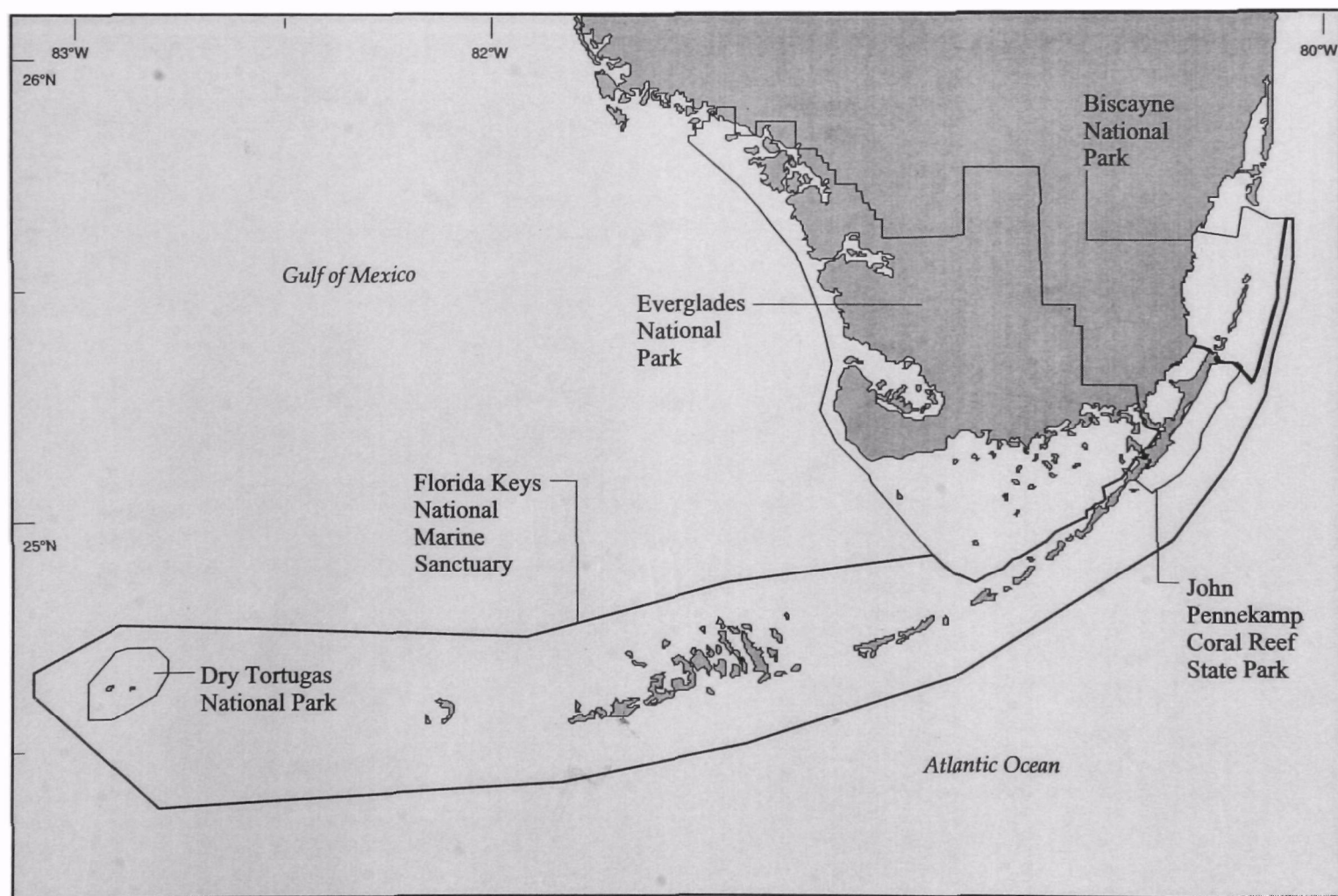


Water Quality Protection Program For The Florida Keys National Marine Sanctuary

First Biennial Report to Congress 1996



Map of the Florida Keys National Marine Sanctuary and South Florida

THE PURPOSE OF THE WATER QUALITY PROTECTION PROGRAM:

To recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of the Sanctuary. This includes restoration and maintenance of a balanced, indigenous population of corals, shellfish, fish and wildlife, and recreational activities in and on the water.

Water Quality Protection Program Steering Committee

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Cover graphic and map of the Sanctuary provided
by the Strategic Environmental Assessments
Division, Office of Ocean Resources Conservation
and Assessment, National Oceanic and
Atmospheric Administration

**FROM THE CO-CHAIRS
WATER QUALITY PROTECTION PROGRAM
STEERING COMMITTEE**

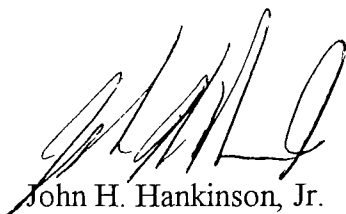
On behalf of the Water Quality Protection Program (WQPP) Steering Committee, we are pleased to present this first Biennial Report to Congress on the WQPP for the Florida Keys National Marine Sanctuary. As directed by Congress, the U.S. Environmental Protection Agency (EPA) and the State of Florida, represented by the Florida Department of Environmental Protection (FDEP), developed a comprehensive WQPP for the Sanctuary.

The WQPP document was developed in consultation with the National Oceanic and Atmospheric Administration (NOAA) and was delivered to NOAA in May 1993 for incorporation into the Comprehensive Management Plan for the Sanctuary. NOAA's plan was released for public review in April 1995. Various Federal, State, and local government agencies and representatives from the academic community, environmental groups, and the general public participated in the development of the WQPP document. The untiring efforts of the numerous individuals who worked on the WQPP demonstrate their commitment to the environment and the protection of the very special Florida Keys ecosystem. The unprecedented cooperation and coordination among the various entities which worked together resulted in a document that has been highly praised and has already demonstrated its usefulness.


Using Federal and State funds, EPA and the State of Florida have initiated a comprehensive water quality monitoring and research/special studies program as required by the Florida Keys National Marine Sanctuary and Protection Act of 1990. We are committed to dedicating the funds and other resources required to implement this critical component of the WQPP. Other recommendations in the WQPP document are being implemented by various Federal, State, and local government agencies.

The groundwork has been laid for the successful restoration and maintenance of the water quality and other resources of the Sanctuary. However, the future of the Florida Keys ecosystem depends on the will and determination of all the citizens of south Florida and the coordinated efforts of many Federal, State, and local government agencies. Our commitment to protect and preserve the living and other resources of the Sanctuary must endure.

Sincerely,



John H. Hankinson, Jr.
Regional Administrator
U.S. Environmental Protection Agency
Region 4



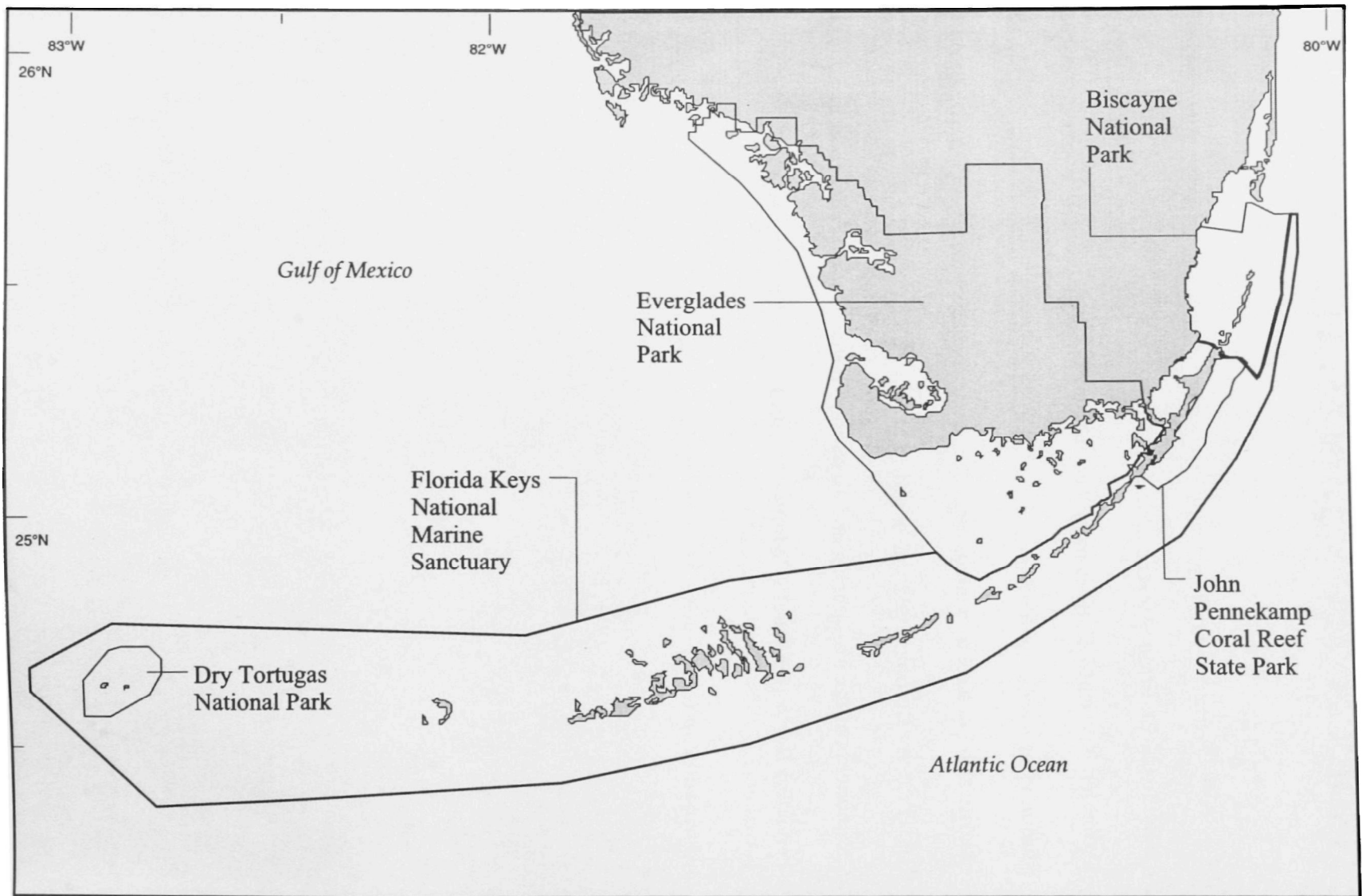
Edwin J. Conklin, Jr.
Director
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Florida Dept. of Environmental Protection

