



2011
ANNUAL REPORT



NATIONAL MARINE
SANCTUARIES

FLORIDA KEYS



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ABBREVIATIONS

- Corps - United States Army Corps of Engineers
- CREMP - Coral Reef Evaluation and Monitoring Project
- DARRP - Damage Assessment Restoration and Resource Protection
- ER - Ecological Reserve
- FDEP - Florida Department of Environmental Protection
- FKNMS or Sanctuary - Florida Keys National Marine Sanctuary
- FKRAD - Florida Keys Reasonable Assurance Documentation
- FWC - Florida Fish and Wildlife Conservation Commission
- JEA - Joint Enforcement Agreement
- MPA - Marine Protected Area
- MSD - Marine Sanitation Device
- NMS - National Marine Sanctuary
- NOAA - National Oceanic and Atmospheric Administration
- OLE - Office of Law Enforcement
- PA - Programmatic Agreement
- SAC - Sanctuary Advisory Council
- SFFFK - Sanctuary Friends Foundation of the Florida Keys
- SFWMD - South Florida Water Management District
- SPA - Sanctuary Preservation Area
- TMDL - Total Maximum Daily Load
- USCG - United States Coast Guard
- USEPA - United States Environmental Protection Agency
- USFWS - United States Fish and Wildlife Service
- WMA - Wildlife Management Area
- WQPP - Water Quality Protection Program



Photography: Cover photograph provided by Coral Restoration Foundation. Additional photographs provided by the Florida Keys National Marine Sanctuary and the National Oceanic and Atmospheric Administration.

EXECUTIVE SUMMARY

On January 28, 1997, the Governor and Cabinet, sitting as the Board of Trustees of the Internal Improvement Trust Fund, approved the Florida Keys National Marine Sanctuary (FKNMS or Sanctuary) Management Plan for implementation in state waters and adopted a resolution containing conditions for that approval. The annual submission of a report of the activities and status of the Sanctuary is one of those conditions. This is the fourteenth annual report covering the period of July 1, 2010 through June 30, 2011.

Sanctuary Science

Scientific research and monitoring in the FKNMS involves dozens of projects conducted by academic institutions, state and federal agencies, and other organizations. Research projects included studies on corals, reef restoration, fisheries, marine mammals, marine protected area design, nutrient dynamics and others. Long-term monitoring of water quality, seagrass, and coral reefs/hard-bottom communities continued, along with the Marine Zone Monitoring Program. Recent socioeconomic studies indicate more than 33,000 jobs are supported by ocean recreation and tourism, accounting for 58 % of the local economy and \$2.3 billion in annual sales.

Education, Outreach & Stewardship

More than 5,000 students and 48,000 visitors came to the Florida Keys Eco-Discovery Center, experiencing the interactive exhibits, aquariums and educational film. Volunteers worked in a variety of FKNMS programs, contributing 7,169 hours at an estimated value of \$141,826. FKNMS staff interacted with more than 5,800 individuals through participation in multiple public events such as seafood festivals, nautical flea markets, Earth Day and others.

Enforcement & Resource Protection

FKNMS-funded officers performed more than 6,800 hours of water patrol. Officers issued 32 FKNMS citations, 106 resource citations, 439 boating safety warnings, and checked over 13,154 users while inspecting over 3,750 vessels. Significant cases continue to be prosecuted for the placement of thousands of illegal spiny lobster habitats or “casitas,” and illegal harvest or sale. Coral Rescue and Nursery Programs protected hundreds of individual coral colonies threatened by coastal construction and repair projects. Coral colonies from nurseries were used to support research, restoration, exhibition, and other valuable projects.

Resource Threat Reduction

Approximately 65% of the equivalent dwelling units in Monroe County and its municipalities have been connected to central wastewater systems that meet stringent State requirements. The deadline for full compliance is December 31, 2015. Waters of the Florida Keys received additional protection with the passage of National Oceanic and Atmospheric Administration (NOAA) regulations, effective December 27, 2010, prohibiting discharge from marine sanitation devices (MSDs) Sanctuary-wide. FKNMS Buoy Teams logged 2,190 hours on the water and 905 dives while maintaining more than 790 FKNMS buoys.

Administration, Community Relations & Policy Coordination

Six Sanctuary Advisory Council (SAC) meetings were held, covering a range of topics including invasive lionfish, law enforcement, coral reef restoration, ocean aquaculture, marine zoning, and linkage between the economy and the environment. The Sanctuary enhanced its online presence through a redesign of its website (<http://floridakeys.noaa.gov/>) and new Facebook page (<https://www.facebook.com/floridakeysnoaa.gov>).



ACTION PLAN STATUS REPORTS

Introduction

Action Plans are the means by which the Sanctuary identifies and organizes a wide variety of management tools. They are the “road maps” for management, and articulate the programs and projects used to fulfill the purposes and policies of the National Marine Sanctuary (NMS) Act. There are 14 Action Plans organized into 5 groups in the Final Revised FKNMS Management Plan, approved by the Governor and Cabinet in December 2007. The following report provides the status of these 14 Action Plans.

SANCTUARY SCIENCE

Science Management and Administration Action Plan

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.

The Sanctuary issued over 70 permits and amendments to support research in the Florida Keys during FY 10/11. Permit holders were largely university researchers, but also included government agencies, students, and private industry. Newly permitted projects and ongoing research covered a wide array of subjects including fisheries and invertebrates, marine mammals, seagrass, marine protected area (MPA) design, nutrient dynamics; and oceanography.



Many research projects complement the FKNMS long-term monitoring programs, investigating particular issues of value to resource managers. For example, research on the endangered *Acropora* spp. (staghorn and elkhorn coral) documented the distribution and growth of natural and out-planted coral colonies, while other projects used cutting edge technology to investigate culture techniques and genetic responses to stressors. Other studies focused on coral reproduction and recruitment, information valuable to reef restoration efforts. In some of these studies, researchers collected “coral spawn” which was used to investigate the factors that govern larval development and natural recruitment.

Several important research projects are underway investigating coral health and diseases. Foundational studies are underway to identify bioindicators of coral health, and examining how environmental conditions affect disease dynamics

and susceptibility. Other studies at the molecular level look into the immune responses of soft corals, and the potential link between coral diseases and viruses in symbiotic algae, or human enteric bacteria. This type research may tie into other studies focused on treatments for coral diseases.

Several toxicological studies are underway, which are important in light of dense coastal development and its effect on coastal waters. One study is developing standard toxicological testing methods for assessing impacts of contaminants on corals, while others specifically target the effect of oil on coral larvae, or oil and dispersants on adult coral polyps.

Research is also being done on an emerging threat, the exotic coral *Tubastraea coccinea*. Survey and monitoring work is underway to determine the effect, if any, this coral has on diversity and recruitment of native communities.

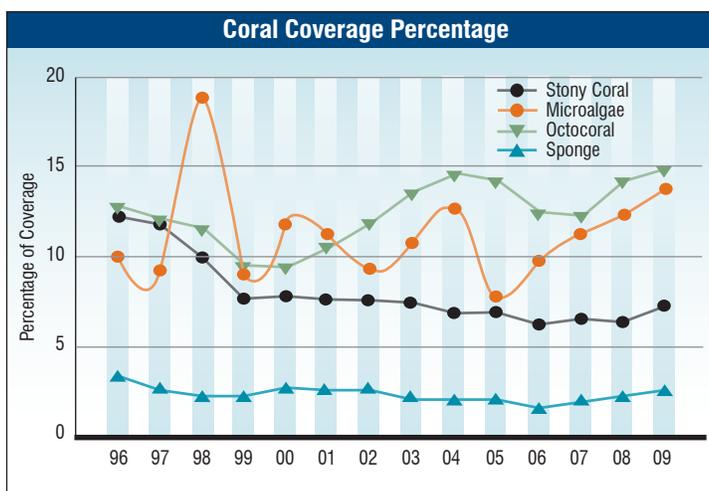
Research and Monitoring Action Plan

The marine ecosystem of the Florida Keys is diverse and complex, and many of its physical and ecological processes and their interrelationships are not well known. The purpose of monitoring is to establish a baseline of information on natural resources and other components of the ecosystem and to measure changes over time. As monitoring studies gather data, they have the potential to detect significant changes in natural resources that result from management actions or from other causes. The findings of research projects may also help identify cause and effect relationships for ecological patterns and trends.

