the FKNMS Web site floridakeys.noaa.gov).
- In January 1998, a workshop of 50 social scientists and stakeholders was held to design the Socioeconomic Research & Monitoring Program. Go to marineeconomics.noaa.gov/SocmonFK/keys.html for Goals and Objectives and products developed to date.
- The Tortugas 2000 process for designing the Tortugas Ecological Reserve relied heavily on compilation of existing research and new characterization studies in physical oceanography, natural resources, and human dimensions (floridakeys.noaa.gov/tortugas/welcome.html).
- A symposium at NOAA headquarters in 2001, conducted to present findings of the monitoring programs and associated projects to a broad audience of managers, scientists, and other interested parties.
- A session on marine ecosystems of the Florida Keys at the 2003 *Greater Everglades Ecosystem Restoration Science Conference.* The half-day session included 10 oral presentations covering a wide range of topics.
- A 2004 colloquium, "Connectivity: Science, People, and Policy in the Florida Keys National Marine Sanctuary," to engage the public about recent scientific findings regarding resource condition and linkages between natural resources, socio-economic use, and management challenges. A proceedings volume of presentations and panel discussions at the two-and-a-half-day meeting will be published in the National Marine Sanctuary Program's Conservation Series (sanctuaries.nos.noaa.gov/science/conservation/welcome.html).
- Staff helped organize a special symposium on Caribbean Connectivity at the 2006 annual meeting of the Gulf and Caribbean Fisheries Institute, which included a day of scientific presentations and a hands-on workshop on remote-sensing tools for managers. A set of papers will be published in the National Marine Sanctuary Program's Conservation Series (sanctuaries.nos.noaa.gov/science/conservation/welcome.html).
- Reports on findings of the Science Program including the Water Quality Protection and Marine Zone Monitoring Programs (posted at the FKNMS Web site floridakeys.noaa.gov). The 2002-03 report was published in the National Marine Sanctuary Program's Conservation Series (sanctuaries.nos.noaa.gov/science/conservation/welcome.html).
- Participation in South Florida, National, and International committees including the South Florida Ecosystem Restoration Task Force's Working Group, Florida Bay and Adjacent Marine Systems Program Management Committee, Southern Florida Shallow-Water Coral Ecosystem Mapping Implementation Team's Steering Committee, Comprehensive Everglades Restoration Plan Project Delivery Teams, Florida Reef Resilience Program's Steering Committee, Florida Oceans and Coastal Resources Council, Atlantic *Acropora* Biological Review Team and Recovery Team, U.S. Coral Reef Task Force, U.S. Climate Change Science Program's Synthesis and Assessment Product 4.4 (Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources), CORALINA International Advisory Board, and Organizing Committee for the 11th International Coral Reef Symposium.

- Presentations at regional, national and international conferences and workshops.
- Publications in peer-reviewed journals, books, and conference proceedings.

Strategies

There are five strategies in this Action Plan:

- B.11 Issuance of Sanctuary Research Permits
- W.29 Dissemination of Findings
- W.32 Maintaining a Technical Advisory Committee
- W.34 Regional Science Partnerships and Reviews
- W.35 Data Management

Each of these strategies is detailed below. Table 3.2 provides estimated costs for implementation of each strategy over the next five years.

Table 3.2 Estimated Costs of the Science Management and Administration Action Plan

Science Management and Administration Action Plan Strategies	Estimated Annual Cost (in thousands)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
B.11: Issuance of Sanctuary Research Permits	20	20	20	20	25	*105*
W.29: Dissemination of Findings	15	15	15	15	20	*80*
W.32: Maintaining a Technical Advisory Committee	10	10	10	10	15	*55*
W.34: Regional Science Partnerships and Reviews	60	60	65	65	70	*320*
W.35: Data Management	60	60	65	65	70	*320*
Total Estimated Annual Cost	*165*	*165*	*175*	*175*	*200*	880

* Contributions from outside funding sources also anticipated.