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Map of the Florida Keys National Marine Sanctuary and South Florida

Introduction

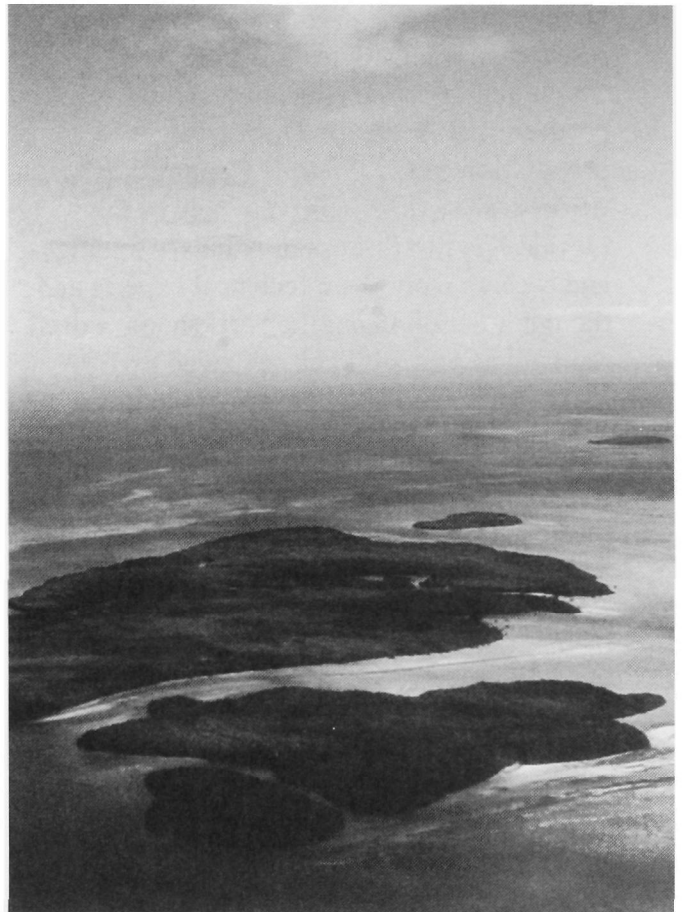
The Florida Keys National Marine Sanctuary (FKNMS) was created with the signing of Public Law 101-605, Florida Keys National Marine Sanctuary and Protection Act, on November 16, 1990. Included in the Sanctuary are 2,800 square nautical miles of nearshore waters extending from just south of Miami to the Dry Tortugas.

The Florida Keys extend approximately 220 miles southwest from the southern tip of the Florida peninsula. Adjacent to the Florida Keys land mass are located spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. These marine environments support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and esthetic values which give this area special national significance. These environments are the marine equivalent of tropical rain forests in that they support high levels of biological diversity, are fragile and easily susceptible to damage from human activities, and possess high value to human beings if properly conserved.

Recognizing the critical role of water quality in maintaining Sanctuary resources, Congress directed the U.S. Environmental Protection Agency (EPA) and the State of Florida, represented by the Florida Department of Environmental Protection (FDEP), to develop a Water Quality Protection Program for the Sanctuary. This is the first such program ever developed for a marine sanctuary.

The purpose of the Water Quality Protection Program is to recommend priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of the Sanctuary. This includes restoration and maintenance of a balanced, indigenous population of corals, shellfish, fish and wildlife, and recreational activities in and on the water.

In addition to corrective actions, the 1990 Act also requires development of a water quality monitoring program and provision of opportunities for public participation in all aspects of developing and implementing the program.



Steven Frink

Background

The Water Quality Protection Program was developed in two phases. During Phase I, information was compiled and synthesized on the status of the Sanctuary's natural environment (EPA 1992). Priority problems were identified through this literature review and through discussions with scientists and other participants in technical workshops. The Phase I effort included assessments of the Sanctuary's water quality, coral community, submerged and emergent aquatic vegetation, nearshore and confined waters, and spills and hazardous materials.

Phase II focused on developing options for corrective action, developing a water quality monitoring program and associated research/special studies program, and developing a public education and outreach program (EPA 1993). During the preparation of the Phase II Report, two EPA/FDEP workshops were held in the Florida Keys to discuss preliminary findings and receive input from technical experts and the public. Following the workshops, a draft report was prepared and reviewed by EPA, FDEP, other federal and state government agencies, and the general public.

The information in the Phase I and II Reports was used to develop the recommendations included in the Water Quality Protection Program Document. The Document includes an executive summary, program description, rationale for action, detailed action plan, and a set of initial recommendations for corrective action, monitoring, research/special studies, and public education/outreach.

The Florida Keys National Marine

Sanctuary and Protection Act of 1990 requires that the National Oceanic and Atmospheric Administration (NOAA) develop a Comprehensive Management Plan for the Sanctuary and implement regulations to protect Sanctuary resources. Water quality issues and associated problems are a major component of the management plan. The Water Quality Protection Program was developed in coordination with NOAA and the draft Water Quality Protection Program document was submitted to NOAA in May 1993 for inclusion in the Comprehensive Management Plan. NOAA's Plan, which was released for public review in April 1995, includes an environmental impact statement.

The Water Quality Protection Program is one part of a much larger ongoing effort by federal and non-federal agencies to restore the South Florida ecosystem, including the Everglades and Florida Bay. The federal efforts are coordinated by the South Florida Ecosystem Restoration Task Force.

Program Description

The Water Quality Protection Program consists of an administrative framework and a set of recommendations for corrective action, monitoring, research/special studies, and public education/outreach.

Administrative Framework

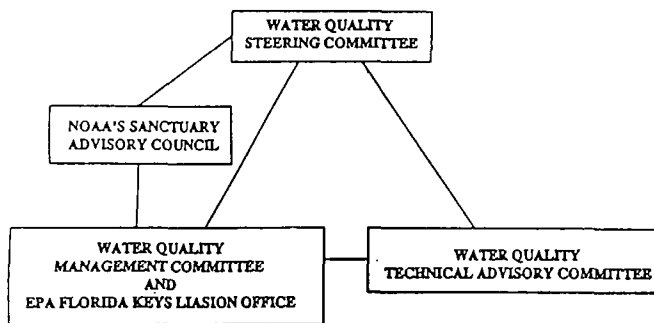
The Water Quality Protection program is administered by EPA and FDEP, in cooperation with NOAA.

The National Marine Sanctuaries Program Amendments Act of 1992 specifies

the establishment of a Steering Committee (see inside front cover), Technical Advisory Committee (see inside back cover), and an EPA Florida Keys Liaison Office to assist and support the implementation of the Program.

A Management Committee has also been established to coordinate and facilitate the activities of the Steering Committee and Technical Advisory Committee.

Figure 1. Administrative Framework for the Water Quality Protection Program



Through the administrative framework, EPA and FDEP can directly implement recommendations for monitoring and research/special studies, and can work with NOAA to develop and implement public education/outreach programs for water quality. In addition, EPA and FDEP are working with the larger framework of government agencies, institutions, organizations, and individuals responsible for Sanctuary management to implement recommendations for corrective actions. EPA and FDEP are also responsible for evaluating progress and developing new or revised approaches as necessary.

The Water Quality Steering Committee was established by EPA and FDEP. The purpose of the Steering Committee is to set

guidance and policy for the development and implementation of the WQPP. Membership includes representatives of EPA, FDEP, NOAA, National Park Service, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, Florida Department of Community Affairs, South Florida Water Management District, Florida Keys Aqueduct Authority, local government (three), and knowledgeable citizens (three).

The Technical Advisory Committee (TAC) was established by EPA, FDEP, and NOAA. The purpose of the TAC is to advise the Steering Committee and to assist in the design and prioritization of programs for monitoring and research/special studies. The TAC is composed of scientists from federal and state agencies, academic institutions, and private nonprofit organizations, as well as knowledgeable citizens.