The Water Quality Protection Program (WQPP) has established comprehensive, long-term monitoring of three components of the ecosystem; water quality, seagrasses, and coral reefs/hard-bottom communities (for more detail on the WQPP see the Water Quality Action Plan section). The Marine Zone Monitoring Program documents effects of 24 MPAs. Other research and monitoring projects document trends in ecological processes, reef fishes, spiny lobster, queen conch, other invertebrates, and benthic community structure. Social and economic research has illustrated very significant connections between the economy and the environment in the Keys. Together, these monitoring and research programs provide Sanctuary managers with basic information about the state of the Florida Keys ecosystem and changes resulting from marine zoning.

Water quality has been monitored quarterly at approximately 150 stations since 1995. In general, water quality is good Sanctuary-wide but documentation of elevated nitrate in the inshore waters of the Keys has been evident since the first sampling event in 1995. This gradient was not observed in a comparison transect from the Tortugas (no human impact). Observance of this type of distribution implies an inshore source which is diluted by low nutrient ocean waters. Analysis of monitoring data from 1995 through 2008 indicates a statistically significant improvement in some parameters such as dissolved inorganic nitrogen and light attenuation, across large portions of the Sanctuary. This trend will be watched closely in the future, particularly with regard to any potential effect attributable to Everglades restoration and water treatment infrastructure improvements. (Boyer and Briceño, 2009)

Coral reef health declined globally in the late 1990s and media attention to this worldwide decline heightened awareness and concern for the condition of coral in the FKNMS. In 1995, the Florida Fish and Wildlife Research Institute and university partners began the Coral Reef Evaluation and Monitoring Project (CREMP) which is funded annually by the United States Environmental Protection Agency (USEPA) and NOAA as part of the WQPP. From 1996 to 2007, CREMP recorded a 47% decline in stony coral cover at sites sampled Sanctuary-wide. The most significant losses occurred between 1997 and 1999 (38%) due to major bleaching events in 1997 and 1998. Coral cover has been relatively stable since that time. For the first time in its history, CREMP recorded a statistically significant *increase* in coral cover in 2009, but there also was a significant increase in macroalgae and octocoral (soft coral). In January of 2010 South Florida experienced cold weather that reduced water temperatures to below the tolerance of many coral species. Publications are in preparation which document elevated levels of coral mortality that occurred across large areas of FKNMS due to this cold water event (Ruzicka et al, 2010).

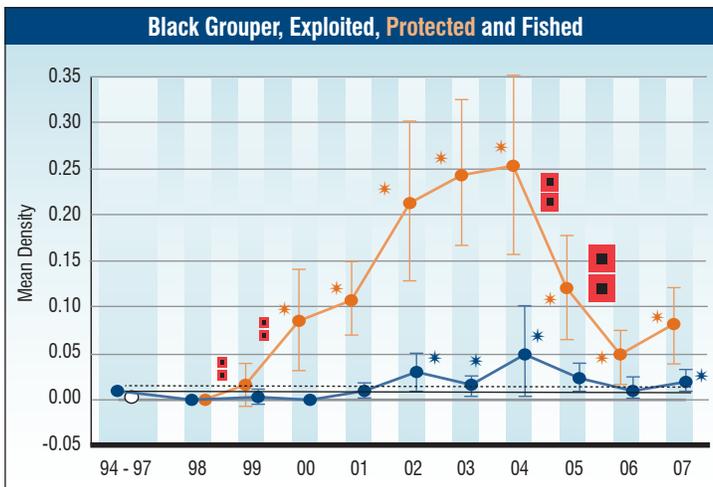


Seagrass beds carpet 80% of the Sanctuary seafloor and make up part of the largest contiguous seagrass bed on earth. Seagrasses have been quantitatively monitored in the Sanctuary since 1995, documenting the distribution and importance of these habitats. At 19 of the 30 permanent sampling sites in the Florida Keys, there have been changes in the relative abundance of seagrasses and macroalgae over the period 1995 - 2008 that are consistent with increased nutrient availability (Fourqurean, 2008). Most of these 19 sites showed increases in fast-growing macroalgae. Increased macroalgae can be a precursor to decreases in seagrass abundance, and in fact 2 sites already have shown a decrease in seagrass abundance. In addition, at 10 of the 30 permanent sampling sites there have been long-term shifts in the nitrogen to phosphorus ratio (N:P) in seagrass leaves that are consistent with increases in nutrient availability. The results suggest that there is regional-scale change in nutrient availability that is causing changes in seagrass beds over a large portion of the FKNMS.



Results of the Marine Zone Monitoring Program continue to show differences in abundance and size of some species within Sanctuary Preservation Areas (SPA) and Ecological Reserves (ER) compared to their reference sites. In 1997, just after the establishment of the FKNMS marine zones, there was no difference in the abundance or size of spiny lobster in the Western Sambo ER compared to reference sites. However, just 2 years later in 1999, the abundance of lobster in the ER was greater, and in 2003 the abundance was twice that of the reference areas (Cox and Hunt, 2005). Monitoring demonstrated that the size and abundance of spiny lobster has been greater inside the Western Sambo ER than in unprotected reference areas from 2004 to 2010. Habitat for all life stages of spiny lobsters is protected within the ER, suggesting that once adults establish residence, the ER is sufficiently large to protect a portion of the population as it travels to foraging grounds and between winter dens and spring spawning habitat. Spiny lobster is one of the most economically important species harvested within the FKNMS, with annual catch in Monroe County exceeding 5 million pounds, valued at more than \$30 million.

Since no-take protection was initiated in 1997, significant density increases have also been observed for several exploited reef fish species in ERs and some SPAs compared to fished reference areas. Among exploited fish, mean densities of snapper species and total species combined were reported to be higher in these Marine Protected Zones (Bartholomew et al, 2007). The graph to the left illustrates this trend up to 2004, at which time it is thought that hurricanes caused a decrease in black grouper density (Ault, 2010).



left illustrates this trend up to 2004, at which time it is thought that hurricanes caused a decrease in black grouper density (Ault, 2010).

According to recent socioeconomic studies, from 2007 to 2008, more than 400,000 visitors and residents of the Florida Keys engaged in over 2 million person-days of recreational sports fishing. These recreational fishers spent \$274 million in the Florida Keys, approximately \$107.6 million of which was directly spent on fishing items. Also from 2007 to 2008, approximately

739,000 visitors and residents participated in 2.8 million days of diving in the Florida Keys and \$54 million was spent at diving/snorkeling operations. During these trips divers spent an additional \$470 million in Monroe County and the Florida Keys, directly supporting more than 7,500 jobs. Overall, more than 33,000 jobs are supported by ocean recreation and tourism, accounting for 58 percent of the local economy and \$2.3 billion in annual sales. (Leeworthy, 2010; Leeworthy and Morris, 2010; Leeworthy et al, 2010).

EDUCATION, OUTREACH & STEWARDSHIP

Education and Outreach Action Plan

Florida Keys Eco-Discovery Center - Since opening in 2007, the Florida Keys Eco-Discovery Center in Key West, the visitor's center of FKNMS, has established itself as an important educational resource for visitors and residents of south Florida. In the past year, more than 5,000 students and 48,000 visitors have enjoyed the center's interactive exhibits, aquariums and educational film. The center's conference facility has also become a vital meeting place for local agencies and community organizations, as evidenced by the more than 230 meetings, seminars and workshops held at the center in the past year. Public attendance has grown at an average annual rate of 18% over the past four years and guests from every state and 84 countries have signed the center's guest book.

