5 Improve the Use and Effectiveness of Marine Protected Areas (MPAs)

Introduction

NOAA and the other Federal, state, and territorial agencies on the U.S. Coral Reef Task Force (USCRTF) have recognized that successful conservation of coral reef ecosystems requires the identification and management of ecologically important reef areas within the broader marine environment. As a result, the USCRTF has provided formal acknowledgement of Marine Protected Areas (MPAs) as an important coral reef management tool, and has taken measures for the official incorporation of this tool into their marine resource management efforts. Creating a network of well-managed MPAs helps protect the biodiversity and resilience of coral reef resources. MPAs can also serve an integral role in an ecosystem-based approach to management and conservation. MPAs can protect critical habitats and endangered species, enhance tourism and recreation, and serve important roles in public education and outreach. MPAs can also provide a framework for the application of adaptive management, maintaining feed-back loops between science, management, and policy decisions.

The 2002 National Action Strategy of the USCRTF identifies the establishment and effective management of a representative network of MPAs as the most powerful tool for conservation of coral reef ecosystems. However, much progress still remains to be made in the area of successful MPA development. According to a CRCP report on the status of U.S. coral reef MPAs, there are currently 207 MPAs managed by U.S. state and territory governments. Of these, only 49 (24%) provide some level of no-take protection (Exhibit III-5-1), and only 42 (20%) have management plans (Exhibit III-5-2). The majority of these sites are still facing a number of challenges which need to be addressed to help them achieve management goals and objectives. These challenges include enforcement, funding and other resources, management capacity, monitoring, and public support (Exhibit III-5-3). The ultimate success of these MPAs is contingent upon the resolution of these obstacles to effective management.

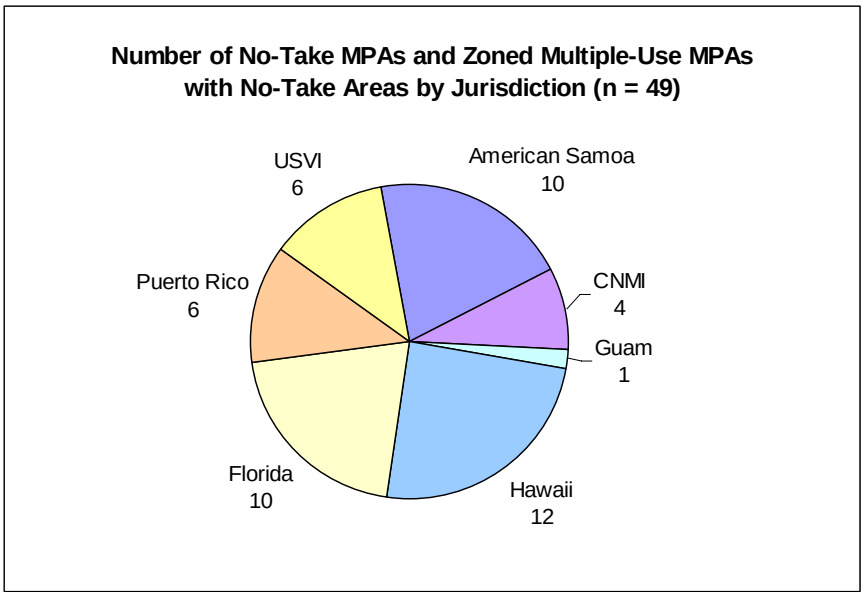

Exhibit III-5-1. Number of coral reef MPAs managed by U.S. state and territory governments providing no-take protection by jurisdiction.

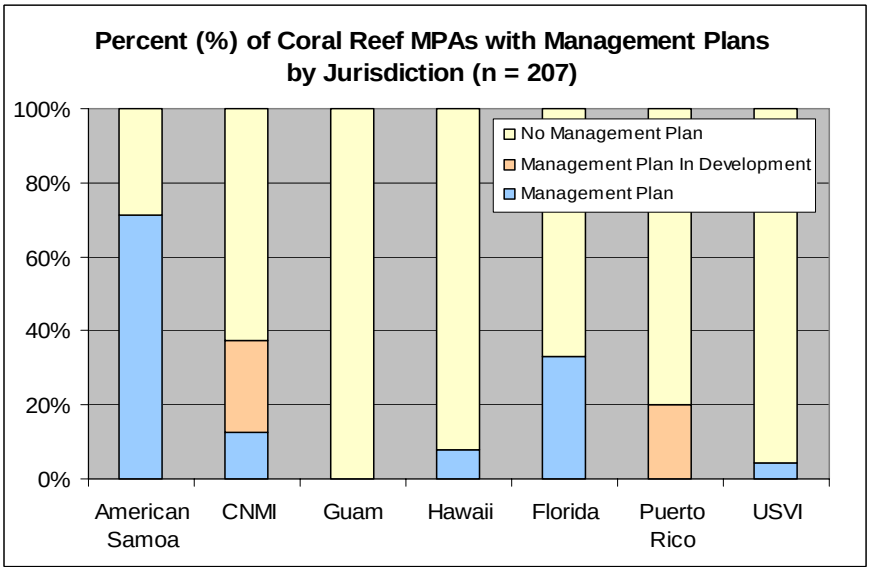

Exhibit III-5-2. Coral reef MPAs managed by U.S. state and territory governments with management plans.

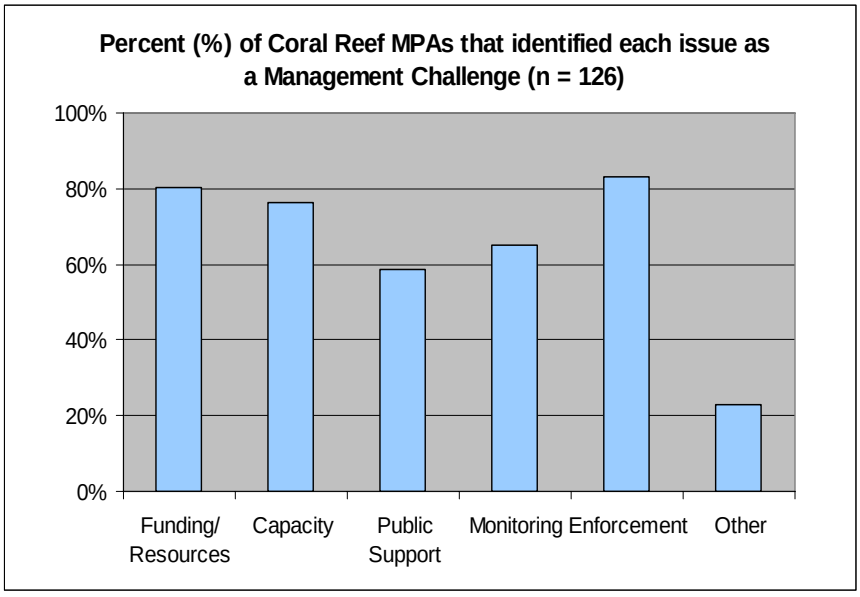

Exhibit III-5-3. Percent of coral reef MPAs managed by U.S. state and territory governments that identified five key issues as a challenge to effective MPA management.

NOAA's Coral Reef Conservation Program (CRCP) supports this priority management tool by funding research, monitoring, mapping, modeling, management, outreach/education, and technical capacity building initiatives. These initiatives aid in strengthening the management of existing MPAs and also provide the information required to establish new MPA sites that contribute to the development of functional ecological networks of MPAs in coral reef ecosystems. Over the past five years, the CRCP has provided over $23.4 million (or 18% of overall program funding from 2002-2006) to support 143 NOAA projects and external grant projects to sustain efforts to establish, manage, study, and monitor coral reef MPAs, as shown in Exhibit III-5-4.

Exhibit III-5-4a
Investments to Improve Use and Effectiveness of Marine Protected Areas (MPAs), 2002-2006

Spend Plan Category	Number of Projects	% Category Projects	% Total Projects	Funding	% Category Projects	% Total Projects
Improve Use and Effectiveness of Marine Protected Areas (MPAs)	**143**	**11.0**	**11.0**	**$23,425,302**	**18.1**	**18.1**
Northwestern Hawaiian Islands Ecosystem Reserve	7	4.9	0.5	$15,295,900	65.3	11.8
Build and Support Systems and Networks of MPAs	45	31.5	3.5	$2,720,125	11.6	2.1
Improve MPA Management Effectiveness	47	32.9	3.6	$2,585,477	11.0	2.0
Conduct Science in Support of MPA Design and Adaptive Management	44	30.8	3.4	$2,823,800	12.1	2.2

NOAA research has supported studies to evaluate habitat and fish populations. These studies provide information for decisions on where MPAs should be established and set a baseline which can be used to evaluate future MPA success in conserving habitat and restoring populations of reef dwelling species. Modeling projects have provided information on the benefits of MPA establishment. The program has also supported biological and socioeconomic monitoring in coral reef areas. Funds have also supported the direct management of MPAs including the management of the Northwestern Hawaiian Islands National Ecosystem Reserve (now the Papahanaumokuakea Marine National Monument). The program has supported the development of management plans and zoning strategies with state and territory governments in the Pacific and Caribbean regions, and has provided staff to support the development of MPA networks. The program has also provided funding for the installation of MPA infrastructure such as field stations, mooring buoys, and signage. MPA outreach efforts have made the public aware of MPA locations and regulations and strived to build public support for the development of new MPAs. Training and technical assistance has been provided to state and territory managers and other local MPA practitioners to increase their capacity to successfully establish and manage coral reef MPAs.

Performance Goals

Several performance goals and targets are relevant to this funding category. Goal 5 of the USCRTF National Coral Reef Action Strategy of 2002 calls upon NOAA and other members of the USCRTF to "Improve the Use of Marine Protected Areas in Coral Reef Ecosystems" by achieving five sub-objectives:

1. Conduct and support nationwide, state, and territory assessments of the effectiveness and gaps in the existing system of U.S. coral reef MPAs.
2. Develop proposals for establishing new MPAs and enhancing effectiveness of existing areas as appropriate through existing authorities and involvement of all constituencies.
3. Strengthen capabilities of existing MPAs to protect coral reef resources through review and revision of existing sites, applicable management plans, programs, policies, and authorities.
4. Establish additional coral reef MPAs where needed. This includes establishing additional "no-take" ecological reserves in a balanced suite of representative U.S. coral reefs and associated habitats, with the goal of protecting at least five percent of all coral reefs and associated habitat types in each major island group and Florida as ecological reserves by 2002; at least 10 percent by 2005; and at least 20 percent by 2010.
5. Strengthen and support cooperation with and among the Freely Associated States and international partners to establish networks of MPAs to protect and conserve reef ecosystems.