The Florida Keys Liaison Office will be located in the State of Florida. The Liaison Office staff is to perform the following activities:

- Assist and support the implementation of the Program.
- Assist and support local, state, and federal agencies in developing and implementing specific actions.
- Coordinate EPA actions with other federal, state, and local government agencies in developing strategies to maintain, protect, and improve water quality in the Keys.
- Provide for public review and comment on the Program and

implementing regulations.

A Management Committee has been established to coordinate and facilitate the activities of the Steering Committee and TAC. The Management Committee is a working group with the following responsibilities:

- Plan, prepare agenda for, and coordinate Steering Committee and TAC meetings.
- Advise the Steering Committee on all matters for which it has direct responsibilities, making recommendations for approval or disapproval.
- Plan and develop budgets and schedules associated with overall Program implementation.
- Monitor the progress of Program activities to ensure that schedules are adhered to and objectives accomplished.



Components

The Water Quality Protection Program consists of the following four interrelated components.

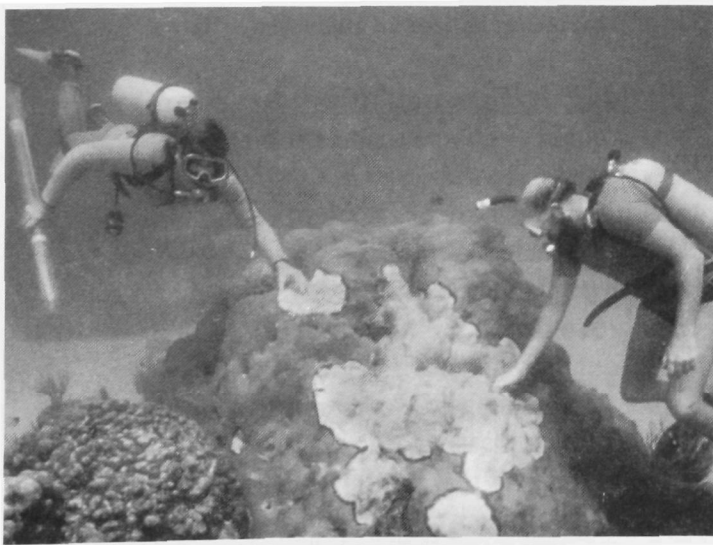
- **Corrective Actions** - These are actions to reduce water pollution directly by using engineering methods, prohibiting or restricting certain activities, modifying existing regulations, and/or focusing enforcement to meet the objectives of the Program. Other actions are designed to make the regulatory/management system work more efficiently, possibly leading indirectly to reduced pollution.
- **Monitoring** - A comprehensive, long-term water quality monitoring program has been designed to provide information about the status and trends of water quality and biological resources in the Sanctuary. The monitoring program will also provide information about the effectiveness of remedial actions to reduce pollution.
- **Research/Special Studies** - The purpose of the research/special studies program is to identify and understand cause/effect relationships involving pollutants, transport pathways, and biological communities of the sanctuary. Special studies will provide information to address specific management questions and concerns, improve our general understanding of Sanctuary ecosystems, develop predictive models, and develop

monitoring tools and methodologies.

- **Public Education/Outreach** - The purpose of this component is to increase public awareness of the Sanctuary, the Water Quality Protection Program, and pollution sources and impacts on Sanctuary resources. This component also involves soliciting and incorporating public input in the design and implementation of the Program. Successful implementation of the numerous corrective actions will depend, to a large degree, on the fulfillment of this component.

Ecological Problems

The variety and magnitude of recent ecological problems in the Sanctuary and adjacent areas (e.g., Florida Bay) indicate that existing management actions are not adequate to prevent continuing environmental degradation.



Harold Hudson - NOAA

Although knowledge of cause/effect relationships is incomplete, there is potential for severe damage to Sanctuary resources if a comprehensive program to control pollution and improve water quality is not implemented. The following conclusions are based on the Phase I Report.

- The Sanctuary is part of a complex hydrologic/ecological system that includes the Everglades, Florida Bay, and other adjacent areas. Major environmental problems are occurring in Florida Bay, including seagrass die-off, sponge die-off, mangrove decline, and algal blooms, and the Bay is now in a state of crisis. Historical alterations in the quantity and timing of freshwater flow from the Everglades are believed to be the major cause. Action is needed in Florida Bay to avoid effects on Sanctuary water quality and resources.
- Water quality in confined waters (e.g., dead-end canals, marinas) is deteriorating and is potentially deteriorating in nearshore waters, and this degradation may be affecting biota inhabiting nearshore areas.
- Septic leachate from on-site sewage disposal systems (OSDS) is degrading water quality in confined waters and may be degrading water quality in nearshore waters.
- Sewage discharges from live-aboard vessels are degrading water quality in nearshore and confined waters.
- Discharges from sewage treatment/

package plants into nearshore waters may be degrading nearshore water quality.

- Decomposition of weed wrack and other windblown organic debris is probably degrading water quality in some canals.
- Stormwater runoff is degrading confined water quality and may be degrading nearshore water quality.
- Water-temperature fluctuations, anthropogenically increased nutrient levels, reduced transparency, sedimentation, contamination from spilled oil and petroleum products, pesticides, herbicides, trace elements, and heavy metals may be affecting Sanctuary coral reef communities.
- Degraded water quality is probably adversely affecting submerged and emergent aquatic vegetation in the Sanctuary.

Taken together, these observations indicate that action is needed to control pollution sources and improve water quality in the Florida Keys in order to restore and maintain Sanctuary resources. Actions should include engineering and/or management measures, as well as education/outreach programs to reduce pollution.

Pollution Sources Targeted for Action

The Phase I Report identified and discussed pollution sources potentially affecting Sanctuary water quality and resources. The pollution sources discussed below are targeted for corrective actions, research/ special studies, monitoring, and public education/outreach activities.



Florida Marine Research Institute

Florida Bay/External Influences - Severe water quality and ecological problems have developed in Florida Bay in recent years, and the Bay is now in a state of crisis. Problems include a massive seagrass die-off, phytoplankton blooms, sponge die-offs, mangrove die-backs, and all of the potential cascading effects of these phenomena. Since 1987, much of Florida Bay has been affected by a massive, unprecedented seagrass die-off that has left tens of thousands of acres of denuded sediments.

Through the resulting sediment resuspension and nutrient release, the seagrass die-off may be the cause of massive phytoplankton blooms that have affected the Bay during recent years. Sponge die-offs caused by phytoplankton blooms may have serious impacts on juvenile spiny lobsters, which reside by day under sponges for protection from predation.

Most scientists believe that recent ecological problems in Florida Bay are the result of a long-term reduction in freshwater flow from the Everglades to the Bay. The mechanism has not been documented, but high salinities and a long-term change from an estuarine to a marine system are believed to be contributing factors.

The problems in Florida Bay must be viewed as a potential threat to water quality and resources in the Sanctuary. Water quality and natural resources in the Bay are tightly linked to those of the Sanctuary. According to some coral experts, Florida Bay water may be contributing to coral declines in the Sanctuary. The need for action to deal with water delivery problems in Florida Bay has been strongly stressed by workshop participants and other scientists during the development of the Water Quality Protection Program.

Domestic Wastewater - Domestic wastewater discharges originating from land-based sources account for about 70% of the wastewater/ stormwater nutrient loadings from within the Sanctuary. Several studies

Table 1. Estimated Nutrient Loadings

| Source | Total Nitrogen | | Total Phosphorus | |
|---|----------------|------------------|------------------|------------------|
| | lb/day | Percent of Total | lb/day | Percent of Total |
| OSDS | 932 | 39.2 | 226 | 41.6 |
| Cesspits | 283 | 11.9 | 100 | 18.4 |
| Package plants (groundwater discharge) | 758 | 31.9 | 152 | 27.9 |
| Municipal wastewater treatment plants (surface discharge, NPDES) | 320 | 13.5 | 36 | 6.6 |
| Live-aboards | 84 | 3.5 | 30 | 5.5 |
| Total | 2377 | 100 | 544 | 100 |

have suggested relationships between on-site sewage disposal system (OSDS) use and nutrient levels in nearshore and offshore waters of the Sanctuary. Other data have also indicated a relationship between high OSDS densities and poor water quality conditions in semi-confined waters such as dead-end canals.

In the Florida Keys, domestic wastewater facilities include about 30,000 regulated OSDS, 10,000 unregulated cesspits, over 200 small package plants, and two municipal wastewater treatment plants (City of Key West and City of Key Colony Beach). Effluent from the package plants is disposed of via shallow injection wells. Estimated nutrient loadings from these sources and live-aboard boaters are summarized in Table 1, page 11. Based on these estimates, about 51% of the total wastewater nitrogen and 60% of total wastewater phosphorus loadings come from OSDS and cesspits.

Extensive use of OSDS and cesspits, combined with severely limited soils and compact clustering of development, have resulted in substantial nutrient loadings to groundwater and surface water in the Florida Keys. Even with the limited data available, it is clear that continued reliance on high densities of conventional OSDS in severely limited substrates is not compatible with restoring and maintaining the excellent water quality necessary to support Sanctuary resources.