Stewardship and Education Programs - FKNMS stewardship and education programs seek to increase appreciation for and responsible use of the marine environment. Programs engage individuals directly while they are using Sanctuary resources, or through partnerships with commercial tour operators. *Blue Star* is a voluntary recognition program for Florida Keys dive and snorkel operators whose staff has been trained to a standard of knowledge, and who incorporate coral reef education into their daily business practices and customer interactions. Four new tour operators earned *Blue Star* recognition in FY 10/11 bringing the total participating businesses to ten.

The Team OCEAN volunteer program promotes safe and enjoyable public use of the marine environment within the FKNMS. Trained teams aboard Sanctuary boats are stationed at heavily-visited reef sites during peak recreational boating seasons to inform boaters about the Sanctuary's special zones and regulations, encourage proper use of Sanctuary resources and mooring buoys, promote dive flag safety, and promote safe and responsible boating behavior. The presence of FKNMS vessels at these areas also helps to maintain the integrity of the SPAs, which are "no-take" zones. Team OCEAN made over 1,200 boater contacts in FY 10/11, and volunteers for this program contributed over 500 hours at a value of \$10,000.

Dolphin SMART is a voluntary recognition and education program encouraging responsible viewing of wild dolphins. The program offers participation incentives for Keys tour operators that follow the program criteria and dolphin viewing guidelines while educating their customers about the importance of minimizing wild dolphin harassment.



Lionfish - In addition to printed materials, media coverage, and other traditional outreach, FKNMS worked closely with the science, business, and dive communities to implement a novel education and control strategy to address the lionfish invasion in Sanctuary waters. Partnering with local non-profit Reef Environmental Education Foundation, FKNMS co-hosted four lionfish derbies at marinas and restaurants in the Keys, removing 1,200 lionfish from Sanctuary waters. Derbies rewarded divers who captured the largest, smallest and most lionfish with cash and prizes. Scientists from the U.S. Geological

Survey were on hand to collect tissue and stomach content samples for further study of lionfish genetics, growth and impacts to native fish populations. Attendees sampled dishes prepared from lionfish, promoting the control strategy of consumption as a food source.

Community Events, Festivals, and Partnerships - FKNMS is able to reach thousands of Keys visitors and residents through exhibits and participation in multiple public events and festivals. Events such as seafood festivals, nautical flea markets, Earth Day and other special celebrations allowed Sanctuary staff to interact with more than 5,800 individuals who were interested in marine science and conservation. The Sanctuary also hosted the second annual Ocean Festival, a family oriented one-day event co-sponsored with Mote Marine Lab, which attracted nearly 5,000 people, and for the fourth year in a row, the Sanctuary partnered with the National Weather Service to host "NOAA Science Saturday," a one-day educational event that drew over 1,000 visitors.



Volunteer Action Plan

People are an integral part of the Florida Keys ecosystem. Ultimately, protecting the FKNMS requires that local residents take responsibility and participate in its protection. Recognizing this, the State of Florida and NOAA work in partnership with individuals, non-government organizations and communities on environmental problem solving, education, and outreach. Involving volunteers in the work of the FKNMS encourages a growing conservation ethic in the Florida Keys and results in solutions that benefit humans as well as the greater ecosystem.

Federal volunteers and SAC participants supported the FKNMS through participation in the following programs and activities: Team OCEAN (outreach to residents and visitors and marine debris cleanups); the Florida Keys Eco-Discovery Center; maritime heritage resources; maintenance (mooring buoy, mechanical, building and landscape); the SAC; Dolphin SMART; and coral research and restoration projects. Three interns receiving stipends (two from the Student Conservation Association and one from the Hollings Scholar Program) and two volunteer interns also contributed to special projects throughout the year. Together, this diverse group of individuals contributed over 7,169 hours, at an estimated value of \$141,826. This exceeded the Volunteer Action Plan performance measure of increasing the number of hours by 2010 by 25% from a baseline of 2,500 hours.

Organization	Project	Volunteer Hours
FKNMS	Team OCEAN	508
FKNMS	Florida Keys Eco-Discovery Center	1,087
FKNMS	Maritime Heritage Resources	181
FKNMS	Operations	171
FKNMS	SAC	2,770
FKNMS	Special Projects (incl. interns w/stipends)	2,452.5
TOTAL		7,169.5

ENFORCEMENT & RESOURCE PROTECTION

Regulatory Action Plan

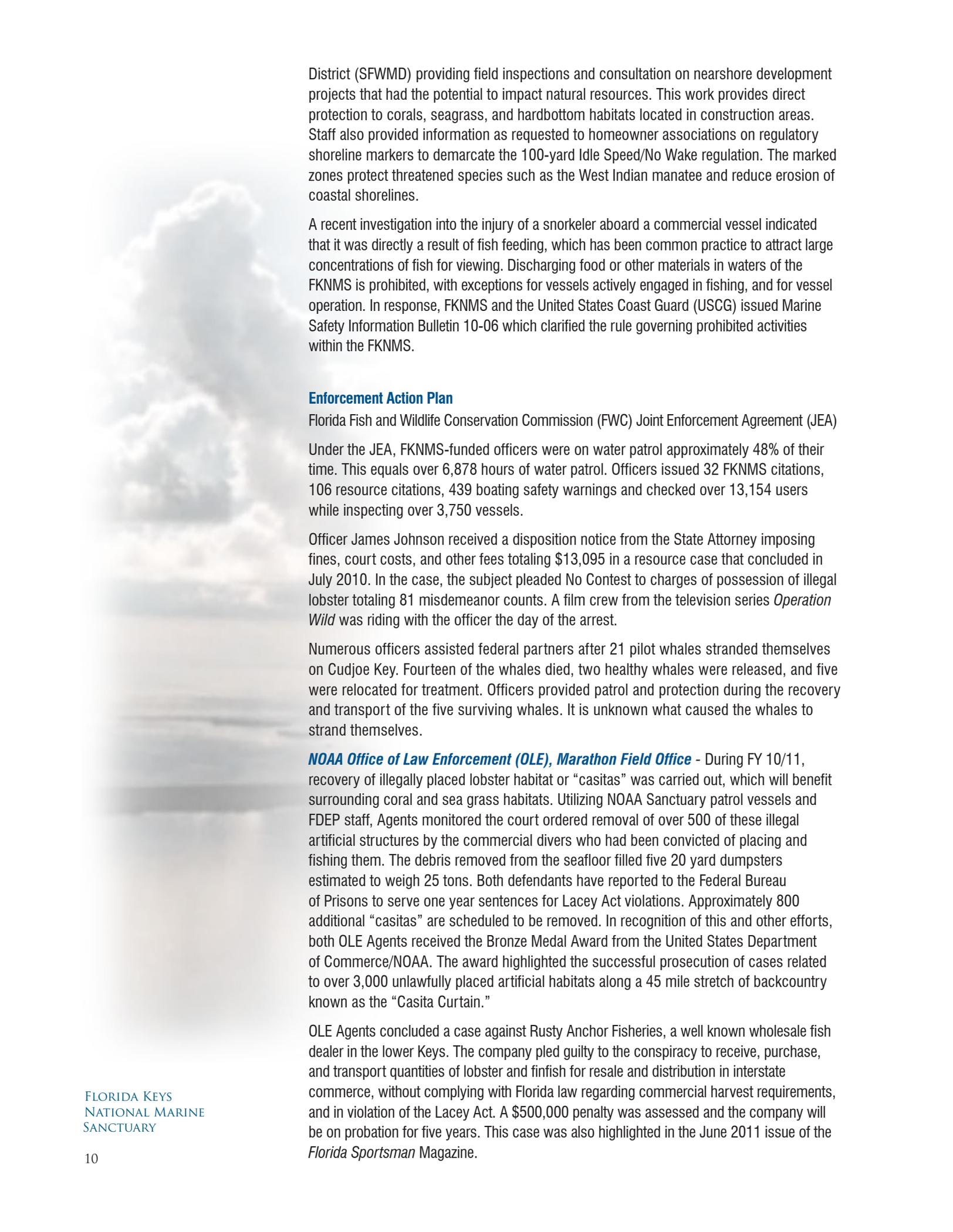
Waters of the Florida Keys received additional protection with the passage of NOAA regulations, effective December 27, 2010, prohibiting discharge from MSDs Sanctuary-wide. The final rule also added a new requirement that MSDs be secured in a manner that prevents discharge of treated and untreated sewage while within the boundaries of the FKNMS. Extending these water quality protection measures into federal waters of the FKNMS met one of the management plan performance measures. Educational brochures and information have been distributed in all marinas, and public service announcements are regularly aired on local radio and television broadcasts to keep boaters informed, and to identify pump out facility locations.