To address these goals and objectives, the CRCP has focused on four main areas for MPA support:

- Build and Support Systems and Networks of MPAs
- Improve MPA Management Effectiveness
- Conduct Science in Support of MPA Design and Adaptive Management
- Support the Operations of the Northwest Hawaiian Islands Coral Reef Ecosystem Reserve (recently designated as the Papahanaumokuakea Marine National Monument).

Exhibit III-5-4b shows the distribution of investments in these subcategories for 2002-2006.

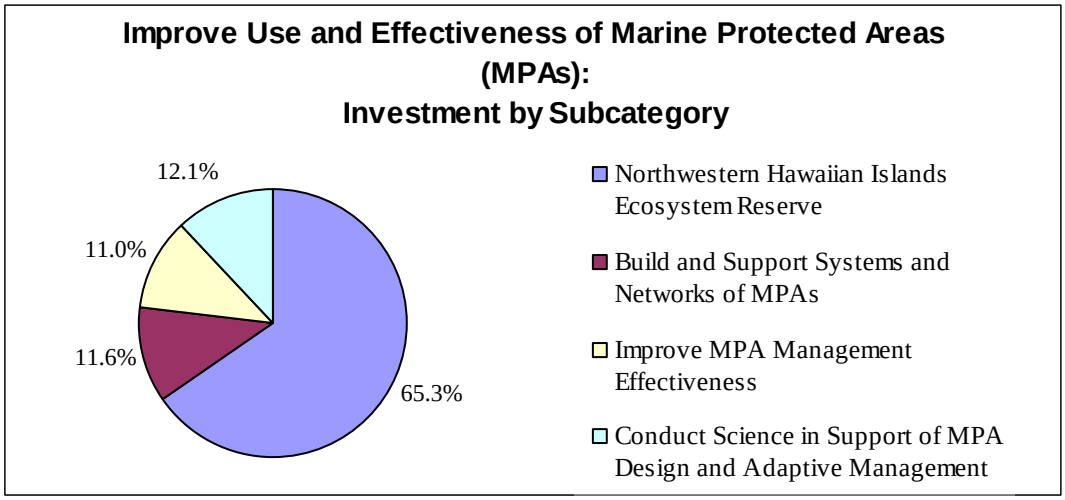

Exhibit III-5-4b. Distribution of Investments by Subcategory, 2002-2006

Subcategory: Build and Support Systems and Networks of MPAs

a. Introduction to Subcategory

Although many MPA sites have been established in coral reef areas, very few of these sites are part of functional ecological networks or have management plans to guide adaptive management. Under this subcategory, CRCP has supported efforts to perform mapping, monitoring, research, management, and outreach projects that support the establishment of new MPA sites, the management of existing MPAs, the development of ecological networks of coral reef MPAs, and social networks of MPA managers and practitioners. Between 2002 and 2006, the CRCP provided $2.7 million to support 45 projects in this subcategory. This area accounted for 12% of funding within the MPA category and 2% of overall CRCP funding. This subcategory also accounted for 31% of the projects in the MPA category and 3% of all of the CRCP projects funded in this five year period (Exhibit III-5-4). The distribution of funds and effort by tool for this subcategory is presented in Exhibits III-5-5a and -5b.

Exhibit III-5-5a
Build and Support Systems and Networks of MPAs
Investments by Tool

Tool	2002		2003		2004		2005		2006		TOTALS 2002-2006			
	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	% of Total Subcategory Projects	Funding	% of Total Subcategory Funding
Ecosystem Research	0	$0	0	$0	0	$0	2	$110,000	2	$126,558	**4**	**8.9**	**$236,558**	**8.7**
Socioeconomic Research	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
Mapping and Monitoring	0	$0	0	$0	3	$195,000	0	$0	1	$59,172	**4**	**8.9**	**$254,172**	**9.3**
Outreach	0	$0	1	$81,954	1	$62,795	3	$60,752	0	$0	**5**	**11.1**	**$205,501**	**7.6**
Management: Direct Implementation	2	$160,000	4	$197,341	6	$392,980	5	$299,944	2	$77,430	**19**	**42.2**	**$1,127,695**	**41.5**
Management: Training/Technical Assistance	2	$130,016	0	$0	6	$519,370	3	$133,400	2	$113,413	**13**	**28.9**	**$896,199**	**32.9**
None or N/A	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
TOTALS	**4**	**$290,016**	**5**	**$279,295**	**16**	**$1,170,145**	**13**	**$604,096**	**7**	**$376,573**	**45**	**100**	**$2,720,125**	**100**

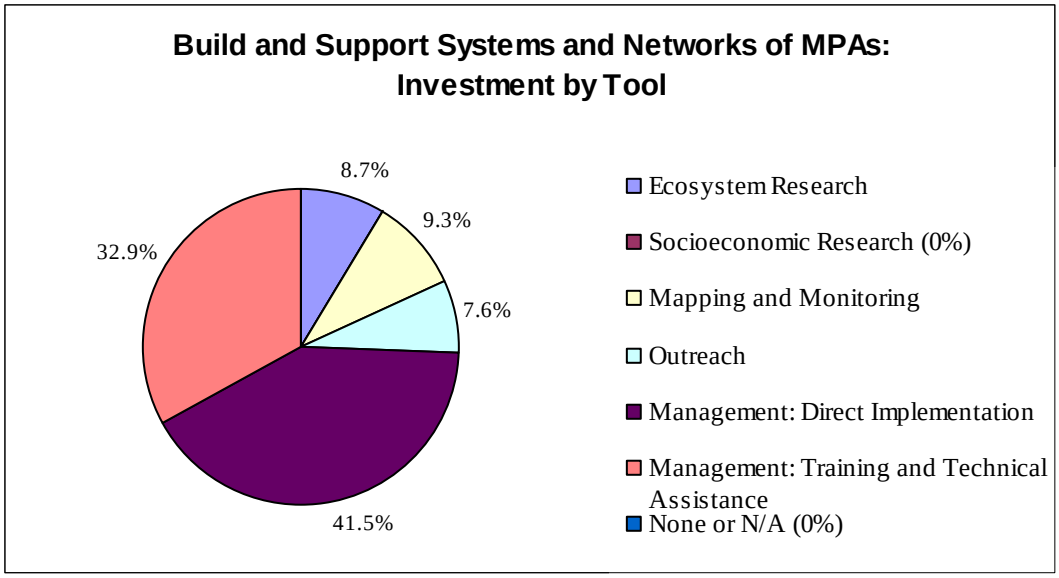

Exhibit III-5-5b. Distribution of Investments by Tool, 2002-2006

The distribution of funds and effort by region for this subcategory is presented in Exhibits III-5-6a and -6b.

Exhibit III-5-6a
Build and Support Systems and Networks of MPAs
Investments by Tool

Region	2002		2003		2004		2005		2006		TOTALS 2002-2006			
	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	% of Total Subcategory Projects	Funding	% of Total Subcategory Investment
Atlantic/Caribbean	3	**$187,136**	2	$99,454	8	$418,361	7	$288,552	5	$221,740	**25**	**46.3**	**$1,215,243**	**44.7**
Pacific	2	$102,880	4	$179,841	9	$656,084	6	$278,544	3	$102,565	**24**	**44.4**	**$1,319,914**	**48.5**
Freely Associated States	0	$0	0	$0	1	$55,500	1	$37,000	2	$52,269	**4**	**7.4**	**$144,769**	**5.3**
International	0	$0	0	$0	1	$40,200	0	$0	0	$0	**1**	**1.9**	**$40,200**	**1.5**
All Regions	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
TOTAL	**5**	**$290,016**	**6**	**$279,295**	**19**	**$1,170,145**	**14**	**$604,096**	**10**	**$376,573**	**54**	**100**	**$2,720,125**	**100**

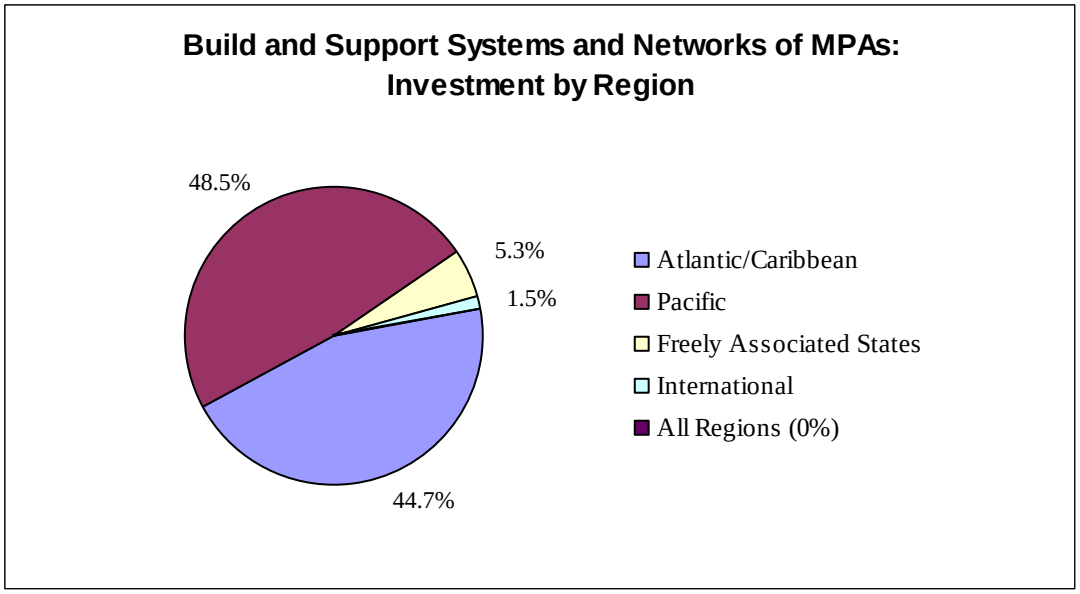

Exhibit III-5-6b. Distribution of Investments by Region, 2002-2006

b. Activities

Management Training and Technical Assistance

Funding under this subcategory over the past five years provided support for NOAA contract and Federal staff to assist local state and territory MPA establishment and management efforts in the Pacific and Caribbean regions. These staff worked to develop a social and learning network of MPA managers in the Pacific who are identifying and addressing priority areas for MPA management capacity building at a regional level. They are also providing training and technical assistance on the development of management plans for MPAs and the evaluation and monitoring of MPA management effectiveness.