In the short term, action is needed to eliminate cesspits and establish an inspection program to ensure that OSDS are operating properly. Over the long-term a comprehensive approach to improving wastewater treatment in the Florida Keys

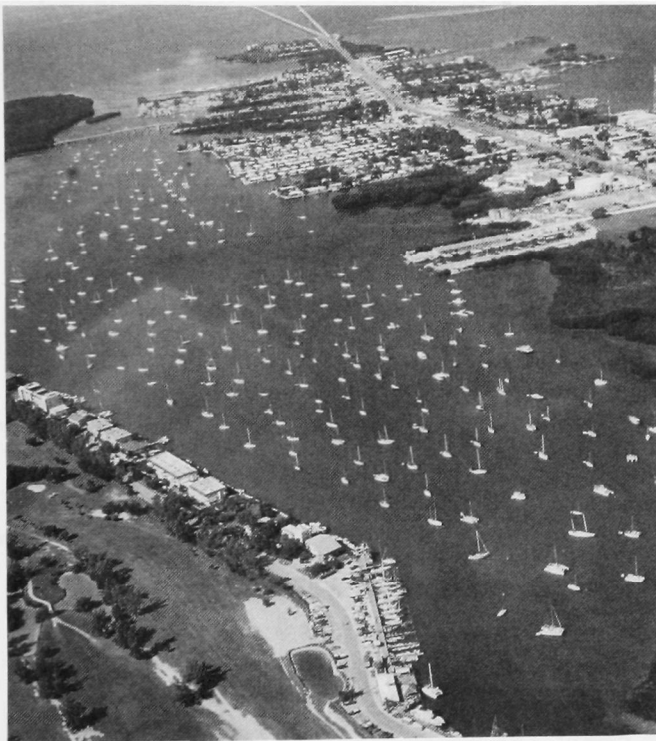
must be developed based on water quality and environmental considerations, as well as public health concerns.

Stormwater - Stormwater is a source of nutrients, sediment, and toxic materials to Sanctuary waters. Stormwater nutrient loadings constitute about 21% and 45% of the total nitrogen and phosphorus wastewater/stormwater nutrient loadings to the Sanctuary, respectively. Stormwater also carries significant quantities of suspended sediment to nearshore waters. In areas of heavy vehicular traffic and in commercial areas, the potential also exists for the discharge of fuel, oil, metals, and other contaminants.

These observations, coupled with the low level of stormwater control throughout the Sanctuary, indicate that stormwater is a regionally significant source of pollution within the Sanctuary. Action is needed to reduce stormwater pollutant loadings from existing development and to ensure that new development is constructed in accordance with stormwater management ordinances and master plans.

Marinas and Live-Aboards - Disposal of wastewater by live-aboards represents about 3% of all total stormwater and wastewater nutrient loadings to Sanctuary waters. For this reason, detrimental effects of live-aboard wastewater disposal are not likely to be significant from a regional standpoint. However, because of the low level of treatment, the tendency of live-aboards to congregate in certain marinas or anchorages, and the potential adverse health effects of discharging untreated wastewater into Sanctuary waters, live-aboard wastewater disposal is considered a significant problem.

Methods for collecting wastewater from live-aboards are fairly simple and inexpensive. However, the regulatory or management issues to be addressed in order to implement proper collection and disposal of live-aboard wastes are somewhat complex. Management recommendations include development and implementation of a comprehensive plan for eliminating sewage discharges from live-aboards. This plan could include elements such as requiring all marinas to install pump-out facilities, establishing a mobile pump-out service, and enforcing pump-out use.



Bill Kruczynski - EPA

Landfills - For active and recently closed landfills in the Keys, there is no indication of a leaching problem based on existing monitoring data, but more information is needed. Two investigative recommendations have been developed and remedial actions will be taken only if problems are found.

Hazardous Materials - Spills of toxic or hazardous materials occur occasionally in the Keys, but little historical information is available on the frequency or severity of spills. Discussions with Florida Department of Environmental Protection personnel in the Keys indicate that most spills are minor, involving less than 100 gallons of material. These spills do not appear to be regionally significant but could create local problems. The possibility remains that a large spill could occur (e.g., tanker grounding) with the potential for regional consequences.

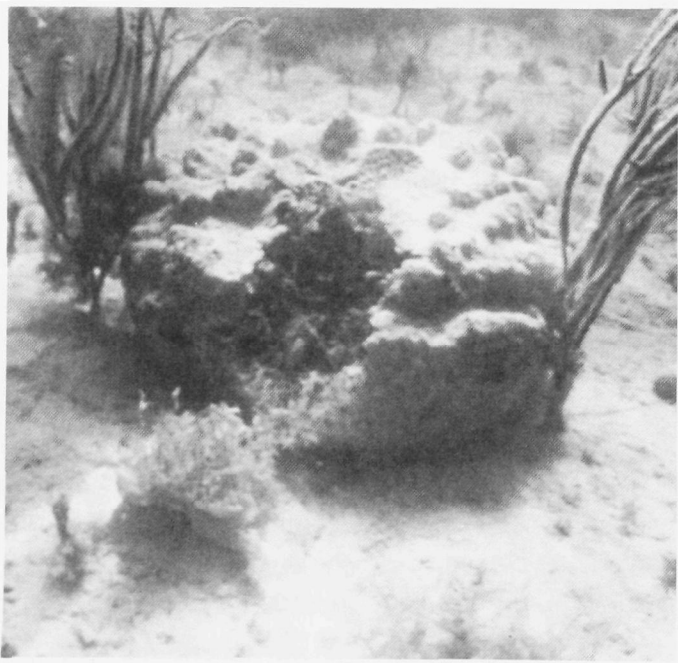
Because of the lack of evidence indicating significant degradation from spills and their unpredictable nature, engineering options addressing toxic or hazardous material spills were not developed. However, management recommendations were developed to decrease the potential for spills and to increase spill response readiness.

Mosquito Spraying - Although the amounts of pesticides used in the Mosquito Control Program are known, little information is available regarding the amounts that reach Sanctuary waters. Also, little is known about the environmental concentrations or effects of residual pesticides in the Sanctuary. The use of engineering options for mosquito control (e.g., pumped mosquito impoundments) is being discontinued elsewhere in Florida and would probably not be practical or permissible in the Keys.

There is no evidence indicating regional degradation from mosquito control operations. However, recommendations were developed to refine the existing aerial spraying program and to conduct research into pesticide impacts and alternatives.

Canals - Canal water quality can be affected by factors such as the physical structure and orientation of the canal, as well as wastewater and stormwater inputs of nutrients, sediment, and toxics. Reduced circulation in dead-end canals and basins increases the risk of depressed dissolved oxygen, retention of both dissolved and particulate pollutants, and potential impacts on benthic and pelagic environments. Winds can blow weed wrack and other organic debris into confined waters, with depressed dissolved oxygen resulting from decomposition of this organic material.

Recommendations for domestic wastewater and stormwater should help to reduce water quality problems in canals and basins over the long term by reducing nutrient inputs. However, direct actions should be investigated to improve canal water quality through methods such as aeration, weed gates, and air curtains.



Florida Marine Research Institute

Summary of Recommendations

The Water Quality Protection Program Document presents recommendations for corrective action, monitoring, research/special studies, and education/outreach developed during Phase II. The recommendations are organized into the following nine categories:

- Florida Bay/External Influences
- Domestic Wastewater
- Stormwater
- Marinas and Live-Aboards
- Landfills
- Hazardous Materials
- Mosquito Spraying
- Canals
- Monitoring and Research/Special Studies

The Water Quality Protection Program Document provides a brief description and rationale for each recommendation. Details of implementing agencies, cost, schedule, etc. are included in the Water Quality Action Plan which is attached as an appendix to the Document. Additional pertinent information (e.g., detailed assumptions for cost estimates for engineering options) is presented in the Phase II Report.

Table 2 summarizes the recommendations presented in the Water Quality Protection Program Document. Table 3 ranks the recommendations as high, medium, or low in priority. Table 4 lists only the high-priority recommendations and provides a brief rationale for each.

Prioritization is based on the projected

Table 2. Summary of Recommendations

FLORIDA BAY/EXTERNAL INFLUENCES

Florida Bay Freshwater Flow

- The Steering Committee for the Water Quality Protection Program shall take a leading role in restoring historical freshwater flow to Florida Bay, which is now in a state of crisis. In addition, Sanctuary representatives shall work with appropriate federal, state, and local agencies to ensure that restoration plans and surface water improvement and management plans for South Florida and the Everglades are compatible with efforts to maintain water quality within the Sanctuary.

Florida Bay Influence

- Conduct research to understand the effect of water transport from Florida Bay on water quality and resources in the Sanctuary.

DOMESTIC WASTEWATER

Inspection/Enforcement Program

- Establish authority for and implement inspection/enforcement programs to eliminate all cesspits and enforce existing standards for all OSDS and package plants.

OSDS Demonstration Project

- Conduct a demonstration project to evaluate alternate, nutrient-removing OSDS.

AWT Demonstration Project

- Conduct a demonstration project to evaluate installation of a small, expandable AWT plant to serve an area of heavy OSDS use with associated water quality problems.

Nutrient Reduction Targets

- Conduct research to develop nutrient reduction targets necessary to restore and maintain water quality and Sanctuary resources.

Sanitary Wastewater Master Plan

- Develop a Sanitary Wastewater Master Plan for the Florida Keys. Based on results of the demonstration projects and preliminary nutrient reduction targets, the Master Plan would evaluate options for further wastewater treatment (i.e., beyond eliminating cesspits and enforcing existing standards) and specify details of costs, schedules, service areas, etc. for implementation.