FKNMS staff reviewed proposed changes to Office of National Marine Sanctuaries regulations that, if promulgated, will update and consolidate permitting requirements for all sanctuaries. Final regulations are expected to be released in late 2011.

The Sanctuary's permitting program issued 487 permits, amendments, and authorizations in FY 10/11, allowing activities compatible with resource protection to be conducted with appropriate monitoring and conditions. In addition, scientific findings from permitted activities are used to support management decisions related to Sanctuary resources. Permits may be issued under various categories as defined in FKNMS regulation (15 CFR 922.166) that include research, education, and facilitating multiple Sanctuary uses.

Permit type/category	Issued FY 10/11
Research	71
Education	9
Authorizations to Corps, FDEP, SFWMD	58
Marine events and fireworks discharge	6
Lionfish removal from SPAs	193
Baitfishing in SPAs with cast net	96
Baitfishing in 3 SPAs with hairhook	19
Special Use Permit	3
Tortugas North access	32

FKNMS staff worked in coordination with the United States Army Corps of Engineers (Corps), NOAA Fisheries, Florida Department of Environmental Protection (FDEP), Florida Department of Agriculture and Consumer Services, and South Florida Water Management



District (SFWMD) providing field inspections and consultation on nearshore development projects that had the potential to impact natural resources. This work provides direct protection to corals, seagrass, and hardbottom habitats located in construction areas. Staff also provided information as requested to homeowner associations on regulatory shoreline markers to demarcate the 100-yard Idle Speed/No Wake regulation. The marked zones protect threatened species such as the West Indian manatee and reduce erosion of coastal shorelines.

A recent investigation into the injury of a snorkeler aboard a commercial vessel indicated that it was directly a result of fish feeding, which has been common practice to attract large concentrations of fish for viewing. Discharging food or other materials in waters of the FKNMS is prohibited, with exceptions for vessels actively engaged in fishing, and for vessel operation. In response, FKNMS and the United States Coast Guard (USCG) issued Marine Safety Information Bulletin 10-06 which clarified the rule governing prohibited activities within the FKNMS.

Enforcement Action Plan

Florida Fish and Wildlife Conservation Commission (FWC) Joint Enforcement Agreement (JEA)

Under the JEA, FKNMS-funded officers were on water patrol approximately 48% of their time. This equals over 6,878 hours of water patrol. Officers issued 32 FKNMS citations, 106 resource citations, 439 boating safety warnings and checked over 13,154 users while inspecting over 3,750 vessels.

Officer James Johnson received a disposition notice from the State Attorney imposing fines, court costs, and other fees totaling \$13,095 in a resource case that concluded in July 2010. In the case, the subject pleaded No Contest to charges of possession of illegal lobster totaling 81 misdemeanor counts. A film crew from the television series *Operation Wild* was riding with the officer the day of the arrest.

Numerous officers assisted federal partners after 21 pilot whales stranded themselves on Cudjoe Key. Fourteen of the whales died, two healthy whales were released, and five were relocated for treatment. Officers provided patrol and protection during the recovery and transport of the five surviving whales. It is unknown what caused the whales to strand themselves.

NOAA Office of Law Enforcement (OLE), Marathon Field Office - During FY 10/11, recovery of illegally placed lobster habitat or “casitas” was carried out, which will benefit surrounding coral and sea grass habitats. Utilizing NOAA Sanctuary patrol vessels and FDEP staff, Agents monitored the court ordered removal of over 500 of these illegal artificial structures by the commercial divers who had been convicted of placing and fishing them. The debris removed from the seafloor filled five 20 yard dumpsters estimated to weigh 25 tons. Both defendants have reported to the Federal Bureau of Prisons to serve one year sentences for Lacey Act violations. Approximately 800 additional “casitas” are scheduled to be removed. In recognition of this and other efforts, both OLE Agents received the Bronze Medal Award from the United States Department of Commerce/NOAA. The award highlighted the successful prosecution of cases related to over 3,000 unlawfully placed artificial habitats along a 45 mile stretch of backcountry known as the “Casita Curtain.”

OLE Agents concluded a case against Rusty Anchor Fisheries, a well known wholesale fish dealer in the lower Keys. The company pled guilty to the conspiracy to receive, purchase, and transport quantities of lobster and finfish for resale and distribution in interstate commerce, without complying with Florida law regarding commercial harvest requirements, and in violation of the Lacey Act. A \$500,000 penalty was assessed and the company will be on probation for five years. This case was also highlighted in the June 2011 issue of the *Florida Sportsman Magazine*.

NOAA vessel Peter Gladding - The *Gladding* had an excellent year of patrol in the Dry Tortugas and surrounding waters of the Florida Keys. Obligated JEA patrol hours in the Dry Tortugas were exceeded as were the expected number of patrols, despite being out-of-service for over four months due to boat maintenance and crew changes. The crew changes were due to one of the assigned crew members being on active military duty in Afghanistan. He has since safely returned. During the *Gladding* down times, the Dry Tortugas missions were accomplished via the crews back up vessel (a 30' center console); deploying a crew aboard the FWC Offshore Patrol Vessel *Gulf Sentry*; deploying crew aboard USCG cutters; and flying aboard a USCG C144 aircraft.

The *Gladding* crew was involved with three search and rescue cases. One involved recovering 19 Cuban migrants that were picked up at sea by the Dry Tortugas Ferry. The migrants were taken aboard the *Gladding* at sea and cared for until being transferred at sea to a USCG vessel. Another was an at sea underway transfer of a sick crew member of an ocean going tug. The tug captain put out a call for assistance and the *Gladding* was close by. The patient was extremely ill and was transported to Key West emergency medical services personnel. The crew was able to monitor his vital signs, administer oxygen and keep him stable.



FKNMS JEA Hours in Dry Tortugas	
Obligated Vessel Hours = 768	Actual = 807
Obligated Personnel Hours = 3,072	Actual = 3,149

Cases Made in Dry Tortugas (not including warnings)	
FKNMS	6
Federal Fish	8
State Fish	9
National Park Research Natural Area	1

Damage Assessment and Restoration Action Plan

The FKNMS Damage Assessment, Restoration, and Resource Protection (DARRP) team continues to implement new technologies and improve the quality of data collection, analysis, and reporting methods for seagrass and coral resource injury assessments. Currently, DARRP staff is developing methods that measure the topographic complexity of coral reef habitats. This tool is a useful aid in determining the amount of structural injury a reef has sustained in vessel groundings and for goal setting of coral restoration projects.

The DARRP team also continues a comprehensive effort to monitor the recovery of past major vessel grounding sites within the FKNMS. Currently, more than 35 of these restoration projects (both coral and seagrass) are being monitored by DARRP staff. Monitoring data from these site surveys have documented the structural stability of the restoration projects,

as well as their success in attracting juvenile hard and soft corals, seagrass, and other marine life. Formal reports documenting monitoring data for these sites have been posted on the NMS Program's web site.