In the Pacific, the Pacific Island Marine Protected Area Community (PIMPAC) was developed. PIMPAC is a social network aimed at addressing the challenge Pacific Island nations face by being located hundreds or thousands of kilometers apart with little opportunity to share information with regional peers or gain access to skills-building opportunities. PIMPAC is designed to help participants bridge that geographic gap, through regional training workshops, staff exchanges, technical assistance services, academic institution partnerships (e.g., curriculum and program development, student internships), a newsletter, and a listserv. Training on management plan development has been provided via regional workshops with MPA managers and practitioners from 10 Pacific jurisdictions (American Samoa, CNMI, Guam, Hawai'i, Palau, the Marshall Islands and the Federated States of Micronesia including Yap, Chuuk, Pohnpei, and Kosrae).

Training on management plan development and an introduction to management effectiveness has been provided via regional workshop for seven Caribbean jurisdictions (Puerto Rico, the USVI, the British Virgin Islands, Bahamas, Grenada, St. Vincent/Grenadines, and Bonaire). Targeted follow-up assistance on management plan development has been provided in the Bahamas and Puerto Rico.

Management Implementation

Staff funded under this subcategory manage grants to the states and territories which support the on-the-ground implementation and management of local state and territory MPA sites. Funding was also provided to develop an MPA technical specialist position located in the CNMI.

Staff funded under this subcategory also provided targeted support in Puerto Rico to:

- Establish zoning strategies for different management goals and objectives within existing MPAs.
- Identify priority coral reef areas for conservation.
- Identify priority MPA sites for the development of management plans.
- Initiate collaborative processes to involve local stakeholders in the development of management plans for these sites.
- Analyze the legal foundation for community involvement in MPA establishment and management in Puerto Rico.

Activities supported through the CRCP grant programs mainly addressed direct implementation and technical training for management purposes. Several direct implementation activities provided specific staff to oversee MPA management activities, including support for administration, outreach, biological staff, and research for the USVI East End Marine Park. In the Pacific, staff developed strategies and support tools for jurisdiction-wide MPA networks. Technical training activities were also carried out to provide skills building for local staff and stakeholders to enable them to incorporate stakeholder input and scientific information into MPA management decision making.

Outreach

NOAA staff worked with the State of Hawai'i's MPA advisory group to produce outreach materials for increased public support of MPAs in Hawai'i. After the management project for identifying priority coral reef areas for conservation was completed, outreach materials were produced and distributed to make the public aware of these areas and increase support for protecting them.

Program Highlight: Makai Watch Program

To engage the public in management, the Hawai'i Department of Land and Natural Resources (DLNR) has partnered with local NGOs and communities to implement the Makai (meaning "seaward") Watch Program. This program encourages communities to actively participate in the management of local near-shore resources through education, monitoring, and surveillance. Communities work to develop goals and objectives and a work plan to carry out management activities in their local area. Most communities that participate in the Makai Watch Program are adjacent to an MPA and support the management of those sites by monitoring human use and biological factors, fostering awareness of resource users on regulations and natural history, and reporting violations to an enforcement officer who can respond more efficiently to sites.

This program has been very successful in engaging the public in local resource management. Through collaboration with the state and NGOs, communities have been able to provide greater protections to local resources and even pass additional rules. DLNR recently published a new community stewardship guide, *Getting Involved in Caring for Hawaii's Coastal Resources: A Community Guidebook*, to provide communities with step-by-step instructions on how to get engaged and/or become a Makai Watch community.

Ecosystem Research

A regional survey of five new MPAs in the South Atlantic was initiated to establish baseline estimates of species composition and fish abundance, especially for species of grouper and tilefish; describe habitat features; and document the relationship between habitat and species assemblages. These sites encompass shelf edge coral reefs with abundant soft corals, solitary hard corals, sponges, and gorgonians.

Mapping and Monitoring

At a national level, the projects in this subcategory have supported the completion of a GIS-based compilation of all *de facto* MPAs in U.S. coral reef waters as well as a geospatial analysis in the seven coral reef states and territories. This analysis will provide area-based information on the percentage of coral reef ecosystems that have been protected within MPAs, and more specifically within no-take reserves.

c. Funding Recipients and Partners

Exhibit III-5-7 highlights examples of CRCP partners and grant recipients who undertook activities within this subcategory.

Exhibit III-5-7
Build and Support Systems and Networks of MPAs
Funding Recipients and Partners

NOAA Offices	States and Territories	Non-Governmental Organizations	Academic Institutions
• NOS - Office of Ocean and Coastal Resource Management	• American Samoa	• The Nature Conservancy	• University of Connecticut (NURP Center)
• NOS - Special Projects Office	• Guam	• The Ocean Conservancy	
• NOS - International Programs Office	• CNMI	• The Community Conservation Network	
• NMFS - Pacific Islands Regional Office	• Florida	• The Micronesia Conservation Trust	
• NMFS - Southeast Fisheries Science Center	• Hawaii		
• NMFS - Southeast Regional Office	• Puerto Rico		
	• U.S. Virgin Islands		
	• Republic of Palau		
	• Republic of the Marshall Islands		
	• Federated States of Micronesia		

d. Outputs

Many significant accomplishments have resulted from the projects supported through this subcategory over the last five years. MPA managers from seven jurisdictions received training on how to develop effective MPA management plans. In Puerto Rico, an assessment of marine habitats within La Parguera was completed; specific management measures for these habitats were developed and submitted to Commonwealth resource management authorities as recommendations. Also in Puerto Rico, a list of priority sites for management plan development was prepared.

A final report for five new MPA sites in the South Atlantic region was issued to the South Atlantic Fishery Management Council (SAFMC) in September 2006. This report described the habitat and fish assemblages evaluated during a June 2006 cruise, which provided baseline data

for post-closure comparisons and assisted the SAFMC in selecting the best options for closure in early 2007.

The Pacific Islands Marine Protected Area Community (PIMPAC) has:

- Compiled an MPA management planning guidebook and training module.
- Developed a regional MPA management planning training for 33 regional managers.
- Provided technical support to three islands to carry out community-based management planning processes.
- Developed a regional website to house relevant materials.
- Developed exchange visit criteria and request forms.
- Developed a regional listserv to foster discussion and information sharing.
- Created partnerships with regional universities to carry out a two-day MPA management planning session within a six-week course for coral reef managers, and a concept paper to begin the development of an MPA-focused graduate degree program.
- Supported internships to foster the next generation of conservation leaders and MPA managers.
- Developed a three-year strategic plan to enhance technical assistance, information sharing, academic institution support for MPA management curriculum and field work, and peer-to-peer learning.

Other major outputs from activities in the Pacific region are:

- Development of a newspaper insert on MPAs in Hawai'i to provide the public with accurate information about MPAs and dispel misconceptions about MPAs. The newspaper insert was developed by providing facilitation services to Hawai'i's Division of Aquatic Resources to promote a unified voice on MPAs by the management agency.
- Hire of an MPA specialist in CNMI to coordinate MPA activities among all resource agencies, policy makers, and the public; conduct outreach about local MPA efforts; and guide the development of an MPA plan.
- Support to American Samoa MPA staff to support capacity building, including management planning training and monitoring training for four MPA staff members.

The effort to assess the impact of *de facto* MPAs has achieved the following milestones:

- Developed a new functional classification system for *de facto* MPAs that parallels one developed for more traditional conservation-focused areas.
- Built a new database to capture this information and link to the broader inventory of marine managed areas in U.S. waters.
- Documented the location, purpose, and nature of restrictions for nearly all Federal *de facto* MPAs.
- Created a comprehensive GIS with boundaries for many *de facto* MPAs in the U.S.

- Worked with the Department of Defense to explore ways to acquire data on restricted areas and to use them for broader conservation benefits. To date, the project has documented 13 sites in the Caribbean, seven in Guam and CNMI, 25 in the Gulf of Mexico (which includes the Keys and Flower Garden Banks areas), 11 in Hawai'i, and one in the Pacific Remote region at Kwajalein Atoll in the Marshall Islands. This comprehensive inventory will be evaluated to determine the extent to which these restricted areas may contribute to the ocean conservation and management goals of NOAA and its island partners.

Key outputs of the work carried out funded by the Coral Reef Conservation Grant Program under this subcategory are direct staffing and management of managed areas, and the development of decision support tools to be used to carry out MPA network development.

e. Outcomes

Several longer term outcomes also resulted from the projects supported in this subcategory. As a direct result of training on MPA management development in the Caribbean region, five jurisdictions successfully developed new site-specific MPA management plans. As a result of the assessment of marine habitats in La Parguera, Puerto Rico and the subsequent management measures that were recommended to the local government, signs were installed on 10 shallow cays warning boaters to avoid these areas, along with additional mooring and channel marker buoys. Identifying priority sites for MPA management plan development led to the implementation of community-based initiatives to develop five MPA management plans. Three of these sites have complete draft plans that are now in official government approval processes. Similar efforts in two additional sites are underway. This project also built long-term capacity within the local government to involve local stakeholders in management planning processes and to perform threats-based strategic management planning.

In the South Atlantic region, the SAFMC selected the five new MPA sites at its June 2007 meeting, based on findings presented in the final report. The amendment to enact these closures has been sent to the Secretary of Commerce for final approval.

Projects supported through the CRCP grant programs resulted in direct management outcomes such as increased community participation in management activities and decision making. For example, the Makai Watch program in Hawai'i (see Program Highlight, p. III-5-10) resulted in two new legislated managed areas through community requests, and over 15 other communities providing support for management activities such as surveillance, monitoring, and outreach at their local sites. CNMI used CRCP funding for a two-year MPA specialist, and subsequently the local government has decided to use their existing grant funds to continue this position. As a result of the trainings on MPA management plan development in American Samoa, involved staff members are revising existing management plans to ensure more strategic and effective management of sites.