Master Plan Implementation

- Implement the preferred wastewater treatment option selected in the Sanitary Wastewater Master Plan.

City of Key West Ocean Outfall

- Upgrade effluent disposal for City of Key West wastewater treatment plant. Evaluate deep well injection, including the possibility of effluent migrating through the boulder zone into Sanctuary waters. Evaluate options for reuse of effluent, including irrigation and potable reuse. Discontinue use of the existing ocean outfall and implement deep well injection, aquifer storage, and/or reuse.

Water Quality Standards

- Develop and implement water quality standards, including biocriteria, appropriate to Sanctuary resources.

NPDES Program Delegation

- Delegate administration of the NPDES program for Florida Keys dischargers to the state of Florida.

Resource Monitoring of Surface Discharges

- Require all NPDES-permitted surface dischargers to develop resource monitoring programs.

Improved Interagency Coordination

- Improve interagency coordination for industrial wastewater discharge permitting.

Combined OSDS Permitting Responsibilities

- Combine OSDS permitting responsibilities in one agency for commercial establishments, institutions, and multi-family residential establishments utilizing injection wells.

Monitoring of Revised OSDS Rules

- Monitor revised rules designed to improve the performance of OSDS in the Florida Keys.

Laboratory Facilities

- Establish an interagency laboratory capable of processing monitoring and compliance samples.

STORMWATER

Stormwater Retrofitting

- Identify and retrofit stormwater hot spots using grass parking, swales, exfiltration trenches, pollution control structures, and detention/retention facilities. Control stormwater runoff in areas handling toxic and hazardous materials. Install swales and detention facilities along limited sections of U.S. 1.

Stormwater Permitting

- Require that no development in the Florida Keys be exempted from the stormwater permitting process.

Table 2. Summary of Recommendations (continued)

Stormwater Management

- Require local governments to enact and implement stormwater management ordinances and comprehensive stormwater management master plans. Petition the EPA to include the Florida Keys in the stormwater NPDES program if adequate stormwater management ordinances and administrative capability to manage such ordinances are not in place by a certain date.

Best Management Practices

- Institute a series of Best Management Practices and a public education program to prevent pollutants from entering stormwater runoff.

MARINAS AND LIVE-ABOARDS

No-Discharge Zones

- Evaluate the need for and implement, as appropriate, no-discharge zones in the Florida Keys, particularly in areas where live-aboard vessels congregate and there is a history of water quality violations.

Mooring Fields

- Establish mooring fields in places having significant concentrations of live-aboard vessels.

Pump-Out Facilities

- Develop and implement a comprehensive plan for elimination of sewage discharges from live-aboards and other boaters. The plan could include elements such as requiring all marinas to install pump-out facilities, establishing a mobile pump-out service, and enforcing pump-out use.

Containment Areas

- Establish paved and curbed containment areas for boat maintenance activities such as hull scraping and repainting, mechanical repairs, fueling, and lubrication. Create secondary containment, generally in the form of curbing or synthetic liners, for areas where significant quantities of hazardous or toxic materials are stored. Evaluate procedures to avoid or reduce fuel spillage during refueling operations.

Marina Permitting

- Improve interagency cooperation in marina permitting.

Environmental Awareness Program

- Formalize and expand the existing Florida Marine Patrol District 9 environmental education program to heighten awareness of how human activities contribute to water quality problems.

LANDFILLS

Historical Landfill Search

- Conduct a comprehensive search for abandoned landfills and dumps. Evaluate each site to determine if they contain hazardous materials or are causing environmental problems. If problems are discovered, evaluate and implement appropriate remedial actions such as boring or mining, upgrading closure, collecting and treating leachate, constructing slurry walls, or excavating and hauling landfill contents.

Landfill Monitoring

- Intensify existing monitoring programs around landfills to ensure that no leaching is occurring into marine waters. Identify and monitor old landfills that were never permitted and therefore have no closure plans or closure permits. If problems are discovered, evaluate and implement appropriate remedial actions such as boring or mining, upgrading closure, collecting and treating leachate, constructing slurry walls, or excavating and hauling landfill contents.

HAZARDOUS MATERIALS

Hazardous Materials Response

- Improve and expand oil and hazardous materials response programs throughout the Sanctuary.

Spill Reporting

- Establish a reporting system to ensure that all spills in and near the Sanctuary are reported to Sanctuary managers and managers of impacted areas within the Sanctuary. Establish a geo-referenced Sanctuary spills database.

Hazardous Materials Handling

- Conduct an assessment and inventory of hazardous materials handling and use in the Florida Keys including facilities, types and quantities of materials, and transport/movement. Add information to the FDER/EPA/Monroe County GIS database.

Environmental Crimes Category

- Change the environmental crimes category associated with small spills from a felony to a civil offense, thereby removing the need to prove criminal intent.

Table 2. Summary of Recommendations (continued)

MOSQUITO SPRAYING

Mosquito Spraying

- Refine the aerial spraying program to further reduce aerial spraying over marine areas. This could include a review of threshold levels used to initiate aerial spraying, development of a more refined plan for flight lines, and use of improved equipment. Reconsider the use of mosquito larvicides in breeding areas, including those in currently restricted areas, to reduce the need for aerial spraying of adult mosquito populations. Evaluate the elimination of thermal fogs and replacement with ultra-low volume spraying methods.

Pesticide Research

- Develop and implement an independent research program to assess and investigate the impacts of, and alternatives to, current pesticide practices. Modify the Mosquito Control Program as necessary on the basis of research findings.

CANALS

Canal Water Quality

- Inventory and characterize dead-end canals/basins and investigate alternative management strategies to improve their water quality. Implement improvements (consistent with the strategies developed for wastewater and stormwater) in known hot spots.

MONITORING/RESEARCH

Water Quality Monitoring Program

- Conduct a long-term, comprehensive water quality monitoring program as described in the EPA Water Quality Protection Program, Phase II report.

Predictive Models

- Develop phased hydrodynamic/water quality models and coupled, landscape-level ecological models to predict and evaluate the outcome of in-place and proposed water quality management strategies.

Pollutant Assessment

- Develop a segmentation framework to identify surface water areas sharing common hydrographic properties affecting water quality. Determine the susceptibility of each segment to pollutant inputs based upon all loadings (i.e., land and water based) and segment specific hydrographic properties affecting their retention.

Groundwater Leachate Transport

- Conduct a hydrologic/geologic assessment of leachate transport (e.g., from injection wells, landfills, storage tanks, etc.) into nearshore waters. Determine whether and in what quantities groundwater nutrients are reaching Sanctuary waters, including the Florida Reef Tract.

Florida Bay Influence

- Conduct research to understand the effect of water transport from Florida Bay on water quality and resources in the Sanctuary.

Water Quality Impact Research

- Conduct research to identify and document causal linkages between water quality (e.g., levels of pollutants, nutrients, salinity, temperature, etc.) and ecological problems in each major ecosystem.

Indicators

- Develop diagnostic indicators of water quality problems (e.g., tissue C:N:P ratios, alkaline phosphate activity, and shifts in community structure by habitat). Conduct research to identify and evaluate indicators (biochemical and ecological measures to provide early warning of widespread ecological problems) in each type of ecosystem.

Other Monitoring Tools

- Conduct research to identify and evaluate innovative monitoring tools and methodologies to detect pollutants and identify cause/effect relationships involving water quality and biological resources.

Regional Database

- Establish a regional database and data management system for recording research results and biological, physical and chemical parameters from monitoring.

Dissemination of Research Findings

- Develop a program to disseminate scientific research results, including an information exchange network, conferences, and support for the publication of research findings in peer-reviewed scientific journals.

Global Change

- Examine the effects of global climate change on the organisms and ecosystems of the Keys.

Technical Advisory Committee

- Establish a technical advisory committee for coordinating and guiding research and monitoring activities.

Ecological Monitoring Program

- Develop and implement a sanctuary-wide, comprehensive ecosystem monitoring program. The objective of the program will be to monitor the status of various biological and ecological indicators of system components throughout the Sanctuary and adjacent areas to discern the local and system-wide effects of human and natural disturbances and assess the overall health of the Sanctuary.