Groundings - In FY 10/11 there were 240 reported vessel groundings within the boundaries of the FKNMS. These groundings had varying degrees of damage, resulting in 76 enforcement actions, ranging from written charges to verbal warnings. DARRP staff provided injury assessments for approximately 25 of these groundings. Overall grounding incidents were down compared to previous years.



In 2009 NOAA awarded The Nature Conservancy and its partners \$3.3 million to support threatened coral recovery and restoration in Florida and the U.S. Virgin Islands. The goal of this project is to recover one acre of coral reefs in each of eight distinct areas of the Caribbean by growing *Acropora* (staghorn and elkhorn coral) in seafloor nurseries and transplanting them to depleted reef sites. This project will provide tangible ecological benefits through an increase in biodiversity as well as enhanced ecosystem services.

The FKNMS Coral Rescue and Nursery Program protected hundreds of individual corals threatened by seawall construction and repairs, marina and dock development, and shoreline stabilization projects in the Florida Keys during FY 10/11. Using protocols developed by Sanctuary staff, coral rescue and transplantation is required by project applicants when corals are threatened by construction. Sanctuary staff provided training for contractors, agency personnel, and volunteers as needed to complete coral rescue. Corals that cannot be safely transplanted near project sites are housed at either the FKNMS dockside coral nursery (located at the Nancy Foster Florida Keys Environmental Complex in Key West) or

an offshore coral nursery near Looe Key that is managed in partnership with Mote Marine Laboratory. Nursery corals are used to support research, restoration, exhibition, and other valuable projects. As of June 2011, a total of 286 individual pieces of coral representing at least 12 genera are being cared for and awaiting placement. More than 12 transfers of specimens from the FKNMS coral nurseries have occurred in the past year, supporting the work of research facilities, universities, aquariums and coral aquaculture programs.

Maritime Heritage Resources Action Plan

The FKNMS contains a vast array of maritime heritage; submerged early shipwrecks dating from the periods of discovery and colonization, European Colonial, American and Modern. NOAA is the co-trustee for maritime archaeological resources located within its boundary. Maritime heritage resources such as historic shipwrecks and artificial reefs are non-renewable and are protected under the Florida Keys National Marine Sanctuary and Protection Act.

Programmatic Agreement - In 2011 the Programmatic Agreement (PA) for historic resource management in the FKNMS among NOAA, State of Florida and the Advisory Council Historic Preservation was renewed for an additional five years. Under the PA, FKNMS issued a total of 10 (9 Survey and Inventory, and 1 Research and Recovery) Maritime Archaeological permit actions for activities related to the identification and research of maritime heritage resources.

Public Outreach and Presentations - A Heritage Awareness Diving Seminar was jointly sponsored by the State of Florida Bureau of Archeological Research, and FKNMS, in which 17 students participated.

FKNMS staff presented “Lost on a Reef: Partnerships in the Search for the *Guerrero* (1827)” at the 9th Maritime Heritage Conference, Baltimore, Maryland. The presentation covered research and fieldwork performed over the past 20 years on the 1827 shipwrecked slave vessel *Guerrero* and British Naval Schooner *Nimble*. The conference was attended by more than 400 people from over two dozen organizations.

Heritage Assets - FKNMS has continuing trustee responsibility for 218 artifacts displayed in four locations in the Florida Keys.

Heritage Highway, a project which documented roadside artifacts, was completed by a local high school student. A grand total of 156 artifacts, including 77 cannons and 59 anchors, were recorded and photographed along the roadside of the Florida Keys. The roadside artifacts, salvaged decades ago from the waters of FKNMS, provide an opportunity for visitors to appreciate the Keys’ rich maritime history without getting wet, but highlight the importance of conservation of heritage resources.

An enforcement case was made after the crew of the *Peter Gladding* spotted a commercial vessel fishing in the Tortugas North ER. The crew documented the fishing violation and also discovered a historic anchor on the vessel. The anchor was seized, and NMS Archaeologists determined it was from the early 1900s. The captain was charged with possessing a historical FKNMS artifact.



RESOURCE THREAT REDUCTION

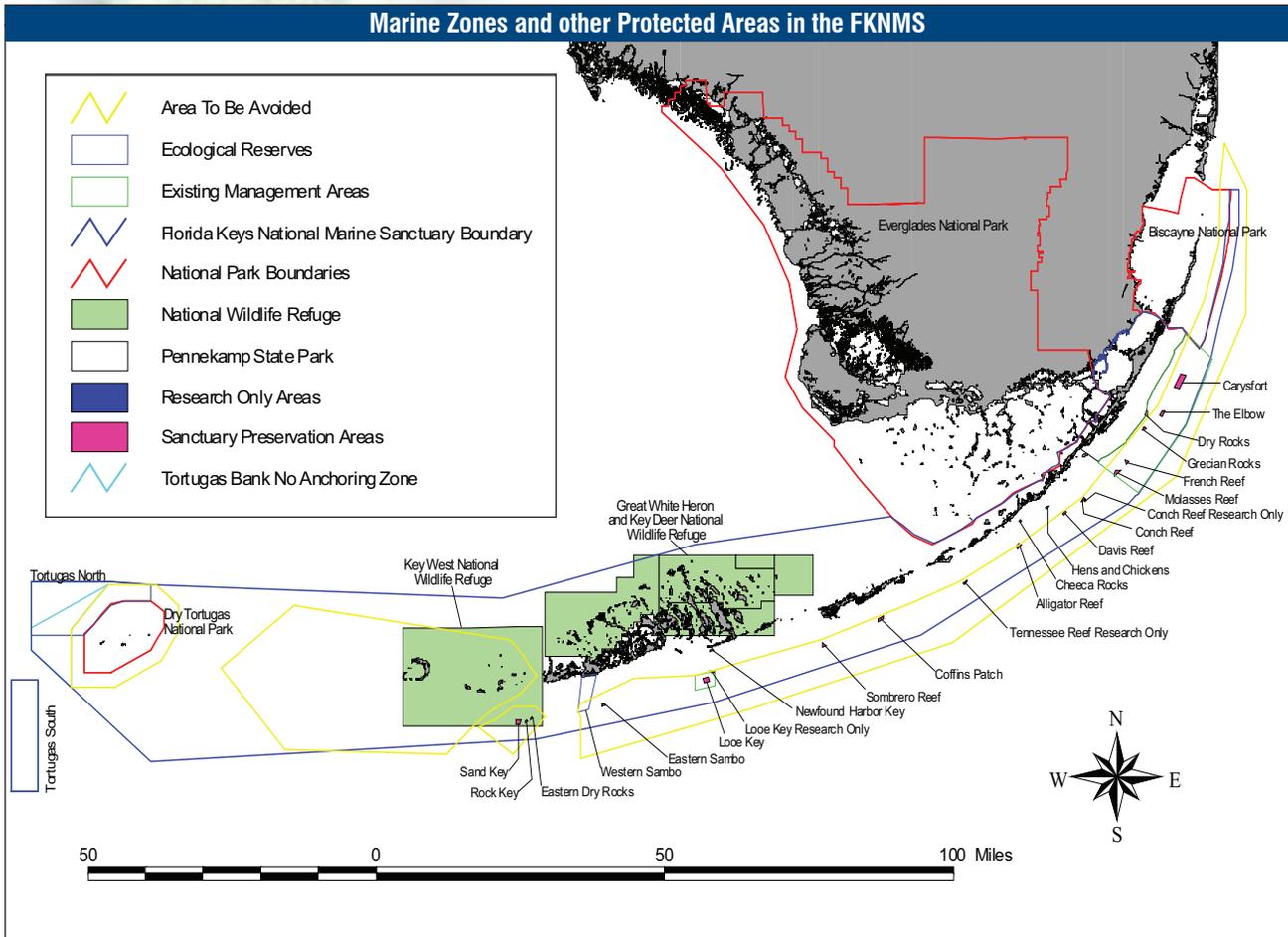
Marine Zoning Action Plan

In its enabling legislation, Congress instructed NOAA to consider temporal and geographical zoning to ensure protection of Sanctuary resources. FKNMS established the nation’s first comprehensive network of marine zones after years of planning, design, and public input. The marine zoning plan for FKNMS consists of five types of zones with varying levels of resource protection. Zones with restrictions on consumptive activities (such as fishing) are marked with large round 30” diameter yellow buoys, and other areas of restricted access or shallow resources are marked with white and orange can-shaped buoys. Overall FKNMS maintains a system of more than 300 of these marker and information buoys. The Sanctuary’s zones have met with favorable response from the community, and many areas have shown positive biological change inside their boundaries. Monitoring results can be found in the Research and Monitoring Action Plan section of this report.