STRATEGY B.11 ISSUANCE OF SANCTUARY RESEARCH PERMITS

Strategy Summary

This strategy allows researchers to conduct prohibited activities if these activities further highly beneficial research and monitoring in the Sanctuary. Research activities that are not prohibited are maintained in a voluntary research registry. Permits are monitored and their provisions enforced (see also Strategy R.1 in the Regulatory Action Plan, 15 CFR 922.166, and the Sanctuary Web site floridakeys.noaa.gov/research_monitoring/permits.html).

Activities (1)

(1) Continue Research Permitting Program. Sanctuary staff continues to manage, authorize, and enforce the permitting program and review all permit applications. Strategy R.1 in the Regulatory Action Plan further describes the full permitting program. The FWC and Monroe County also issue permits for certain activities within their jurisdictions and staff coordinates with these programs.

> *Status:* On-going.
> *Implementation*: When determining whether to issue a research permit, the potential for damage is compared to expected benefits. Research that may result in resource alteration must be of the highest quality and be considered highly beneficial. Staff may request a committee of coral experts to review applications to collect live coral. Information and forms required for a research permit request are posted at the Sanctuary's Web site (floridakeys.noaa.gov/research_monitoring/permits.html). The results of permitted research are evaluated through a peer review. The Sanctuary is the lead agency, in collaboration with the DEP, FWC and Monroe County.

STRATEGY W.29 DISSEMINATION OF FINDINGS

Strategy Summary

This strategy will develop a program to synthesize and disseminate scientific research and monitoring results, including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals. It will help disseminate research findings among scientists, resource managers, and the general public.

Activities (5)

(1) Develop Periodic Reports on Sanctuary Health. This activity will create Florida Keys National Marine Sanctuary Condition reports for the general public. The reports will include up-to-date information on the status and trends of water quality, critical habitats, and species of particular interest. The reports will review the effectiveness of marine zoning in protecting biodiversity, sensitive habitats, fisheries resources and in modifying use patterns and user perceptions. The reports will also consider the state of the Sanctuary in the context of other tropical marine ecosystems at regional and global scales. Reports will be prepared periodically as the Science Program produces significant new information.

Status: Work on the first FKNMS Condition Report will begin in 2007. In addition, periodic science reports are posted on the Sanctuary's internet site.
Implementation: FKNMS is the lead agency.

(2) Continue to Communicate Findings of the Science Program. Staff conducts symposia and prepares newsletter articles, public presentations, annual reports, and other written and oral materials.

Status: On-going.
Implementation: FKNMS staff publish a newsletter (*Sounding Line*) (refer to the Outreach and Education Action Plan) and make frequent public presentations. Reports of findings of the science program are posted at the FKNMS Web site (floridakeys.noaa.gov). FKNMS is the lead agency. Collaborating organizations have primary roles.

(3) Establish an Information Exchange Network. This activity would develop a compendium of on-going and planned research to be updated periodically.

Status: No action has been taken to develop a compendium; however, a summary of on-going monitoring and research is posted at the FKNMS internet site.
Implementation: A FKNMS Science Advisory Panel (December 2000) reviewed existing science projects and recommended future action. Based on that review, a *Final Draft Comprehensive Science Plan* has been developed and the Technical Advisory Committee has provided further comment and review. The plan is posted at the FKNMS Web site (floridakeys.noaa.gov). A second review of the FKNMS science program will take place in 2007. FKNMS is the lead agency; the EPA has a primary role.

(4) Sponsor Conferences. This activity involves sponsoring conferences to keep scientists and managers informed on research and monitoring results and existing or planned management actions.

Status: On-going.
Implementation: FKNMS and EPA staff convened a meeting in December 2000 at which principal investigators presented all elements of the science program to an independent panel for peer review. In December 2001, FKNMS, EPA, State of Florida, and other agency partners hosted a symposium in the NOAA Main Auditorium entitled "The Florida Keys National Marine Sanctuary: An Ecosystem Report Card." This one-day symposium presented results from status and trends monitoring of coral reefs, seagrasses, and water quality, and also reviewed performance of fully protected marine zones on benthic communities and fishery populations. Principal investigators from each monitoring project were present to discuss their findings and answer questions.