Table 3. Prioritization of Recommendations

| Recommendation | Priority | | |
|---|----------|--------|-----|
| | High | Medium | Low |
| Florida Bay/External Influences | | | |
| Florida Bay Freshwater Flow | ● | | |
| Florida Bay Influence | ● | | |
| Domestic Wastewater | | | |
| Inspection/Enforcement Program | ● | | |
| OSDS Demonstration Project | ● | | |
| AWT Demonstration Project | ● | | |
| Nutrient Reduction Targets | ● | | |
| Sanitary Wastewater Master Plan | ● | | |
| Master Plan Implementation | ● | | |
| City of Key West Ocean Outfall | ● | | |
| Water Quality Standards | | ● | |
| NPDES Program Delegation | | | ● |
| Resource Monitoring of Surface Discharges | | | ● |
| Improved Interagency Coordination | | | ● |
| Combined OSDS Permitting Responsibilities | | | ● |
| Monitoring of Revised OSDS Rules | | | ● |
| Laboratory Facilities | | | ● |
| Stormwater | | | |
| Stormwater Retrofitting | | ● | |
| Stormwater Permitting | | ● | |
| Stormwater Management | | ● | |
| Best Management Practices | | ● | |
| Marinas/Live-Aboards | | | |
| No-Discharge Zones | | ● | |
| Mooring Fields | | ● | |
| Pump-Out Facilities | ● | | |
| Containment Areas | | ● | |
| Marina Permitting | | | ● |
| Environmental Awareness Program | | ● | |

Table 3. Prioritization of Recommendations (continued)

| Recommendation | Priority | | |
|------------------------------------|----------|--------|-----|
| | High | Medium | Low |
| Landfills | | | |
| Historical Landfill Search | | ● | |
| Landfill Monitoring | | ● | |
| Hazardous Materials | | | |
| Hazardous Materials Response | | ● | |
| Spill Reporting | | | ● |
| Hazardous Materials Handling | | ● | |
| Environmental Crimes Category | | ● | |
| Mosquito Spraying | | | |
| Mosquito Spraying | ● | | |
| Pesticide Research | ● | | |
| Canals | | | |
| Canal Water Quality | ● | | |
| Research/Monitoring | | | |
| Water Quality Monitoring Program | ● | | |
| Predictive Models | ● | | |
| Pollutant Assessment | ● | | |
| Groundwater Leachate Transport | ● | | |
| Water Quality Impact Research | ● | | |
| Indicators | | ● | |
| Other Monitoring Tools | | | ● |
| Regional Database | ● | | |
| Dissemination of Research Findings | | | ● |
| Global Change | | ● | |
| Technical Advisory Committee | ● | | |
| Ecological Monitoring Program | ● | | |

Table 4. High Priority Recommendations and Rationale

| Recommendation | Rationale |
|--|---|
| FLORIDA BAY/EXTERNAL INFLUENCES | |
| Florida Bay Freshwater Flow | Addresses a potentially major, external influence on water quality in the Sanctuary. The Sanctuary must be involved in decisions affecting its jurisdiction. |
| Florida Bay Influence | Helps to understand a potentially major, external influence on water quality in the Sanctuary. Provides stronger scientific basis for action to restore historical freshwater flow to Florida Bay. |
| DOMESTIC WASTEWATER | |
| Inspection/Enforcement Program | Cesspits and OSDS are major anthropogenic nutrient sources; compliance/ enforcement program will yield some nutrient reduction regardless of the ultimate decisions about wastewater treatment options. |
| OSDS Demonstration Project | Provides critical information for decisions regarding wastewater treatment. |
| AWT Demonstration Project | Provides critical information for decisions regarding wastewater treatment. |
| Nutrient Reduction Targets | Provides critical information for decisions regarding wastewater treatment. |
| Sanitary Wastewater Master Plan | Develops a comprehensive approach to wastewater treatment based on all available data, including nutrient reduction targets and performance of alternate OSDS. |
| Master Plan Implementation | Directly reduces nutrient loadings to Sanctuary waters. |
| City of Key West Ocean Outfall | Directly reduces nutrient loadings to Sanctuary waters. |
| MARINAS AND LIVE-ABOARDS | |
| Pump-Out Facilities | Develops a coordinated plan to directly reduce nutrient loadings from live-aboards and other boaters, which can contribute to water quality degradation in confined waters. |
| MOSQUITO SPRAYING | |
| Mosquito Spraying | Reduces aerial spraying of pesticides, leading to reduced inputs of pesticides and diesel oil to the marine environment. |
| Pesticide Research | Evaluates alternatives to minimize impacts of current pesticide practices. |
| CANALS | |
| Canal Water Quality | Addresses documented water quality degradation in canals, especially problems related to structure and orientation of canals rather than primarily to wastewater and/or stormwater pollutants. |
| RESEARCH/MONITORING | |
| Water Quality Monitoring Program | Provides critical data on long-term status and trends in water quality and biological resources for management decisions. The monitoring program is required by the Florida Keys National Marine Sanctuary and Protection Act. |
| Predictive Models | Predictive models can be useful tools for management decisions about pollution control actions. |
| Pollutant Assessment | Information on unquantified nutrient loadings is critical for setting nutrient reduction targets for wastewater treatment. Some other pollutant loadings are poorly documented in the Florida Keys. |
| Groundwater Leachate Transport | Provides critical information for decisions regarding wastewater treatment. Need to know if all wastewater nutrients discharged to groundwater subsequently enter coastal waters, and if they are reaching the reef tract. |
| Water Quality Impact Research | Provides critical information about cause/effect relationships linking pollutants and Sanctuary resources. |
| Regional Database | Data management is an integral part of all research and monitoring efforts; must be developed before field/lab work begins. |
| Technical Advisory Committee | Establishes technical (scientific and resource management) oversight for all research and monitoring efforts. |
| Ecological Monitoring Program | Provides critical information on the health of living resources and the ecosystem, causal relationships related to management decisions, and the effectiveness of management actions. The ecological monitoring program is required by the Florida Keys National Marine Sanctuary and Protection Act. |

effectiveness of the recommendations in reducing water quality problems in the Sanctuary. Recommendations that will reduce pollution directly, provide information needed for critical decisions, or allow another high-priority recommendation to be implemented are generally assigned a high priority. Recommendations that might directly reduce pollution by making the management/regulatory system work more efficiently are generally assigned a lower priority.

It should be noted that some high-priority recommendations involve significant prerequisites to be implemented. Conversely, some low-priority recommendations might be implemented early if they involve simple, inexpensive measures.

Recommendations for monitoring and research/special studies are being implemented directly by EPA and FDEP under the administrative framework for the Water Quality Protection Program. For educational activities, EPA and FDEP are assisting NOAA, which is responsible for educational programs in the Sanctuary.

In contrast, most recommendations for corrective action will require coordinated activities by numerous federal, state, and local government agencies. There will be ample opportunities for public review and comment before any such measures are implemented. Environmental and socioeconomic impacts of recommendations that are incorporated into NOAA's management plan have been evaluated in an Environmental Impact Statement. NOAA's draft Comprehensive

Management Plan and Environmental Impact Statement were released to the public on April 4, 1995.



Steven Frink

Monitoring and Special Studies Program

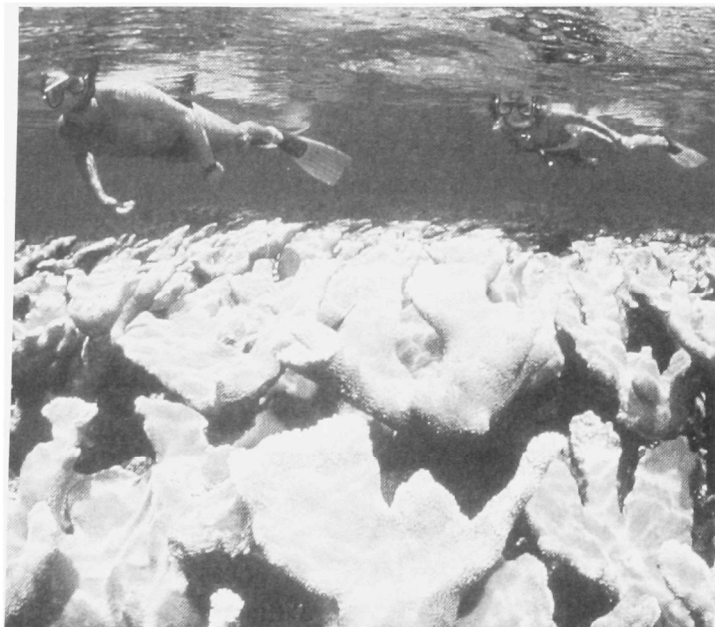
The Florida Keys National Marine Sanctuary and Protection Act of 1990 requires that a comprehensive water quality monitoring program be established, with the following goals:

- To determine the sources of pollution causing or contributing to existing or anticipated pollution problems in the Sanctuary.
- To evaluate the effectiveness of efforts to reduce or eliminate those sources of pollution.

- To evaluate the progress toward achieving and maintaining water quality standards and toward protecting and restoring the coral reefs and other living marine resources of the Sanctuary.

To meet these goals, EPA developed both a monitoring program and a research/special studies program. Together, these programs will provide information needed by Sanctuary managers to accomplish the goals of the Water Quality Protection Program.

Monitoring involves systematic, long-term data collection and analysis to measure the status of water quality and biological resources and to detect change over time. Detecting such changes can focus special studies on determining the cause, can prompt management decisions for corrective action, and can be used to evaluate the success of corrective action.



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Special studies involve short- and long-term data collection to understand causal linkages between pollution sources and ecological problems. This understanding can be used to develop predictive models, devise corrective actions, and improve the monitoring program.

Initially, the monitoring and special studies programs were developed during Phase II with guidance from technical experts (EPA Phase II Report 1993). The programs were developed without cost constraints, and some aspects of design and all details of implementation were left to be worked out. Therefore, EPA also developed an Implementation Plan which includes the following:

- Recommendations for prioritizing the monitoring and special studies programs to coincide with expected available funding and existing management priorities.
- Specific steps to be taken in implementing the monitoring and special studies programs.
- Discussion of concepts for the role of predictive modeling in the Water Quality Protection Program.