SPAs protect shallow, heavily used reefs where conflicts historically occurred among user groups. Regulations for SPAs are designed to limit consumptive activities while allowing activities that do not threaten resource protection. There are 18 SPAs totaling approximately 6.5 square nautical miles in the FKNMS.

ERs seek to protect biodiversity by setting aside areas with minimal human disturbance. The 2 ERs in FKNMS encompass large, contiguous, diverse habitats, in order to protect and enhance natural spawning, nursery, and permanent-residence areas for the replenishment and genetic protection of fish and other marine life.

Special-Use (Research-only) Areas are set aside for research and education, or for the recovery or restoration of injured or degraded resources. Access is restricted to permitted entry only. There are four permanent Special-Use Areas in the Sanctuary.



Wildlife Management Areas (WMA) seek to minimize disturbance to especially sensitive or endangered wildlife and their habitats. These zones typically include bird nesting, resting, or feeding areas, turtle-nesting beaches, and other sensitive habitats. Regulations are designed to protect these species or the habitat while providing for public use. Access restrictions may include no-access buffers, no-motor zones, idle-speed only/no-wake zones, and closed zones. There are currently 27 WMAs in the Sanctuary. Twenty WMAs are co-managed with the United States Fish and Wildlife Service (USFWS) as part of their National Wildlife Refuges. NOAA manages the remaining seven WMAs.

There are also 21 Existing Management Areas in the Sanctuary, which were established prior to the 1997 Sanctuary Management Plan. Fifteen of these are administered by FDEP, four by USFWS, and two by NOAA.

Mooring Buoy Action Plan

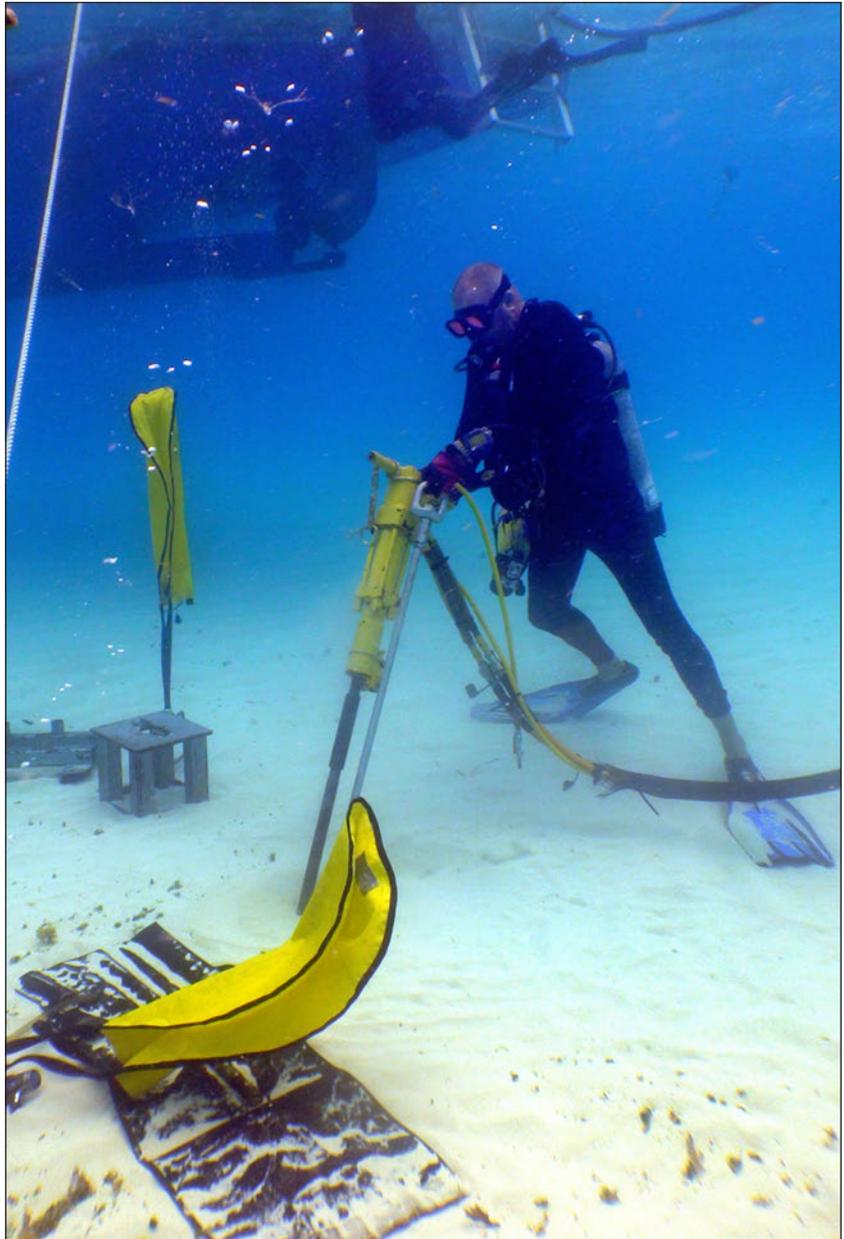
The FKNMS Key West and Key Largo Buoy Teams continue to install and maintain a system of 490 mooring buoys, using the secure environmentally friendly embedment anchor system first deployed off Key Largo in 1981. These buoys serve to eliminate or reduce anchor damage, increase safety at popular reef and wreck sites, and preserve sensitive shallow water habitats. For the past year, on average, greater than 97% of the mooring buoys were present, maintained, and available to the public.

To accomplish this work the Buoy Teams logged 2,190 hours on the water and 905 dives while conducting buoy system inspections, cleanings, system component replacements, and buoy anchor point installations. Significantly, the team organized and completed a 5 day buoy maintenance expedition to the Tortugas North ER, servicing 24 mooring buoys, and rotating 12 of the buoy systems into service at alternate locations in this important no anchor zone. Detailed work activities are recorded daily, and efforts are underway to analyze this information in order to better understand the frequency of various work procedures allowing better budgeting and field activity planning.

Outreach and Partnerships - The Buoy Team provided assistance to the Florida Institute of Oceanography by re-establishing and maintaining the Carysfort Reef oceanographic and meteorological data buoy. The team also replaced buoy systems for the State of Florida San Pedro Historical Maritime Heritage Site.

“Splicing parties” were organized, with the public invited to assist in the preparation of buoy system components. The events help promote awareness in the community while increasing maintenance capacity. The team also conducted outreach meetings with dive operators to discuss maintenance of moorings on shipwrecks, which are economically important dive sites.

A grant from the FDEP Coastal Zone Management Program was obtained, for use in purchasing buoy system components, and paying staff salaries. Donations were also obtained from private sources, most notably the Ocean Reef Rod and Gun Club, illustrating the support that this management effort has in the community. These funds help to supplement NOAA funding in the FKNMS budget.



Waterway Management Action Plan

Ongoing management of waterways in the FKNMS entails a strong interagency effort to provide safe access to all multi-use areas of the Sanctuary while maintaining a

waterway marking strategy that provides natural resource protection. Coordination between FKNMS, Monroe County Office of Marine Resources, the USCG, and the USFWS is inherent to implementing this action plan.