It is more difficult to correlate outreach activities with long-term changes in attitude towards MPAs, but initiatives such as the development of the newspaper insert on MPAs in Hawai'i and community based programs like Makai Watch helped clarify the goals, objectives, and utility of MPAs and facilitated public engagement in MPA management activities. This can be seen in the recent increase in public and community support in Hawai'i for legislation that promotes community involvement in site-based management.

f. Challenges

The major challenge faced in carrying out these activities has been local staff capacity to carry out the work required to make significant improvements in MPA effectiveness. However, it has been shown that community engagement in MPA management can improve policies, public acceptance, and overall management activity. This is best demonstrated by Hawai'i's approach of involving communities in management activities. Initiatives supported through CRCP funding are aimed at sharing the lessons of these efforts within and among regions, with the intent of building similar programs in all jurisdictions. Therefore, continued and increased support for these efforts is necessary, in addition to support for building the next generation of MPA managers through capacity building programs that target young adults.

g. Future Directions

Major outcomes of this work require lengthy time periods to demonstrate results such as quantifiable improvements in management effectiveness. Projects thus far have provided the foundation for improving effectiveness in MPA management and supporting networks of MPAs throughout the regions. Island jurisdictions have already committed to establishing networks of MPAs through the USCRTF efforts and/or the Micronesia Challenge. The Micronesia Challenge is a commitment by the island jurisdictions of Palau, the Federated States of Micronesia, the Republic of the Marshall Islands, the Territory of Guam, and the CNMI to provide effective conservation within each jurisdiction of 30% of nearshore marine and 20% of terrestrial resources by the year 2020. However, implementing these networks will require extensive capacity building networks and resource and information sharing. There is currently a trend to improve existing management schemes via significant increases in public participation in management activities. To effectively conserve coral reef ecosystems, history shows that community and stakeholder support is critical to success. All of the activities carried out thus far move the states, territories, and Freely Associated States in this direction by either providing ways to improve community relations or the skills and tools needed to gather and disseminate the appropriate information to stakeholders. Outcomes of these projects will require more time but are anticipated to show support for increased numbers and effectiveness of MPA networks throughout the region.

Subcategory: Improve MPA Management Effectiveness

a. Introduction

This second subcategory aims to improve the effective management of existing MPA sites in coral reef ecosystems by providing the information and support needed to make sound management decisions, achieve MPA goals and objectives, and effectively conserve priority coral reef resources. There is some overlap between the two subcategories "build and support systems and networks of MPAs" and "improve MPA management effectiveness" because both fund projects designed to support effective MPA management. The main difference is that the first subcategory focuses on the development and management of new MPA sites and networks, while this subcategory mainly funds projects for existing sites.

Between 2002 and 2006, the CRCP provided $2.6 million to support 47 projects in this subcategory. This area accounted for 11% of funding within the MPA category and 2% of overall CRCP funding. This subcategory also accounted for 33% of the projects in the MPA category and 4% of all of the CRCP projects funded in this five year period (Exhibit III-5-4).

There were 26 management, nine monitoring, five outreach, four ecosystem research, and three socioeconomic research projects conducted in this subcategory during this period. More than two-thirds (83%) of the funds in this subcategory were directed towards projects conducted in the Gulf of Mexico or U.S. Caribbean, 8% were directed towards the Pacific, 7% towards the Freely Associated States, and less than 2% for International and All Regions categories (Exhibit III-5-9). The apparent regional disparity in funds distribution can be explained by the fact that activities in the Pacific region were largely carried out via funds to the NWHI, which constitutes a distinct subcategory under CRCP's efforts to Improve the Use and Effectiveness of MPAs (see page III-5-21). The distribution of funds and effort by tool for this subcategory is presented in Exhibits III-5-9a and 9b.

Exhibit III-5-9a
Improve MPA Management Effectiveness
Investments by Tool

Tool	2002		2003		2004		2005		2006		TOTALS 2002-2006			
	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	% of Total Subcategory Projects	Funding	% of Total Subcategory Funding
Ecosystem Research	1	$70,972	0	$0	2	$59,000	0	$0	1	$50,000	**4**	**8.5**	**$179,972**	**7.0**
Socioeconomic Research	0	$0	0	$0	1	$10,000	0	$0	2	$125,997	**3**	**6.4**	**$135,997**	**5.3**
Mapping and Monitoring	1	$175,000	1	$180,000	1	$155,000	4	$383,845	2	$182,447	**9**	**19.1**	**$1,076,292**	**41.6**
Outreach	0	$0	0	$0	2	$58,992	1	$32,586	2	$50,632	**5**	**10.6**	**$142,210**	**5.5**
Management: Direct Implementation	1	$38,000	7	$507,206	3	$45,000	2	$25,500	5	$171,283	**18**	**38.3**	**$786,989**	**30.4**
Management: Training and Technical Assistance	3	$62,900	1	$45,000	1	$50,000	2	$81,463	1	$24,655	**8**	**17.0**	**$264,018**	**10.2**
None or N/A	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
TOTAL	**6**	**$346,872**	**9**	**$732,206**	**10**	**$377,992**	**9**	**$523,394**	**13**	**$605,013**	**47**	**100**	**$2,585,477**	**100**

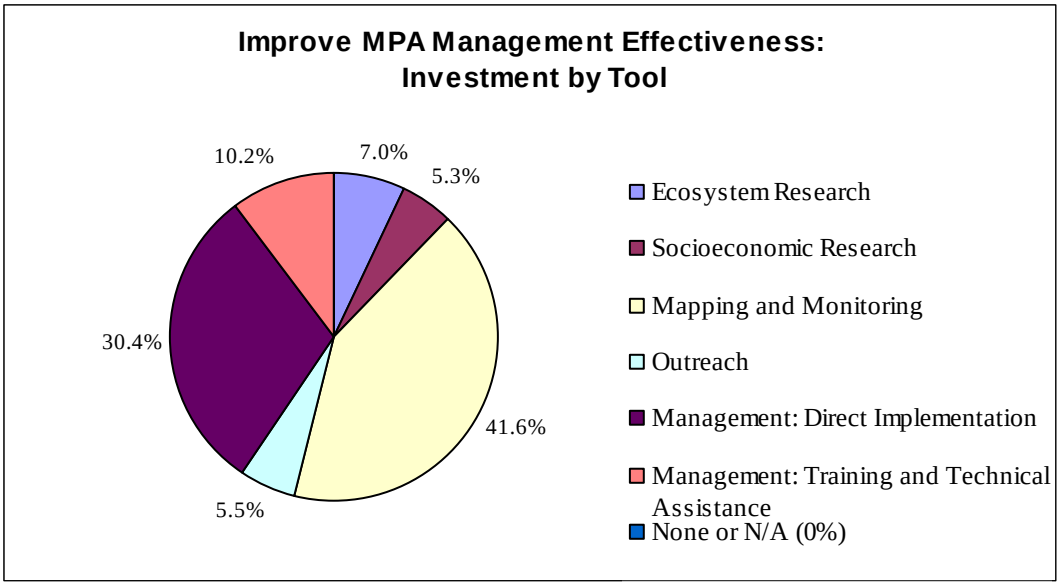

Exhibit III-5-9b. Distribution of Investments by Tool, 2002-2006

The distribution of funds and effort by region for this subcategory is presented in Exhibits III-5-10a and 10b.

Exhibit III-5-10a
Improve MPA Management Effectiveness
Investments by Region

Region	2002		2003		2004		2005		2006		TOTALS 2002-2006			
	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	% of Total Subcategory Projects	Funding	% of Total Subcategory Investment
Atlantic/Caribbean	1	$175,000	8	$664,406	7	$303,292	6	$434,500	10	$569,178	**32**	**59.3**	**$2,146,376**	**83.0**
Pacific	2	$37,386	1	$22,800	4	$71,800	3	$52,331	3	$33,370	**13**	**24.1**	**$217,687**	**8.4**
Freely Associated States	3	$96,486	1	$45,000	1	$2,900	2	$36,563	0	$0	**7**	**13.0**	**$180,949**	**7.0**
International	0	$0	0	$0	0	$0	0	$0	1	$2,466	**1**	**1.9**	**$2,466**	**0.1**
All Regions	1	$38,000	0	$0	0	$0	0	$0	0	$0	**1**	**1.9**	**$38,000**	**1.5**
TOTAL	**7**	**$346,872**	**10**	**$732,206**	**12**	**$377,992**	**11**	**$523,394**	**14**	**$605,013**	**54**	**100**	**$2,585,477**	**100**

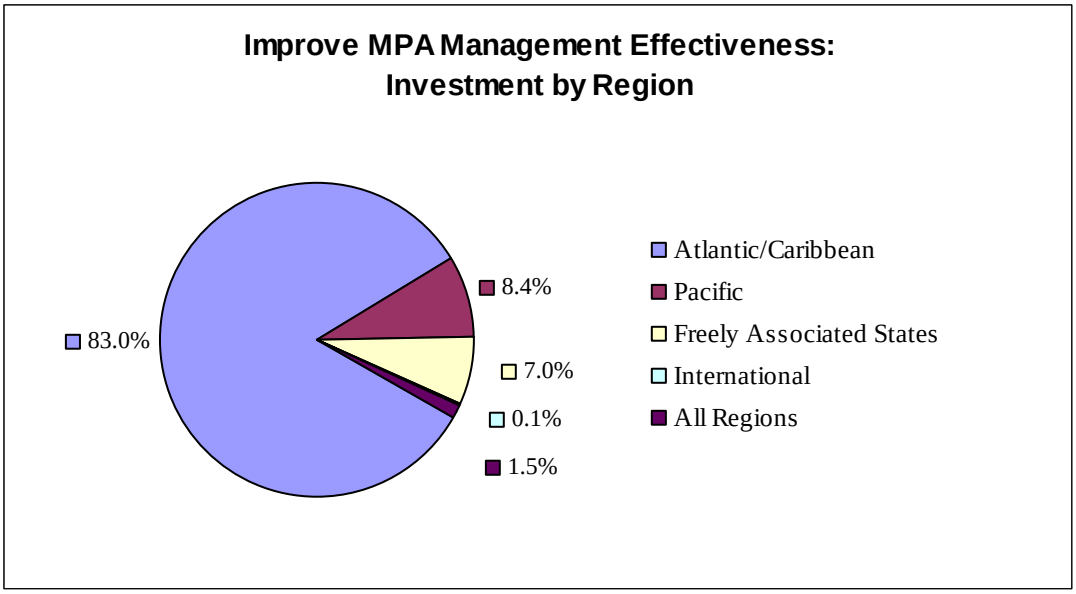

Exhibit III-5-10b. Distribution of Investments by Region, 2002-2006

b. Activities

Many projects in this subcategory were designed to address specific questions posed by fishery management councils. Others targeted specific user groups with efforts to increase public awareness of the location and benefits of MPAs. The nature of this subcategory yielded many projects with goals of gauging public opinion, educating the public and resource managers or creating interjurisdictional agreements. Several followed a more traditional scientific research path, with results published or otherwise presented to the scientific community.