Management priorities, available funds, and estimated costs were considered in developing recommendations for the monitoring and special studies programs. Each program was divided into components, and priorities were assigned based on the Water Quality Protection Program Document. Table 5 summarizes program components according to three categories: monitoring, research/special studies, and

Table 5. Components of the Monitoring and Research/Special Studies Programs

| Component | Description |
|---|--|
| MONITORING PROGRAM | |
| Water Quality Monitoring Regular monitoring Continuous monitoring Sediment quality Biological body burdens | During regular surveys, water samples will be collected and water quality parameters measured at stations throughout the Sanctuary. Measurements include physico-chemical parameters, nutrient concentrations, and biological parameters. Physico-chemical parameters will be measured by continuous recording instrumentation at selected water quality stations and/or biological monitoring stations. A one-time survey of toxic pollutants in sediments will be conducted at water quality stations throughout the Sanctuary. Samples will be analyzed for standard bulk sediment parameters and selected pollutants. Representative organisms will be collected during at least one survey to estimate body burdens of toxic pollutants. Samples will be collected at biological monitoring stations and analyzed for selected pollutants. |
| Coral Reef/Hard Bottom Monitoring | Coral reefs, patch reefs, and nearshore hard bottom communities will be monitored during regular surveys. |
| Seagrass Monitoring | Seagrass communities will be monitored during regular surveys. |
| Mangrove Monitoring | Mangrove communities will be monitored through remote sensing (Advanced Inventory of Wetlands project repeated every 5-7 years). |
| RESEARCH PROGRAM | |
| Wastewater Pollutants Wastewater detection Pollutant load reduction goals (PLRGs) | Studies to detect and document the presence and ecological impacts of wastewater pollutants in Sanctuary waters. Studies to develop a strategy to estimate the reduction in wastewater pollutant loading necessary to restore and/or maintain Sanctuary resources. |
| Florida Bay Influence | Studies to understand the effect of recent water quality and ecological problems in Florida Bay on water quality and resources in the Sanctuary. |

Table 5. Components of the Monitoring and Research/Special Studies Programs (continued)

| Component | Description |
|--|---|
| PROGRAM SUPPORT | |
| Quality Assurance/Quality Control (QA/QC) | The monitoring and research programs will adhere to QA/QC procedures described in EPA guidance documents. An EPA QA/QC Officer has been designated. Each principal investigator will submit a Work/Quality Assurance Project Plan before work can begin. |
| Data Management | FMRI is developing a data management plan and data management system for the Sanctuary. The plan will address all aspects of data management for research and monitoring, including information distribution, storage, archiving, and QA/QC of data input. |
| Synthesis/Reporting | The National Marine Sanctuaries Program Amendments Act of 1992 requires that the Steering Committee submit a Biennial Report to Congress that summarizes progress, modifications to the program, and recommendations concerning implementation. In addition, it will be necessary to synthesize principal investigator reports periodically to evaluate progress in relation to management goals. |
| Dissemination of Information | Investigators are expected to publish in the open scientific literature. The Sanctuary will help disseminate monitoring and research results by developing an information exchange network, holding conferences, and supporting publication of findings in peer-reviewed journals. |

Table 6. Priorities for Water Quality Monitoring and Research/Special Studies Programs Based on FY 1994 and FY 1995 Funding

| Component Description | Time Frame | Estimated Annual Cost | Allocation of Actual FY 1994 Funding | Allocation of Actual FY 1995 Funding |
|---|--------------|---|--------------------------------------|--------------------------------------|
| MONITORING PROGRAM | | At least \$1,400,000^a | \$700,000 | \$1,000,000 |
| Water Quality Status and Trends Monitoring | | | | |
| • Regular water quality monitoring | long term | \$700,000 | \$400,000 | \$400,000 |
| • Continuous water quality monitoring | unknown | \$400,000 | \$0 | \$0 |
| • Sediment quality | 1 time | \$200,000 | \$0 | \$0 |
| • Tissue body burdens | 1 time | unknown | \$0 | \$0 |
| Biological Resource Status and Trends Monitoring | | | | |
| • Coral reef/hard bottom monitoring | long term | \$350,000 | \$200,000 ^b | \$400,000 |
| • Seagrass monitoring | long term | \$350,000 | \$100,000 ^b | \$200,000 |
| • Mangrove monitoring | every 5-7 yr | unknown | \$0 ^c | \$0 |
| Corrective Action Monitoring | | | | |
| • Monitoring of pilot projects or other actions | unknown | unknown | \$0 ^c | \$0 |
| RESEARCH/SPECIAL STUDIES PROGRAM | | \$750,000 | \$240,000 | \$381,200 |
| Wastewater Pollutants | | | | |
| • Detecting wastewater pollutants and documenting ecological impacts | 2-3 yr | \$300,000 | \$190,000 ^b | \$269,596 |
| • Developing pollutant load reduction goals | 2-3 yr | \$300,000 | \$50,000 ^b | \$21,029 |
| Florida Bay influence | | | | |
| • Circulation studies | 2-3 yr | \$150,000 | \$0 ^b | \$90,575 |
| • Ecological studies | 2-3 yr | | | |
| Other pollutants/water quality problems | unknown | unknown | \$0 | \$0 |
| PROGRAM SUPPORT | | \$100,000 | \$75,000 | \$77,480 |
| • Quality assurance/quality control | long term | \$0 ^d | \$0 ^d | \$0 |
| • Data management | long term | \$50,000 | \$50,000 | \$60,000 |
| • Synthesis/reporting | long term | \$50,000 | \$25,000 | \$17,480 |
| • Dissemination of findings | long term | \$0 ^c | \$0 ^c | \$0 |
| Note: All funds, except \$250,000 from the South Florida Water Management District, are from EPA. | | At least \$2,250,000^a | \$1,015,000 | \$1,458,680 |

^a Estimated cost including only the basic components of the monitoring program (regular water quality monitoring, coral reef/hard bottom monitoring, and seagrass monitoring). Additional components will be funded as money becomes available. Total costs will be higher depending on which additional components are funded.

^b Priorities for additional funds. These components are supported at less than minimal levels.

^c No activity (and therefore no funding) is needed in FY 1994.

^d No funding is needed to support the EPA Quality Assurance/Quality Control Officer.

program support. Costs to implement all components were developed. Then, as information about actual funding (FY 1994) became available, the monitoring and special studies programs were scaled back and recommendations were developed as to which components could be funded initially and at what level. Table 6 summarizes recommendations for monitoring and research/special studies based on the FY 1994 and FY 1995 funding available.

Monitoring Program

The recommended monitoring program consists of regular water quality monitoring, coral reef/hard bottom monitoring, and seagrass monitoring (Table 6). Options for continuous water quality monitoring, sediment sampling, tissue body burdens, mangrove monitoring, and/or corrective action monitoring cannot be included in the first year but could be added in the future depending on available funding and management priorities. Unlike the basic status and trends monitoring which is repeated, the optional components would be done only once (sediment sampling, tissue body burdens), once every 5-7 years (mangrove monitoring), or on a case-by-case basis (corrective action monitoring).

The FY 1995 monitoring effort (funded with FY 1994 dollars) was budgeted for \$700,000 (Table 6). This compares with an estimated annual cost of \$1,400,000 to \$1,800,000 to implement a comprehensive monitoring program. Costs were reduced to match available funds by delaying optional components, reducing the sampling frequency and number of stations for water quality monitoring, and developing minimal coral reef/ hard bottom and seagrass

monitoring efforts for FY 1995. The FY 1996 monitoring effort is being funded with FY 1995 dollars as per Table 6.

Recommended priorities for additional funds in future years would be to upgrade the seagrass and coral reef/hard bottom monitoring efforts, then seek to add components such as continuous monitoring, sediment sampling, and tissue body burdens.



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Research/Special Studies

The recommended research/special studies program topics for FY 1995 were wastewater pollutants and Florida Bay influence (Table 5). Studies on other water quality problems are being deferred until later. A total of \$621,200 (includes \$240,000 of FY 1994 funds) was available for the research/special studies program in FY 1995. Table 6 shows how the FY 1994 and FY 1995 funds were divided among the special study topics. Specific decisions on

funding were made based on an extensive review, evaluation, and ranking by a scientific panel.

The \$621,200 figure mentioned above was not based on a fixed scope (unlike the monitoring program). Experience suggests that the amounts proposed to study wastewater pollutants and Florida Bay may not be sufficient. To a much greater extent than the monitoring program, future funding needs for the research program will be determined by study findings.

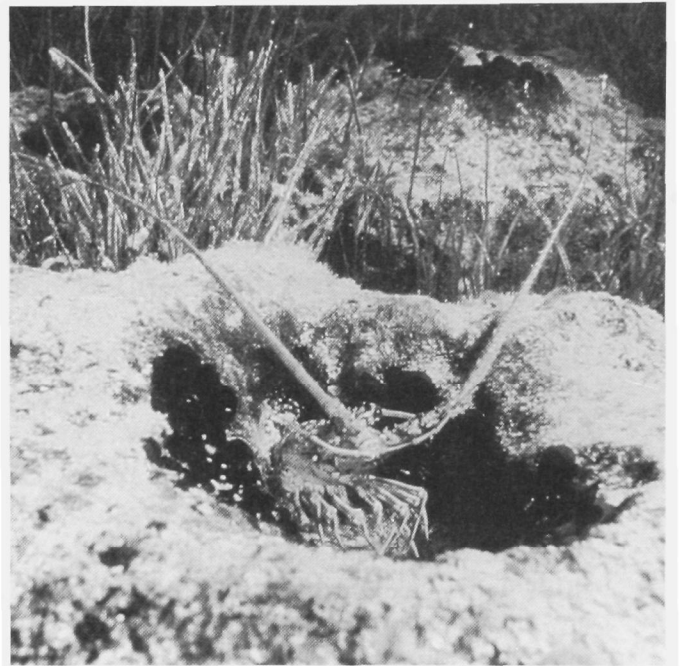
Pollutant Load Reduction Goals

The Phase II Report described a range of engineering and management options to reduce pollutant loadings from wastewater and stormwater. In order to evaluate the options, it is necessary to determine what reduction (if any) in wastewater and stormwater pollutant loadings would be sufficient to restore and /or maintain Sanctuary resources.