There have been no new marked channels established in the past few years, but during the reporting period Monroe County performed maintenance on 80 channel markers at a total cost of more than \$62,000. In addition FKNMS staff maintained a system of more than 300 marker and information buoys which enhance boater safety and natural resource protection. FKNMS is investigating how to incorporate the use of waterway markers into permitting reviews, and mitigation and restoration project designs.

Derelict vessels continue to be a problem in Monroe County, requiring annual effort to remove these safety and environmental hazards. During the reporting period FWC investigated 179 derelict vessels and Monroe County removed 94 vessels at a total cost of more than \$250,000.

In response to derelict vessels and related issues, the Florida Legislature directed FWC to run a pilot program, wherein 5 locations around the state, including Monroe County were to explore regulating mooring of vessels outside mooring fields. Thus far, Monroe County,

and the cities of Marathon and Key West have worked together to gather data on vessels anchored within their jurisdictions, and have put on 3 public workshops to gather input on the development of a county ordinance.



Water Quality Action Plan

WQPP - The WQPP mandated by Congress and developed jointly by the State of Florida, USEPA, NOAA, and Monroe County, has been an evolving and effective mechanism for identifying water quality problems and management solutions. The WQPP has funded three long-term monitoring projects: overall water quality, coral reef and hardbottom community health, and seagrass community health. The 15th consecutive year of long-term status and trends monitoring has been completed at a cumulative cost of

approximately \$13.3 million. Results of the monitoring projects are presented in the Research and Monitoring Action Plan section of this report.

A special project of the WQPP is monitoring the effect of improvements to the Little Venice wastewater treatment plant in Marathon. For this study, benthic monitoring is being performed by Florida International University, using \$82,000 in funding from FDEP for the current year. Preliminary findings indicate reduced availability of nutrients, which supports the benefit of wastewater infrastructure improvements.

On February 1, 2011 WQPP committee members visited 12 sites which illustrated different water quality problems, improvements, or potential future projects. One of the observations made during the trip was the impaired water quality in some canal systems. These canals typically are deeper than approach waters and have collected detritus over a period of years. Restoration of these canals was a topic of discussion and could be a focus area of future WQPP projects.

The WQPP Steering Committee continues to work with state, federal and the local agencies to acquire the financial resources needed to implement the County's Wastewater Master Plan, in order to meet the wastewater treatment requirements described in the following paragraphs.

Wastewater Facilities - Excessive nutrients from inadequately treated wastewater are a primary contributor to water quality degradation in near shore waters. Monroe County addressed this issue in their 1991 Comprehensive Plan, adopted pursuant to planning regulations for the Florida Keys Area of Critical State Concern (28-20 Florida Administrative Code). Subsequently corrective actions were developed, including the elimination of cesspools, and development of a sanitary Wastewater Master Plan. In 1999 the Florida Legislature increased water quality protections (Chapter 99-395, Laws of Florida), requiring all sewage treatment and disposal systems in Monroe County to comply with new stringent effluent standards by July 1, 2010. In addition, new surface water discharges of wastewater were prohibited, and existing surface water discharges had to be eliminated by July 1, 2006. In this year's session the Florida Legislature extended the July 1, 2010 wastewater compliance deadline to December 31, 2015, and streamlined the associated treatment and disposal requirements (Section 403.086(10), Florida Statutes).

To date approximately 65% of the equivalent dwelling units in Monroe County and its municipalities have been connected to central wastewater collection and treatment systems that meet State requirements, accomplished with assistance of more than \$113 million in Clean Water State Revolving Funds. While progress has been made in upgrading and building new wastewater infrastructure in the Florida Keys, there is still a tremendous amount of work remaining to be done.

There are currently 186 wastewater treatment facilities permitted by FDEP in Monroe County. FDEP requires monitoring of the effluent quality and licensing of plant operators. Monitoring reports are reviewed by FDEP, and facilities are regularly inspected to verify compliance.

Total Maximum Daily Load (TMDL) - The FDEP is required under the Clean Water Act to identify waters in the state that are impaired and to develop TMDLs which define the maximum pollutant loading that can be discharged from point and nonpoint sources, while still achieving water quality targets. An alternative mechanism, a Reasonable Assurance Document, can be developed in lieu of a TMDL when local management activities are already in place or planned which will achieve water quality targets. The responsible governmental agencies and stakeholders in Monroe County chose this later route and developed the Florida Keys Reasonable Assurance Document (FKRAD). FDEP provided a draft of the FKRAD to USEPA for preliminary review, and received a generally positive response, but USEPA voiced concerns regarding dissolved oxygen levels in canals. USEPA indicated that factors such as canal hydrology and accumulation of dead seaweed may continue to impair water quality in some areas. FDEP plans to update the FKRAD document and formally submit to USEPA in December 2011.

Vessel-Generated Waste - The Cities of Key West and Marathon have operational mooring fields, which along with providing safe anchorage also have pump-out facilities for vessel-generated wastewater. The Key West Dockmaster reports that 255,407 gallons of wastewater was pumped out from vessels and properly disposed of during the reporting period. Marathon reports more than 136,000 gallons of wastewater were collected and properly disposed from vessels at their site. The FDEP Clean Vessel program currently supports the Cities of Key West and Marathon, as well as 27 additional operations that provide pump out services in Monroe County. These facilities provide a mechanism for boaters to comply with discharge restrictions, aiding in reducing the amount of vessel-generated nutrients and human pathogens entering near shore waters. For information regarding NOAA regulations prohibiting discharge from MSDs Sanctuary-wide, see the Regulatory Action Plan section.

In Monroe County, there are 23 participants in the FDEP Clean Marina, Boatyard, and Retailer programs, which recognize facilities engaging in environmentally friendly practices, over and above regulatory requirements.

ADMINISTRATION, COMMUNITY RELATIONS & POLICY COORDINATION

Operations Action Plan

The Sanctuary Friends Foundation of the Florida Keys (SFFFK) is a non-profit 501(c)(3) organization which supports the Florida Keys and the FKNMS in the preservation, restoration, and sustainable use of the ecosystem. SFFFK's focus is on development of community support and advancement of public awareness, education, outreach, and scientific research.

In FY 10/11, SFFFK supported and approved funding for printing of the book *Coastal Connections*, which will serve as an excellent educational resource including approximately 230 marine science related topics specific to the Florida Keys. SFFFK also provided support and funding for a well attended Ocean Acidification Teacher Workshop; administration and evaluations for the *Blue Star* Program (see Education and Outreach Action Plan section); Team OCEAN marine debris cleanup logistics; and the SAC described below.



The SAC was established by the Secretary of Commerce to provide advice to the Sanctuary Superintendent and other managers regarding management of the FKNMS, and to assist in the development and implementation of the Sanctuary Management Plan. The SAC consists of appointed members concerned with resource protection and multiple-use management of the Sanctuary, and includes representatives from the following communities: boating, conservation and environment, diving, education and outreach, south Florida ecosystem restoration, fishing (commercial and recreational), elected county government, submerged cultural resources, research and monitoring, tourism, and the community-at-large. In FY 10/11, six SAC meetings were held, covering a range of topics including climate change, invasive lionfish, the Aquarius 2010 mission, law enforcement in the Florida Keys, coral reef conservation and restoration, ocean aquaculture, water quality, communicating linkages between the economy and the environment in the Florida Keys, the draft *FKNMS Condition Report*, marine zoning, among others. Each SAC agenda also had time allotted for members of the public to provide comments.

Television and Social Media - *Waterways* is a cooperative television outreach effort between the FKNMS, USEPA, and Everglades National Park. Seen on over 30 stations throughout Florida by millions of viewers annually, more than one hundred half-hour television episodes of *Waterways* explore the natural treasures of south Florida.