A large majority of the projects were short-term; however, one multi-year project was conducted during each year of this five-year review period. This project collected time series data on the status of habitat and fish assemblages in two shelf-edge reef MPAs in the northeastern Gulf of Mexico. A representative list of short-term projects includes a baseline assessment of coral health in the Flower Gardens National Marine Sanctuary in the western Gulf, a workshop in Hawai'i where managers prioritized factors for socioeconomic studies of MPA-related knowledge and perceptions, and the development and posting of signage describing MPAs in the USVI.

The CRCP grants also funded projects aimed at improving MPA management effectiveness. To do this, grants supported management capacity and skills building to improve site management. Training and technical assistance was funded on topics such as monitoring methodologies, community participation methods, and outreach approaches. Other grants involved direct implementation of tools and programs that support MPA effectiveness, such as MPA

demarcation, enforcement, outreach, and monitoring. Research projects included determining effectiveness of MPA sites and assessments to identify gaps that could be filled to develop biological networks in the Caribbean. Finally, outreach materials for the Fagatele National Marine Sanctuary were also supported through this funding.

c. Funding Recipients and Partners

Exhibit III-5-11 highlights examples of CRCP partners and grant recipients who undertook activities within this subcategory.

Exhibit III-5-11
Improve MPA Management Effectiveness
Funding Recipients and Partners

NOAA Offices	Other Federal Agencies	States and Territories	Fisheries Management Councils	Academic Institutions	Non-Governmental Organizations
• NMFS - Northwest Fisheries Science Center	• National Aeronautics and Space Administration	• CNMI	• Gulf of Mexico	• Harbor Branch Oceanographic Institution	• The Ocean Conservancy
• NMFS - Pacific Islands Fisheries Science Center	• Great Barrier Reef Marine Park Authority (Australia)	• Florida	• Caribbean	• University of Miami	• The National Fish and Wildlife Foundation
• NMFS - Pacific Islands Regional Office		• Guam	• Pacific Islands		
• NMFS - Southeast Fisheries Science Center		• Puerto Rico	• South Atlantic		
• NMFS - Southeast Regional Office		• U.S. Virgin Islands			
• NOS - Office of Ocean and Coastal Resource Management • NOS - Special Projects Office					
• NOS - International Programs Office					

Exhibit III-5-11
Improve MPA Management Effectiveness
Funding Recipients and Partners

NOAA Offices	Other Federal Agencies	States and Territories	Fisheries Management Councils	Academic Institutions	Non-Governmental Organizations
• NOS - National Marine Sanctuaries Program • OAR - National Undersea Research Program • OAR - Atlantic Oceanographic Meteorological Laboratory					

d. Outputs

Accomplishments in this subcategory included scientific publications, reports to fishery management councils (FMCs), presentations at scientific and FMC meetings, cooperative agreements, outreach and logistical improvements, and facilitation between local resource managers and user groups. A complete list of accomplishments and impacts for these 25 projects would be too lengthy for this document; however, a representative subset is provided in the text below.

In conjunction with state, territory, and Federal partners on the USCRTF, NOAA completed the first assessment of U.S. coral reef protected areas ("Report on the Status of Marine Protected Areas in Coral Reef Ecosystems of the United States Volume 1: Marine Protected Areas Managed by U.S. States, Territories, and Commonwealths"). The report focuses on MPAs managed by state and territory governments in the seven jurisdictions on the Task Force. This report provides an inventory of existing coral reef MPAs and MPA management efforts in these seven jurisdictions, and is the first of several assessments that need to be completed to gain full comprehension of the scope and effective use of MPAs for coral reef conservation in the U.S. The report used data collected in the National Marine Managed Inventory (http://www.mpa.gov) as well as the expertise of NOAA, state, and territory co-authors to explore the management status of 207 MPAs located across the seven jurisdictions.

Ecological Acoustic Recorder (EAR) units have been deployed in Guam, CNMI, and in the Wake Island lagoon. These units have provided coastal resource managers and enforcement personnel with the ability to remotely detect ecologically significant events and anthropogenic

disturbances such as vessel intrusions (presence or absence, time of incident) or use of explosives.

A needs assessment was completed for seven bays identified as priority areas due to frequent human use and the presence of sensitive habitats in St. Croix's East End Marine Park to determine the most effective locations for mooring buoys based upon benthic habitat surveys. This information is being used by the territory to define regulations related to marine zoning within the Park. Forty-six mooring buoy installations were completed at six sites within the East End Marine Park.

Over 30 participants from the Pacific region met in mid-2004 and generated a wide range of carefully considered priorities for social science research projects that will inform and support the design, management and evaluation of MPAs in the Pacific Islands region. The final workshop report was published by the National MPA Center and widely disseminated during early 2005.

Key outputs of the work funded through the Coral Reef Conservation Grant Program under this subcategory are direct staffing and management of MPAs and the technical assistance to build local capacity for MPA management.

e. Outcomes

Several of the impacts of projects in this subcategory are difficult to quantify. For example, it is difficult to determine how many individuals refrained from coral damaging activities after reading informative signs or how many boat operators used mooring buoys placed in MPAs in the USVI. Similarly, it is difficult to quantify the benefits resource managers received or how many coastal development plans were modified from CRCP-sponsored workshops. Additionally, FMCs rarely base decisions only upon data from CRCP-funded projects. However, there were several examples where management actions can be directly attributed to CRCP projects.

In the Gulf of Mexico, MPAs were designed to protect spawning aggregations of grouper that form on shelf-edge reef habitats. Between 2001 and 2005, target grouper species increased in abundance by 1.5% in eastern Gulf but 19.2% in MPAs. The Gulf of Mexico FMC cited these results as a driving force behind the six-year extension of the MPA closures in 2003 and requested additional reports as they consider extensions beyond the current 2010 sunset date.

In St. Croix, boaters are using mooring buoys rather than weighing anchor in areas where moorings are now available, resulting in a reduction of impacts to important coral reef ecosystem components.

f. Challenges

Most challenges to improving MPA effectiveness are seen at the implementation level. There are two factors which most problems can be traced to: the arrival of funds for CRCP projects late in the fiscal year, and the prohibition on carrying over funds to the subsequent fiscal year. Recent years have seen delays in passage of the Federal budget and funds are often made available to principal investigators in the third quarter of the fiscal year. The arrival of funds coincides with the Atlantic hurricane season. While hurricanes do not impede socioeconomic, outreach, and land-based management projects, several monitoring projects have been adversely impacted. For example, a 2005 project in the U.S. South Atlantic was cancelled four days prior to embarkation due to reallocation of the vessel to post-Hurricane Katrina research activities. With less than three weeks remaining in the fiscal year and no funding carryover allowed into the next fiscal year, the project was cancelled and valuable pre-closure data on five new MPAs were not collected.

g. Future Directions

It is difficult to evaluate the efficacy of MPAs and subsequently improve MPA effectiveness with one-time or short-term surveys. Thus, gathering time series data and periodically revisiting projects originally planned as single season observations is important. Data collected or disseminated through socioeconomic surveys, direct observation of reef habitats and associated fauna, and management training workshops become less valuable over time and MPA effectiveness cannot be improved without timely information. Principal investigators and coral program managers should ensure adequate funds are set aside to analyze all data collected, particularly when such analyses extend beyond the end of a fiscal year. Trained personnel are a very valuable resource and efforts should be made to retain them if their abilities will aid future projects; multiyear funding commitments are a considerable move towards accomplishing this goal. Principal investigators should be encouraged to communicate with Federal, state, and territorial resource managers to target research proposals which will increase the ability of those managers to improve the effectiveness of the MPAs within their jurisdictions.

Subcategory: Conduct Science in Support of MPA Design and Adaptive Management

a. Introduction

Area closures have been employed as management tools in the U.S. for many years; however, the last decade has seen this strategy expand considerably. New MPAs have been recently established in the Pacific, Gulf of Mexico, U.S. South Atlantic, and U.S. Caribbean. Most MPAs focus upon reefs, either shallow hermatypic coral reefs or deeper paleoreefs. In addition to the corals, both of these reef types harbor extensive and diverse suites of fishes and invertebrates

which depend upon the reefs for at least part of their life cycle. However, the establishment of an MPA is only a small part of a successful MPA program. Many MPAs are not effective due to a lack of biological monitoring and other scientific data assessing the resource status and trends necessary to make wise management decisions. The CRCP sought to address this issue with the third subcategory, which focused on projects conducting science in support of MPA design and adaptive management.

Between 2002 and 2006, the CRCP provided $2.8 million to support 44 projects in this subcategory. This area accounted for 12% of funding within the MPA category and 2% of overall CRCP funding. This subcategory also accounted for 31% of the projects in the MPA category and 3% of all of the CRCP projects funded in this five-year period (Exhibit III-5-4). The distribution of funds and effort for this coral reef conservation tool area is presented in Exhibits III-5-12a and III-5-12b.