In August 2004, FKNMS hosted a colloquium in Key West entitled "Connectivity: Science, People and Policy in the Florida Keys National Marine Sanctuary." This two-and-a-half-day meeting included five plenary talks and panels on the topics of regional connections, connectivity between people and marine fishery resources, climate change, resource conditions, water quality, coral and seagrass habitats, human perspectives, and management tools. A proceedings volume will be published.

The FKNMS helped to organize a special symposium, "Caribbean Connectivity," at the annual meeting of the Gulf and Caribbean Fisheries Institute in November 2006. The special symposium included a full day of presentations and a day-long, hands-on workshop designed to train resource managers in the use of remote sensing tools.

FKNMS is the lead agency; the EPA and FWC have primary roles.

(5) Support Journal Publication. This activity involves funding the publication of research and monitoring findings in peer-reviewed scientific and management journals, as needed. Some publications have no associated fees.

Status: On-going.
Implementation: Recent publications have appeared in *Gulf and Caribbean Research, Marine Technology Society Journal, Proceedings of the 2003 Georgia Basin/Puget Sound Research Conference, Ecological Restoration*, a chapter in *Estuarine Indicators, Bulletin of Marine Science, Journal of Environmental Management, Journal of Leisure Research, New Zealand Journal of Marine and Freshwater Research* and *Ocean and Coastal Management.* NOAA is the lead agency; the EPA and FWC have primary roles.

STRATEGY W.32 MAINTAINING A TECHNICAL ADVISORY COMMITTEE

Strategy Summary
This strategy will maintain a previously established Technical Advisory Committee composed of scientists and other staff from federal agencies, state agencies, academic institutions, and private, non-profit organizations as well as knowledgeable citizens. Its purpose is to advise the EPA, DEP and the Sanctuary on the design and prioritization of water quality and ecological research and monitoring.

Activities (1)

(1) Convene Meetings of a Technical Advisory Committee. The Technical Advisory Committee meets once or twice per year to advise FKNMS managers. The EPA develops agendas in consultation with the FKNMS, DEP, South Florida Water Management District (SFWMD), Monroe County, and other members of the Water Quality Protection Program (WQPP) Management Team.

Status: On-going. Periodic meetings are held as the Committee determines a need or as requested by the WQPP Management Team. The most recent meeting was held in the summer of 2006.
Implementation: The EPA and DEP are the lead agencies; the FKNMS has a primary role.

STRATEGY W.34 REGIONAL SCIENCE PARTNERSHIPS AND REVIEWS

Strategy Summary
FKNMS staff actively participate in science-related committees, review panels, and other groups that collaborate on science issues pertaining to South Florida, coral reefs, resource management, and other topics. This strategy ensures that consideration of Sanctuary resources is included in regional

planning, that there is broad-based recognition of scientific findings concerning the Sanctuary, and that Sanctuary expertise is shared with partners.

Activities (1)

(1) Continue Regional Science Partnerships and Reviews. Several FKNMS staff are members of or participate in the U.S. Coral Reef Task Force, South Florida Ecosystem Restoration Task Force's Working Group, Comprehensive Everglades Restoration Plan Project Delivery Teams, Florida Bay and Adjacent Marine Systems Program Management Committee, Florida Reef Resilience Program Steering Committee, Southern Florida Shallow Water Coral Ecosystem Mapping Implementation Steering Committee, meetings of regional Coastal Ocean Observing Systems and their Regional Associations, the Florida Ocean and Costal Resources Council, grant proposal review panels, and other committees and panels. In addition, staff review numerous permit proposals, management plans, science plans, etc such as the Everglades National Park General Management Plan.