The term *pollutant load reduction goal* (PLRG) refers to "estimated reductions in pollutant loadings needed to preserve or restore beneficial uses of receiving waters" (FDEP 1993). PLRGs provide targets or benchmarks toward which specific strategies are directed. Development of PLRGs can be a long-term, iterative process involving establishment of interim goals, implementation of strategies, and continuing evaluation to assess the results (FDEP 1993).

EPA, FDEP, and NOAA are working with an EPA contractor to identify and evaluate alternative strategies for developing PLRGs for wastewater and stormwater in

the Sanctuary (including the option of not developing PLRGs). This work includes an inventory and assessment of previous and ongoing efforts to develop PLRGs in other waterbodies and watersheds in Florida and around the country. This information is needed within the next few years to decide among options for wastewater and stormwater treatment in the Florida Keys.



Florida Marine Research Institute

Data Management

The principal investigators for each component (water quality, coral reef/ hard bottom, and seagrass) of the monitoring program will develop and maintain protocols and procedures under a data management program to ensure that the data generated are accessible to potential users in a timely manner. All original and ancillary data

produced under the Water Quality Protection Program will be generated, processed, stored, and archived in a manner that provides detailed documentation of the procedures used at all stages of data collection, reduction, processing, analysis, and storage.

Under a cooperative agreement with EPA, the Florida Marine Research Institute (FMRI) has developed a data management plan and prototype data management system for the monitoring and research/special studies programs. The principal investigators will work with FMRI to identify data needs, define data entry formats and quality assurance/quality control protocols, and resolve data management conventions and issues.

The principal investigators will design and develop a computerized database under a commercially/commonly available personal-computer-based database program with guidance from EPA and FMRI. The database will be designed to contain the original data generated by the project and any ancillary information necessary for interpretation of the data. The database will be in a format that will allow the database to be directly imported into the data management system.

Budget Summary

Since the Water Quality Protection Program project began in 1991, EPA has used dollars from many different sources to fund the development and now the implementation of the Water Quality Protection Program Document. These

sources include EPA Region 4 program specific funds, EPA Headquarter's funds (Office of Water), Congressional add-ons, and EPA's Gulf of Mexico Program.

Through March 20, 1995, total EPA funds dedicated to the Water Quality Protection Program were \$4,188,200. In addition, the South Florida Water Management District has dedicated \$250,000 of FY 1995 dollars to fund specific projects associated with the monitoring and research/special studies programs.

In addition to the cooperative agreement for data management with FMRI (discussed in the data management section), EPA has entered into cooperative agreements with various institutions and agencies to conduct the work associated with the monitoring program. Information regarding these cooperative agreements is summarized in Table 7. To assist with long-term planning, EPA prepared a five-year budget which lists the prioritized funding needs for monitoring, research/special studies, and Program support.

Special Projects

During the development of the Water Quality Protection Program EPA funded many special projects. Some of these projects are discussed below.

Stormwater Demonstration Project at Bahia Honda State Park - EPA provided approximately 53% (\$50,000) of the funding necessary for the construction of a stormwater demonstration project at Bahia

Table 7. Information on Cooperative Agreements

-
- **Water Quality Monitoring** - EPA has entered into a cooperative agreement with Florida International University to perform the water quality monitoring component of the status and trends monitoring program. The total amount of the award is \$800,000 over a two-year period. Dr. Ronald Jones of Florida International University is the project leader.
 - **Coral Reef/Hard Bottom Monitoring** - EPA has entered into a cooperative agreement with the Florida Department of Environmental Protection/Florida Marine Research Institute to perform the coral reef/hard bottom monitoring component of the status and trends monitoring program. The amount of the award is \$600,000 over a two-year period. Ms. Jennifer Wheaton of the Florida Marine Research Institute is the project leader.
 - **Seagrass Monitoring** - EPA has entered into a cooperative agreement with Florida International University to perform the seagrass monitoring component of the status and trends monitoring program. The amount of the award is \$300,000 over a two-year period. Dr. Jim Fourqurean of Florida International University is the project leader.
 - **Data Management** - Under a cooperative agreement with EPA, the Florida Department of Environmental Protection/Florida Marine Research Institute developed a data management plan and prototype data management system for the monitoring and research/special studies program. The amount of this award was \$50,000. Chris Friel with the Florida Marine Institute is the project leader. In addition, EPA has entered into a subsequent cooperative agreement with the Florida Marine Research Institute to implement the data management system. This separate agreement is in the amount of \$160,000 and covers a two-year period.
-

Note: Monitoring involves systematic, long-term data collection and analysis to measure the status of water quality and biological resources and to detect change over time. The comprehensive monitoring program is expected to last at least five years and some level of monitoring may be necessary for as long as the Florida Keys National Marine Sanctuary exists.

Honda State Park on Big Pine Key. Water quality at the point of discharge into Sanctuary waters was improved by means of retention and sediment filtration systems. This included removal of $\pm 14,000$ square feet of impervious pavement and the construction of shallow retention areas (grass swales).

Study of the Key West Sewage Treatment Plant Ocean Outfall - Region 4 is conducting an intensive study of the Key West sewage treatment plant ocean outfall to evaluate its impacts to the local marine environment. The study is a cooperative effort between EPA, NOAA, and the City of Key West. Reef Relief, a non-profit conservation organization, provided boats and other assistance during the field work phase of this study. Ecological impacts are being investigated through the use of sewage tracers and assessment of benthic communities in potentially affected areas. If EPA determines that an ocean outfall is resulting in unreasonable adverse impacts to the marine environment, it has the regulatory authority to place additional limitations on the discharge.

Interagency Agreement with the National Park Service EPA entered into an interagency agreement with Everglades National Park to support water quality monitoring and nutrient studies on the southwest Florida coast and western Florida Bay. EPA supported this project with funds in the amount of \$100,000.

Florida Bay Watch Program - EPA joined the South Florida Water Management District and other government agencies in support of The Nature Conservancy's Florida Bay Watch Program. EPA Region 4 made a

grant to The Nature Conservancy in the amount of \$29,682. This project has trained and empowered volunteers to monitor water quality and water quality related phenomena in Florida Bay and adjacent waters.

The Nature Conservancy has designed and is implementing this volunteer program to collect observational data such as visibility and water clarity and anecdotal information including the location and extent of fish kills, sponge die-offs, and the location of algal blooms. This program was designed and coordinated to augment ongoing and planned water quality studies.

Interagency Agreement with the U.S. Geological Survey - EPA entered into an interagency agreement with the U.S. Geological Survey to support a ground-water study in the Florida Keys. The title of the study is, "Fate and Pathways of Injection-Well Effluent in the Florida Keys." EPA supported this project with funds in the amount of \$65,000.

Interagency Agreements with NOAA - EPA has entered into an interagency with NOAA to support public education and outreach in the Florida Keys. EPA has provided funds in the amount of \$35,000 to support the Sanctuary's television program, "Water Ways", and many other public education activities. Other activities include the "Coral Reef Classroom" which informs students about water quality and other environmental issues in the Florida Keys.

EPA also has an interagency agreement with NOAA in the amount of \$3,500 to support EPA's office in the Florida Keys. This office, staffed by EPA's Florida Keys Program scientist, is located at NOAA's

Sanctuary Program Office in Marathon, Florida.

Coral Reef Awareness Campaign - EPA provided 25% of the funding (\$20,000) for a Coral Reef Awareness Campaign which focused on water quality improvements in the Florida Keys. The project included intensive environmental education designed to increase community support for water quality improvements recommended in the Water Quality Protection Program Document. As a part of this project, the grantee, Reef Relief (environmental group focused on the Florida Keys coral reef ecosystem) developed a brochure designed to foster understanding of the sources of water quality decline in the Florida Keys and build support for the Water Quality Protection Program. The brochure was mailed to every property owner in the Florida Keys.

Wastewater Demonstration Project - A congressional add-on of \$500,000 was included in EPA's FY 1993 budget to fund innovative and alternative wastewater demonstration projects in the Florida Keys. EPA transmitted, via a grant, the \$500,000 to the Florida Department of Health and Rehabilitative Services (FDHRS). FDHRS has entered into a contract which will provide numerous services for the evaluation of several types of on-site wastewater nutrient reduction systems. The different system technologies will be tested at a central facility and at individual homesites. This project was supported with funds from NOAA's Coastal Zone Management Program in the amount of \$195,000.



Florida Marine Research Institute

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