Exhibit III-5-12a
Conduct Science in Support of MPA Design and Adaptive Management
Investments by Tool

Tool	2002		2003		2004		2005		2006		TOTALS 2002-2006			
	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	% of Total Subcategory Projects	Funding	% of Total Subcategory Funding
Ecosystem Research	4	$203,320	6	$399,000	10	$701,692	9	$567,148	5	$229,204	**34**	**77.3**	**$2,100,364**	**74.4**
Socioeconomic Research	2	$180,650	2	$190,000	2	$57,786	0	$0	0	$0	**6**	**13.6**	**$428,436**	**15.2**
Mapping and Monitoring	2	$130,000	0	$0	0	$0	2	$165,000	0	$0	**4**	**9.1**	**$295,000**	**10.4**
Outreach	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
Management: Direct Implementation	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
Management: Training/Technical Assistance	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
None or N/A	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
TOTAL	**8**	**$513,970**	**8**	**$589,000**	**12**	**$759,478**	**11**	**$732,148**	**5**	**$229,204**	**44**	**100**	**$2,823,800**	**100**

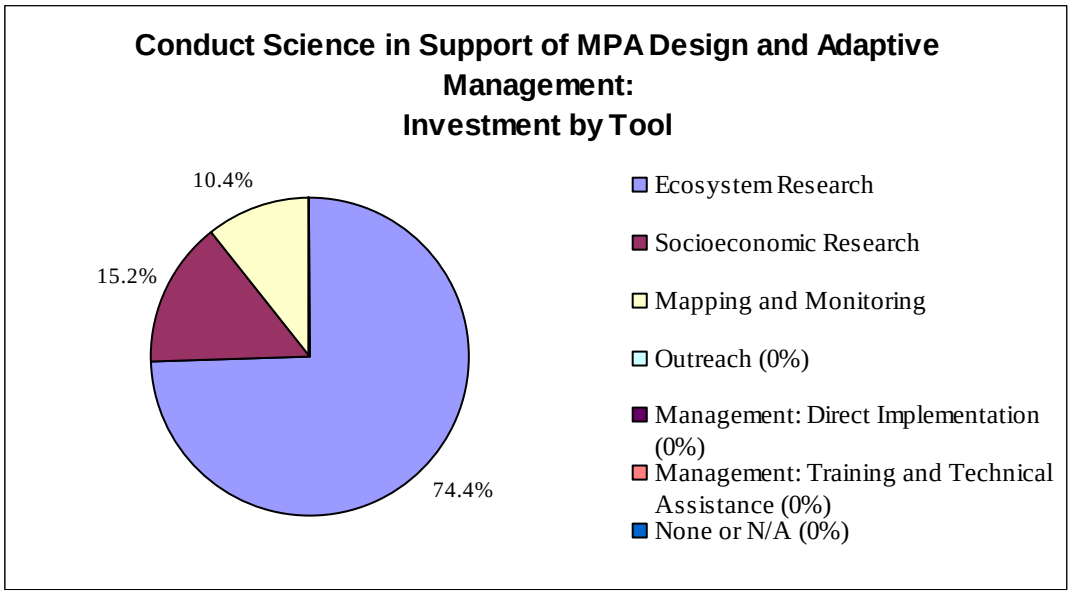

Exhibit III-5-12b. Distribution of Investments by Tool, 2002-2006

The distribution of funds and effort for this subcategory by region is presented in Exhibits III-5-13a and III-5-13b.

Exhibit III-5-13a
Conduct Science in Support of MPA Design and Adaptive Management
Investments by Region

Region	2002		2003		2004		2005		2006		TOTALS 2002-2006			
	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	% of Total Subcategory Projects	Funding	% of Total Subcategory Investment
Atlantic/Caribbean	6	$362,915	6	$427,000	7	$297,334	7	$369,088	4	$193,054	**30**	**55.6**	**$1,649,391**	**58.4**
Pacific	3	$110,893	3	$137,000	4	$297,646	3	$231,562	1	$36,150	**14**	**25.9**	**$813,251**	**28.8**
Freely Associated States	1	$40,163	1	$25,000	1	$54,000	1	$50,000	0	$0	**4**	**7.4**	**$169,163**	**6.0**
International	0	$0	0	$0	3	$110,498	3	$81,498	0	$0	**6**	**11.1**	**$191,996**	**6.8**
All Regions	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
TOTAL	**10**	**$513,970**	**10**	**$589,000**	**15**	**$759,478**	**14**	**$732,148**	**5**	**$229,204**	**54**	**100**	**$2,823,800**	**100**

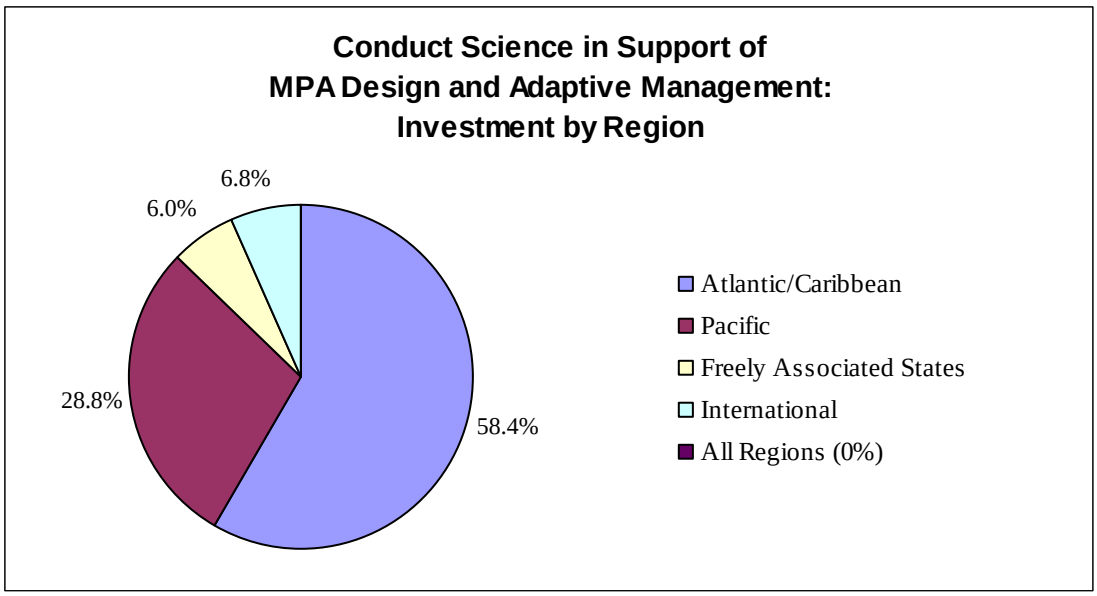

Exhibit III-5-13b. Distribution of Investments by Region, 2002-2006

b. Activities

There were 44 projects in the subcategory of conducting science in support of MPA design and adaptive management between 2002 and 2006: 77% were ecosystem research projects, 9% were mapping and modeling projects, and 14% were socioeconomic research. There were more multi-year projects than short-term ones; however, not all of the multi-year projects were designed to produce time-series data. An example of the latter was multibeam mapping of the Oculina Coral Banks off southeast Florida. While two projects were completed in separate years, different portions of the Banks were mapped each year. A series of modeling projects in Puerto Rico and the USVI over several years was designed to provide fishery managers with data on trophic interactions and likely outcomes of different MPA management strategies. An example of a short-term study was a study on lobsters in the southern Florida Keys in which populations were re-surveyed after a decade of protection in 13 no-take zones in the Western Sambo Ecological Reserve.

Mapping projects focused on deeper reefs along the east and west coasts of Florida which are inaccessible to normal diving activities. This mapping was essential for designing scientifically sound surveys to assess MPA efficacy. Modeling projects in Puerto Rico and the USVI provided information to managers on potential species-specific and ecosystem level benefits and anticipated timeframes of no-take management policies. Management relevant research projects addressed many topics, including larvae dispersal of *Oculina* coral on Florida's east coast, diver fish counts in the new Tortugas Reserve off southwest Florida, and a Caribbean-wide project to predict thermal stress on corals based upon satellite detection of sea surface temperatures.

Socioeconomic studies were designed to gather information from the public on several geographic scales and to educate reef managers about ways to incorporate socioeconomic information into their management programs.

The Coral Reef Conservation Grant Program has funded external partners to conduct targeted ecosystem and socioeconomic research and monitoring activities. Coral reef ecosystem research supported by the program focused on determining the effectiveness of existing MPAs by evaluating abundance of ecologically and economically important species; the spillover effect of fishery species into adjacent habitats (outside the MPA); improvements in the condition of the sessile benthic community and abundance of mobile invertebrates; and the cascading effects on non-target species. Socioeconomic research supported by the program included a cost-benefit analysis of MPAs in Hawai'i; a survey of community support of and support for marine protected area management in the offshore coral reefs and associated ecosystems off the island of Vieques, Puerto Rico; and the development of a sustainable financing strategy for the East End Marine Park MPA in USVI. The National Fish and Wildlife Foundation Grants Program provided funding to look at the usefulness of artificial reefs as MPAs.

c. Funding Recipients and Partners

Exhibit III-5-14 highlights examples of CRCP partners and grant recipients who supported activities within this subcategory.

Exhibit III-5-14
Conduct Science in Support of MPA Design and Adaptive Management
Funding Recipients and Partners

NOAA Offices	Other Federal Agencies	States and Territories	Fisheries Management Councils	Academic Institutions	Non-Governmental Organizations
• NESDIS - National Oceanographic Data Center	• National Aeronautics and Space Administration	• Florida	• Gulf of Mexico	• Harbor Branch Oceanographic Institution	• The Ocean Conservancy
• NMFS - Southeast Fisheries Science Center	• DOI - National Park Service	• Puerto Rico	• Caribbean	• Colorado State University	• The National Fish and Wildlife Foundation
• NMFS - Southeast Regional Office	• DOI – U.S. Geological Survey (Biological Resources Division)	• US Virgin Islands	• South Atlantic	• Jacksonville University	• Perry Institute for Marine Science (NURP Center)
• NOS - Center for Coastal Monitoring and Assessment				• Nova Southeastern University	

Exhibit III-5-14
Conduct Science in Support of MPA Design and Adaptive Management
Funding Recipients and Partners

NOAA Offices	Other Federal Agencies	States and Territories	Fisheries Management Councils	Academic Institutions	Non-Governmental Organizations
• NOS - International Programs Office • NOS - Office of Ocean & Coastal Resource Management • NOS - Special Projects Office • NOS - National Marine Sanctuaries Program • NOS - Office of Response and Restoration • OAR - National Undersea Research Program (NURP)				• Savannah State University • Texas A&M University • University of British Columbia • University of Miami • University of North Carolina Wilmington (NURP Center) • University of Hawaii, Hawai'i Undersea Research Laboratory (NURP Center)	

d. Outputs

The accomplishments in this subcategory included:

- Scientific publications
- Reports to fishery management councils (FMCs)
- Presentations at scientific and FMC meetings
- Multibeam bathymetric and acoustic backscatter maps
- Ecosystem-based management models
- Ecopath and Ecosim models
- Socioeconomic surveys
- Technical reports and memoranda

- Training workshops for MPA managers

The majority of projects within this subcategory were designed to provide managers, principally the FMCs, with data to help them evaluate their management decisions relevant to MPAs. These managers receive considerable input from other scientists, the recreational and commercial fishing sectors, and numerous other interested parties. It is difficult to separate the factors which lead the FMCs to certain decisions; however, data generated from CRCP projects is highly valued as unbiased. Space limitations do not allow for the accomplishments and impacts of all nineteen projects in this subcategory to be presented; the following section outlines some highlight.

The last remaining portions of the *Oculina* Habitat Area of Particular Concern (OHAPC) known or suspected of containing coral habitat were mapped during a research cruise in June 2005 in collaboration with the University of North Carolina at Wilmington, National Underwater Research Center.