Status: On-going.
Implementation: FKNMS staff regularly participate in meetings of various committees and panels and review various documents as noted above. NOAA and FWC are the lead agencies; the EPA and DEP have primary roles.

STRATEGY W.35 DATA MANAGEMENT

Strategy Summary
As technologies evolve, research and monitoring programs become more complex and the volume of information increases. It is clear that a distributed data management strategy is most appropriate. This strategy centers around an internet-based data search engine that points interested parties to Internet sites that serve the requested databases, maps, text files, etc. For the most part, these internet sites would be maintained by the information creators to ensure data currency and accuracy. This strategy is being carried out in accordance with recommendations of the Technical Advisory Committee, the Florida Oceans and Coastal Resources Council and FWC. It evolved from W.33: Ecological Research and Monitoring (Activity 2 – Establish an Ecological Information System) and W.28: Regional Database.

Activities (3)

(1) Continue the Ecological Information System. Spatial and temporal information about ecological resources has been incorporated into an existing South Florida Geographic Information System (GIS). Information summarizing benthic habitats, species distributions and life histories, water quality, etc., is included. These are essential baseline data for effective ecological monitoring. Additionally, information will be derived from existing sources such as the Minerals Management Service / Marszalek / Dade Department of Environmental Resource Management maps and the NOAA/FWC benthic habitat maps, all of which have been digitized and incorporated into the FWC/Fish and Wildlife Research Institute's Marine Resources GIS.

Status: On-going.
Implementation: The FWC and other agencies, pending funding, have several separate but related projects underway that should meet this need. For example, the FWRI worked with the US Army Corps of Engineers (USACE) and Florida Department of Community Affairs (FDCA) on the Florida Keys Carrying Capacity Study, which generated new scenario-based

information. The carrying capacity project incorporated comprehensive growth plans, human-use, and environmental data into a model designed to facilitate growth management. Monroe County is also developing a GIS for land-use analysis, with some marine applications. Pending funding, the FWC would be the lead agency for integrating the data for easy access by FKNMS staff over the internet using map servers and internet-served databases.

(2) Establish a Data Management Protocol. This protocol will standardize the way investigators manage data by creating a single approach to maintaining, storing, and accessing digital data. For many years, researchers have maintained and analyzed their data as they saw fit. With research shifting focus from single organisms to ecosystems, the need arises to integrate multiple databases. In addition, a dynamic, distributed system is necessary for annual data gathering and archiving. A regional database and data management system will also be established for recording research results and the biological, physical, and chemical parameters associated with monitoring programs.

Status: No action has been taken to complete the protocol.
Implementation: Pending funding, the FWC will continue to produce annual CD-ROMs for the Water Quality Protection and Marine Zone Monitoring Programs. Some principal investigators are posting data and reports at individual Web sites. FKNMS will coordinate to the greatest extent possible with the NMSP IMaST group to ensure appropriate consistency with NMSP internal protocols. The FWC is the lead agency; the EPA and FKNMS have primary roles.

(3) Develop a Geographic Information System. This activity seeks to use photographs of sea bottom features near coral reefs to provide baseline data on coral cover at a particular time. The photographs provide information on the location of monitoring stations in relation to benthic cover and assist mooring-buoy specialists in pinpointing the location of buoy anchors. A comparison between 1995 and 1999 color infrared photographs shows seagrass damage over time, and turbidity increases caused by boats crossing over shallow areas. GIS analysis also shows the status of nearshore areas and details of the destruction caused by vessel groundings. A GIS will provide satellite views of the entire Florida Keys, showing areas of monitoring efforts, and nearshore aerial photographs of research areas where benthic habitat studies are being conducted.

Status: On-going.
Implementation: Staff and volunteers assist with GIS software and imagery. FKNMS has the lead for this activity and works with staff from other NOAA offices as well as partner agencies to develop layers as needed. Recent partnership discussions include potential projects with Monroe County Marine Resources Division.