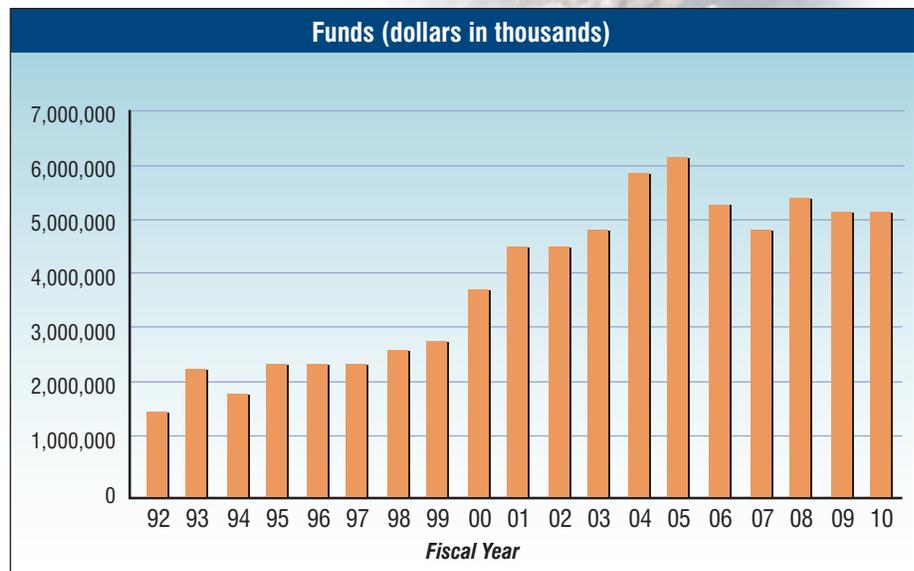
There are currently several new episodes of *Waterways* in development, covering topics such as invasive species (lionfish and pythons), environmental stewardship programs, the 10-year FKNMS zone monitoring report card, the National Park Service, and climate change effects on coral reefs.

The Sanctuary worked to enhance its online presence through a redesign of its website (<http://floridakeys.noaa.gov/>) and the creation of a Facebook page (<https://www.facebook.com/>).

com/floridakeysnoaagov). Redesigning the Sanctuary’s website to be more easily navigable and user friendly was imperative to effectively communicating science to the public. The new format will include a fresh look and feel, more than 500 pages and PDFs of information, along with many photos and videos. Social media tools such as Facebook allow the Sanctuary to broaden the reach of its messages beyond traditional media outlets and reach a diverse audience. More than 2,000 individual fans of the Sanctuary, hailing from more than seven countries, follow Sanctuary news and event updates.

Science Summaries are designed to communicate key results from research and monitoring studies taking place in the FKNMS to a broad audience using a non-technical approach. Sanctuary education and science staff work closely with principal investigators to develop these two-page documents featuring research on corals, reef fish, water quality and other topics. Marine zones and zoning studies of spiny lobster and coral reef fish were the focus of three new science summaries produced in FY 10/11. In addition, summaries describing long-term coral reef, seagrass and water quality monitoring results were updated based on recent findings. Summaries are published to the Sanctuary’s website and may be printed and updated as needed.

Budget - FKNMS operates on a total annual budget of approximately \$5 million funded by NOAA. In FY 10/11 approximately \$1.7 million was dedicated to field and vessel operations; \$1.9 million to resource protection including damage assessment, restoration, and enforcement; \$700,000 to education and outreach activities including the Florida Keys Eco-Discovery Center; \$100,000 to resource monitoring and report development; and \$100,000 to volunteer programs and SAC support.



Evaluation Action Plan

This Action Plan describes measures taken to improve overall management of FKNMS by using routine performance evaluation, including assessment of specific performance measures. The goals and objectives of the Evaluation Action Plan are designed to provide mechanisms to comprehensively evaluate Sanctuary activities in both the short and long term including: tracking status and progress of significant projects; improving accountability internally and externally; keeping trustees and stakeholders informed; providing clear guidance to managers and staff; developing and implementing measurable outcomes; and identifying resource gaps.

These goals and objectives are accomplished, through performance measures incorporated into each of the Action Plans in the FKNMS Management Plan. The authors of this report used these performance measures as a guide in the writing of this report. This approach inherently addresses the Strategy for this Action Plan, and 3 of the 4 Activities therein: annually assess Management Plan implementation; monitor existing performance measures; and report results. The fourth Activity, collaboratively evaluate the Action Plans found in the Management Plan, is also accomplished to a certain extent by the writing of this Annual Report. A full evaluation of the FKNMS Management Plan is performed every 5 years, with the next review due in 2012.

REFERENCES

- Ault, J.S. 2010. Fishery Dynamics of the South Florida Marine Ecosystem. *Proceedings of Linking Science to Management: A Conference and Workshop on the Florida Keys Marine Ecosystem*. Duck Key, FL. Electronic document available from: <http://www.conference.ifas.ufl.edu/floridakeys/Presentations/Wednesday/PM/1530%20Ault.pdf>
- Bartholomew, A., J.A. Bohnsack, S.G. Smith, J.S. Ault, D.E. Harper, and D.B. McClellan. 2007. Influence of marine reserve size and boundary length on the initial response of exploited reef fishes in the Florida Keys National Marine Sanctuary. *Landscape Ecology* (2008) Vol. 23, Supplement 1, pp. 55-65. Electronic document available from: <http://www.springerlink.com/content/b6376187w681p432/>
- Boyer, J.N. and H.O. Briceño. 2009. 2009 Annual report of the water quality monitoring project for the Florida Keys National Marine Sanctuary. Southeast Environmental Research Center Technical Report T-497. Florida International University. Miami, FL. 91pp. Electronic document available from: <http://serc.fiu.edu/wqmnetwork/Report%20Archive/2009FKNMS.pdf>
- Cox, C. and J.H. Hunt. 2005. Change in size and abundance of Caribbean spiny lobsters *Panulirus argus* in a marine reserve in the Florida Keys National Marine Sanctuary, USA. *Mar Ecol-Prog Ser* 294:227-239.
- Fourqurean, J.W. 2008. Seagrass Monitoring in the Florida Keys National Marine Sanctuary, FY 2008 Executive Summary. Report to the Florida Keys National Marine Sanctuary Water Quality Protection Program. 9 pp. Electronic document available from: http://ocean.floridamarine.org/FKNMS_WQPP/products/sgmp/reports/2008_Executive_Summary.pdf
- Leeworthy, V.R. 2010. Visitor Study: Selected Comparisons 1995-96 and 2007-08. Silver Spring: Office of National Marine Sanctuaries, National Ocean Service, National Oceanic and Atmospheric Administration, July 2010, 17pp. Electronic document available from: http://sanctuaries.noaa.gov/science/socioeconomic/floridakeys/pdfs/comparisons_9596_0708.pdf
- Leeworthy, V.R., D.K. Loomis, S.K. Paterson. 2010. Visitor profiles: Florida Keys/Key West 2007-08. Silver Spring: Office of National Marine Sanctuaries, National Ocean Service, National Oceanic and Atmospheric Administration and Amherst, MA: Human Dimensions of Marine and Coastal Ecosystems Program, University of Massachusetts Amherst, May 2010, 196pp. Electronic document available from: http://sanctuaries.noaa.gov/science/socioeconomic/floridakeys/pdfs/full_visitor_08.pdf
- Leeworthy, V.R. and F.C. Morris. 2010. A socioeconomic analysis of the recreation activities of Monroe County residents in the Florida Keys/Key West 2008. Silver Spring: Office of National Marine Sanctuaries, National Ocean Service, National Oceanic and Atmospheric Administration, September 2010, 61pp. Electronic document available from: http://sanctuaries.noaa.gov/science/socioeconomic/floridakeys/pdfs/floridakeysres_report.pdf
- Ruzicka, R., M. Colella, K. Semon, V. Brinkhuis, J. Morrison, J. Kidney, J. Porter, M. Meyers, M. Christman, J. Colee. 2010. Coral Reef Evaluation and Monitoring Program 2009 Final Report. Fish & Wildlife Research Institute/Florida Fish & Wildlife Conservation Commission. Saint Petersburg, FL. 110 pp.



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NATIONAL MARINE
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