Opinion surveys of eight MPAs revealed that the majority of fishers believe the MPAs are achieving their biological goals of protecting fish stocks, spawning aggregations, and habitat, but they have more mixed views about the sociological effects of MPAs. Dissenters cited anthropogenic impacts from vessel traffic and coastal construction as aggravating factors limiting MPA success. According to fishers, the seasonal closure for conch has caused two problems. It encourages “derby fishing” among divers, or repeated hazardous dives and high levels of conch removal, in the days immediately prior to the closure. In addition, the loss of conch shells removes a refuge from predators needed by juveniles of several species.

Diver monitoring data and population assessments in the Dry Tortugas National Park led to two publications which showed a correlation between the level of protection that an MPA provided and response of several exploited species.

Efforts to model the effectiveness of marine reserves in coral reef ecosystems have extended and adapted the marine reserve model to produce tools for use by the Caribbean FMC to support ecosystem-based fishery management needs. Results of models were presented at an international scientific meeting, and they demonstrated changing dynamics for large fished predators and prey species in Caribbean marine reserves.

Studies funded through the Coral Reef Conservation Grant Program have also resulted in significant accomplishments. One study completed over 300 visitor surveys and over 60 stakeholder group interviews to determine community support for marine protected area management in the offshore coral reefs and associated ecosystems off the island of Vieques, Puerto Rico. These findings were presented to both NOAA and the Puerto Rico DNER. Another study identified and evaluated a robust suite of metrics and procedures for assessing MPA impacts on fish community populations that are statistically robust and readily interpreted for the

Florida Keys ecosystem, as well as applicable to MPA assessment throughout U.S. marine waters.

e. Outcomes

Data resulting from the projects within this subcategory was used by managers to make more informed decisions on the placement, duration, and nature of MPAs in the U.S. South Atlantic, Gulf of Mexico and U.S. Caribbean.

For example, the availability of many years of diver monitoring data and population assessments conducted by the SEFSC and supported by CRCP funding lead the Florida Fish and Wildlife Commission to unanimously approve the establishment of a 47 square nautical mile Research Natural Area (RNA) in Dry Tortugas National Park. Data collected was used in modeling studies that helped define the boundary of the RNA and the Tortugas North.

Several grant projects that were funded have also resulted in significant outcomes. An ecosystem research study assessed the recovery of *Diadema antillarium*, the long-spined sea urchin, inside and outside St. Croix, USVI MPAs. In the early 1980s, *Diadema* populations suffered a Caribbean-wide mass mortality which wiped out more than 97% of the population. Preliminary results show that recovery of *Diadema* is widespread, but not universal, on St. Croix. Another study supported through the CRCP Grants Program conducted a visual census of coral reef fishery and habitat resources in the Tortugas region five years after the implementation of the no-take Tortugas Ecological Reserve (created in 2001). Data collected in 2006 was compared to studies conducted in 1999-2000 and 2004. Results found that species richness and composition remained steady over all years. Consistent with predictions from marine reserve theory, no declines for exploited fish populations were detected in the no-take reserves, while for non-target species both increases and decreases in population abundances were observed. A study to examine the effectiveness of the Exuma Cays Land and Sea Park, a large Bahamian marine reserve established in 1959, revealed that increased grazing by herbivorous parrotfish caused a fourfold reduction in the cover of macroalgae, which, because they are the principal competitors of corals, highlights the potential importance of reserves for coral reef resilience.

f. Challenges

The majority of challenges to conducting science in support of MPA design and adaptive management are encountered at the implementation level. The CRCP is funded annually by Congress; funds are often not received by the principal investigators until midway through the fiscal year and must be expended before the end of the fiscal year, as carrying over funds is not possible. Therefore, most CRCP activities take place between June and October, the height of the Atlantic hurricane season. While hurricanes do not impede socioeconomic and modeling projects, mapping and targeted research projects have been adversely impacted. One example of the effect of late arriving funds was a 2006 project in the Florida Keys in which no suitable ROV

could be leased between the release of funds and the end of the fiscal year and far less effective means of surveying were substituted.

g. Future Directions

The efficacy of MPAs cannot be determined with one-time or short-term surveys; rather, repeated monitoring over time is required to accurately assess management successes or failures. This repeated monitoring applies to socioeconomic surveys, direct observation of reef habitats and associated fauna, and data collected for model parameterization. Accurate maps are crucial for scientifically sound survey designs and where such maps are lacking, funds should be devoted for their acquisition. Maps of MPAs in the western and northeastern Gulf of Mexico are virtually complete and substantial coverage exists for MPAs in Puerto Rico and the USVI. A comprehensive plan is in place to map the entire south Florida reef system; however, less than 15% of the reef fish MPAs in the U.S. South Atlantic have been mapped (approximately 30% of two of the five MPAs). Continuation of the current three-year funding cycles, or perhaps expansion to a five-year cycle, would allow researchers to more effectively plan and execute repeated monitoring of all MPAs in the southeastern U.S.

Subcategory: Support the Operations of the Northwest Hawaiian Islands Coral Reef Ecosystem Reserve

a. Introduction

The Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (now Marine National Monument) is the single largest conservation area under the U.S. flag, and the largest marine conservation area in the world. It encompasses 137,797 square miles of the Pacific Ocean (105,564 square nautical miles), an area larger than all the country's national parks combined. The extensive coral reefs found in the Reserve are home to over 7,000 marine species, one quarter of which are found only in the Hawaiian Archipelago. Many of the islands and shallow water environments are important habitats for rare species such as the threatened green sea turtle and the endangered Hawaiian monk seal. Most of the threats to the ecosystems of the Northwestern Hawaiian Islands (NWHI) are posed by human activities. In the past, a number of scientific, military, and commercial activities have threatened the NWHI. Current uses are limited primarily to management activities by jurisdictional agencies, research, education, Native Hawaiian practices, and a small scale commercial bottomfishing and pelagic trolling operation, as well as a small number of recreational trips and visits to historical sites at Midway Atoll. The Reserve is working to reduce threats through an ecosystem-based approach to management. This includes the development of an effective regulatory framework, education and outreach, preventive measures to minimize risk, and response and restoration to damaged or degraded natural resources.

In 2000, NOAA was given the responsibility of managing the NWHI Coral Reef Ecosystem Reserve via Presidential Executive Order. The Coral Reef Conservation Program was directed to provide funding to support the management of this important area for coral reef conservation in the U.S.

Funds provided to NOAA's NWHI Coral Reef Ecosystem Reserve have allowed for several advancements in the area of ecosystem research, mapping and monitoring, outreach, and effective management implementation. These efforts have been closely coordinated with jurisdictional partners including the State of Hawai'i, the U.S. Fish and Wildlife Service (USFWS), and NOAA's Pacific Islands Fisheries Science Center to support increased understanding and effective management of the Northwestern Hawaiian Islands. Some of these coordinated activities were supported by the CRCP through the "Assess and Characterize U.S. Coral Reefs" and other spend plan categories to supplement and complement activities described in this section. Much of the work conducted in this area during the sanctuary designation process led President George W. Bush to designate the NWHI as the Papahanaumokuakea Marine National Monument on June 15, 2006 using his authority under Antiquities Act of 1906. In FY2007, the National Marine Sanctuaries Program took over funding for Monument operations, while the CRCP continues to support targeted efforts (e.g., monitoring, mapping, and marine debris removal) in the Monument.

Between 2002 and 2006, the CRCP provided $15.3M to support 7 projects in this subcategory. This area accounted for 65% of funding within the MPA category and 12% of overall CRCP funding. This subcategory also accounted for 5% of the projects in the MPA category and less than 1% of all of the CRCP projects funded in this five-year period (Exhibit III-5-4). The distribution of funds and effort for this subcategory by coral reef conservation tool area is presented in Exhibits III-5-15a and -15b.

Exhibit III-5-15a
Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve
Investments by Tool

Tool	2002		2003		2004		2005		2006		TOTALS 2002-2006			
	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	% of Total Subcategory Projects	Funding	% of Total Subcategory Funding
Ecosystem Research	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
Socioeconomic Research	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
Mapping and Monitoring	0	$0	0	$0	0	$0	1	$10,000	0	$0	**1**	**14.3**	**$10,000**	**0.1**
Outreach	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
Management: Direct Implementation	1	$3,250,000	1	$3,000,000	1	$2,254,200	1	$3,250,000	1	$3,451,700	**5**	**71.4**	**$15,205,900**	**99.4**
Management: Training/ Technical Assistance	0	$0	1	$80,000	0	$0	0	$0	0	$0	**1**	**14.3**	**$80,000**	**0**
None or N/A	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
TOTAL	**1**	**$3,250,000**	**2**	**$3,080,000**	**1**	**$2,254,200**	**2**	**$3,260,000**	**1**	**$3,451,700**	**7**	**100**	**$15,295,900**	**100**

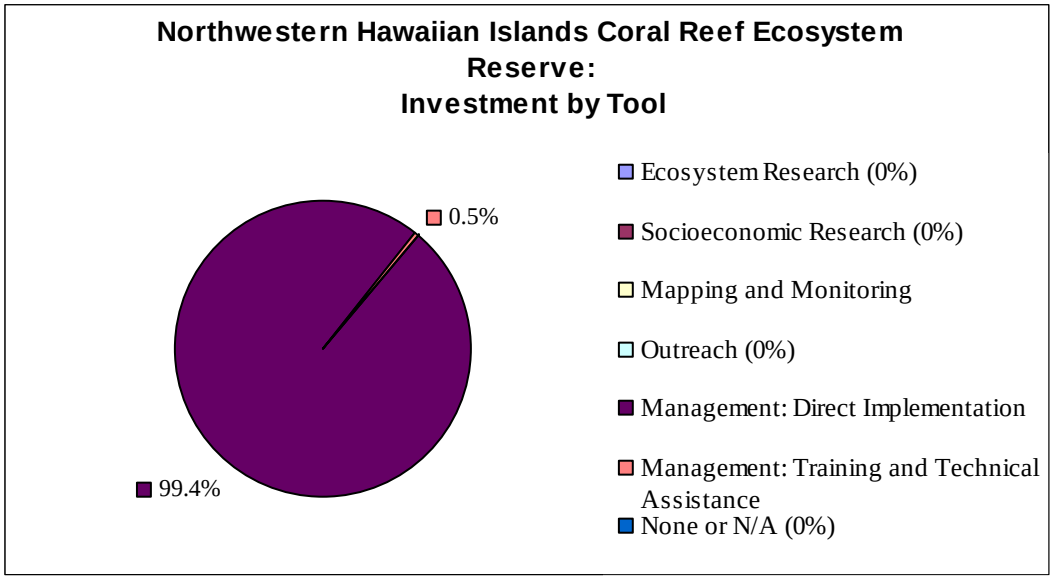

Exhibit III-5-15b. Distribution of Investments by Tool, 2002-2006

The distribution of funds and effort for this subcategory by region is presented in Exhibits III-5-16a and -16b.

Exhibit III-5-16a
Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve
Investments by Tool

Region	2002		2003		2004		2005		2006		TOTALS 2002-2006			
	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	Funding	Number of Projects	% of Total Subcategory Projects	Funding	% of Total Subcategory Investment
Atlantic/Caribbean	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
Pacific	1	$3,250,000	2	$3,080,000	1	$2,254,200	2	$3,260,000	1	$3,451,700	**7**	**100**	**$15,295,900**	**100**
Freely Associated States	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
International	0	$0	0	$0	0	$0	0	$0	0	$0	**0**	**0**	**$0**	**0**
All Regions	0	$0	0	$0	0	$0		$0	0	$0	**0**	**0**	**$0**	**0**
TOTAL	**1**	**$3,250,000**	**2**	**$3,080,000**	**1**	**$2,254,200**	**2**	**$3,260,000**	**1**	**$3,451,700**	**7**	**100**	**$15,295,900**	**100**

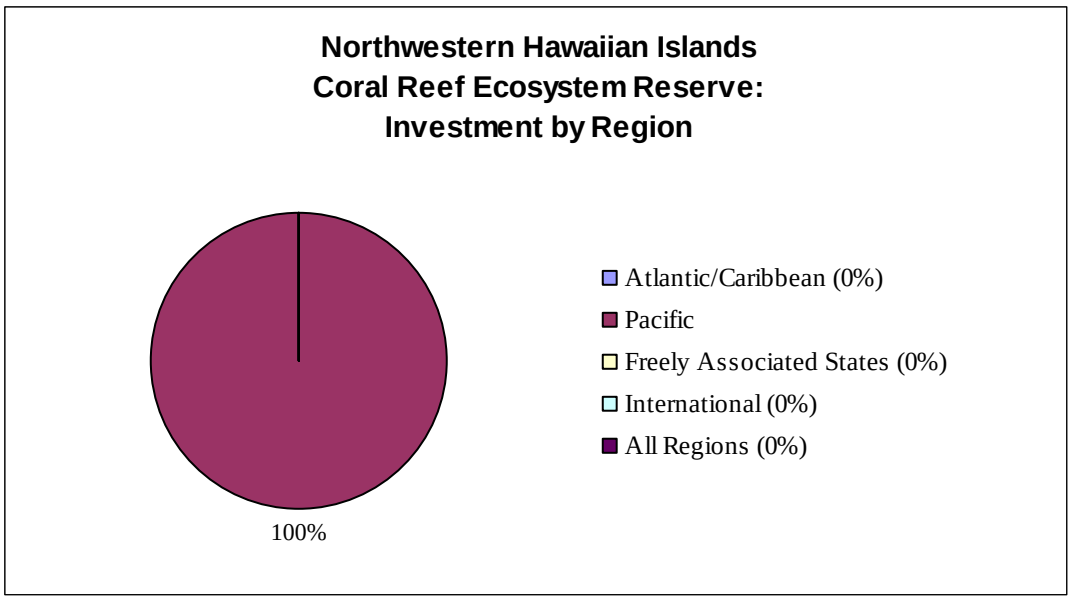

Exhibit III-5-16b. Distribution of Investments by Region, 2002-2006

b. Activities

Ecosystem Research

The advancement of ecosystem research within the last decade is allowing managers to understand the complex processes that confer ecosystem health and resilience in the NHWI. Examples of ecosystem research conducted over the last five years include:

- HIMB Research Partnership – Using the University of Hawaii's Hawai'i Institute of Marine Biology (HIMB) research expertise, a research program was developed to: address Reserve management questions on ecological connectivity of the Hawaiian archipelago to determine recruitment and dispersal of marine populations; conduct basic science investigations of indicators that are associated with health and resilience of coral reefs; evaluate ecosystem condition; and mitigate invasive species. Partners include the Hawai'i Division of Aquatic Resources and NOAA's Pacific Islands Fisheries Science Center. Outputs include Quarterly Reports, peer-reviewed journal publications, and scientific symposiums held bi-annually.
- Energy Flow/Trophic Layers – A partnership with NOAA's National Centers for Coastal Ocean Science (NCCOS) scientists was developed to conduct carbon isotope analysis of specimens representative of taxa at all trophic layers found in the NWHI. This information is being used to understand energy flow through the NWHI ecosystems and provide insight into the stability of a predator-dominated ecosystem.
- Crustose Coralline Algal Investigations –The Reserve has partnered with the University of Hawai'i botany department to survey distribution and abundance of crustose coralline algae

to gain a better understanding of its dominant role in the ecosystem of NWHI shallow water coral reefs.

- Deep Water Surveys – Over 90% of the Northwestern Hawaiian Islands is comprised of deep water. The Reserve has partnered with the University of Hawaii's Department of Oceanography to survey and explore depths greater than 1000m using drop cameras that will be deployed to 2 ½ miles depth in the ocean.
- Information Needs for the Conservation and Management of the NWHI – The Reserve co-sponsored with NOAA's National Marine Sanctuaries Program (NMSP) a workshop to assess the information needs of the diverse NWHI ecosystems. Over 100 scientists and resource managers provided input. This information was used to inform the regional research plan and Monument Research Plan currently under development.
- Scientific Symposium on the NWHI – The Reserve co-sponsored The NWHI's 3rd Scientific Symposium held in Honolulu. Presentations focused on current and past research conducted in NWHI and included discussions on creating a collaborative and cooperative management structure among agencies to develop a coordinated NWHI research plan based on ecosystem-management principles.

Socio-economic Research

- A socio-economic analysis of the NWHI commercial bottomfish fishery was completed. The resulting report summarizes information obtained through interviews with individuals directly involved in the NWHI bottomfish industry (fishers, wholesalers, distributors, and retailers). Information in the report includes benefit and cost estimates, an estimate of the full market value of industry, and opinions and perceptions of fishers and others involved in industry.

Mapping and Monitoring

A thorough characterization of the ecosystem has been identified as a priority management need for monument managers in order to establish a baseline to detect change over time.

- NWHI RAMP – In partnership with NOAA's PIFSC, developed a joint NWHI research and monitoring program (RAMP) to conduct annual surveys of the shallow water coral reefs based on rapid ecological assessments targeting fish, algae, corals and invertebrates.
- NOW-RAMP 2002 – Funded and coordinated a NWHI research expedition for rapid ecological assessments and monitoring of the shallow water habitats of the region, as well as providing funding for deep water studies and comprehensive mapping.
- NWHI Spatial Data Analysis Research Partnership – A research initiative was implemented to collect and analyze characterization and monitoring data from the NWHI utilizing the outside expertise of research scientists from Rosential School of Marine and Atmospheric Sciences (RSMAS) at the University of Miami. This partnership between the Reserve and NOAA Fisheries Pacific Islands Fisheries Science Center will evaluate existing rapid

ecological assessment data collected under the current NWHI RAMP program to asses its cost-effectiveness and improve on efficiencies.

- NWHI Biogeography Assessment – A partnership with NCCOS was established to develop a spatially articulated suite of available data from the NWHI using the NWHI benthic habitat maps as the base foundation. This effort resulted in extensive discussions with Federal, university, and state research partners to identify data sets and make them available for this assessment.
- Mapping – In partnership with the PIFSC Coral Reef Ecosystem Division (CRED), all of the NWHI Reserve Preservation Areas (RPAs) boundaries were mapped. A management priority is to complete mapping of shallow water areas and establish habitat characterization maps to provide a base foundational map for all monitoring data collected. Efforts are ongoing to complete the shallow water mapping to fill in the base maps needed for the NWHI Biogeographic assessment.

Outreach

Outreach has been one of the most effective tools to inform and engage the public to build support for conservation and protection of the Northwestern Hawaiian Islands. Over the last five years, the Reserve (now Monument) has made public engagement a top management priority.

- Public Input and Information meetings – Extensive efforts were made to engage the public throughout the shifting management regimes of the Northwestern Hawaiian Islands. In 2002, public scoping meetings were held across the State of Hawai'i and in Washington, D.C. to collect input on designating the Northwestern Hawaiian Islands as a National Marine Sanctuary. During the development of the NWHI Reserve Operations Plan and the draft environmental impact statement and draft management plan for the proposed national marine sanctuary, over 100 meetings were held to solicit input and review. Following the Presidential designation of the NWHI Marine National Monument, Monument co-trustee agencies (NOAA, USFWS, and State of Hawai'i) held a series of public information meetings in communities across the State of Hawai'i.
- Establishment and maintenance of an Advisory Body – A Reserve Advisory Council (RAC) was established representing stakeholders from education, research, commercial fishing, recreational fishing, eco-tourism, conservation and native Hawaiian interests. The RAC was involved in providing input on the Reserve Operations Plan and the sanctuary designation process.
- Developed and constructed the Mokupapapa Discovery Center, a learning center with exhibits designed to interpret the diverse NWHI ecosystems to the public reaching over 100,000 visitors in 2006 only two years after it opened.
- Native Hawaiian community input workshops were conducted in partnership with the University of Hawai'i's Center for Hawaiian Studies to gather information on Native Hawaiians culturally appropriate activities.
- Archipelago Book Tour – Joint project with National Geographic to produce an "Archipelago" exhibit based on the book developed by photojournalists who documented

images of the fauna and flora of the NWHI. The exhibit toured throughout the State of Hawai'i, including the Honolulu Academy of Arts, Bishop Museum and local schools, the Smithsonian and National Geographic in Washington, D.C.

- Hanauma Bay Lecture Series on NWHI – Lecture series were held at Hanauma Bay in partnership with the Hawai'i Sea Grant Hanauma Bay Education Program to provide the public with an opportunity to meet the scientists and managers engaged in the protection and conservation of the NWHI. This was a two-month long public lecture series highlighting the research, management, and education activities taking place in the NWHI.
- College of Exploration Online Workshop – Hosted "Classroom Exploration of the Oceans 2005", an online, a year-long virtual teacher workshop. A keynote presentation was given by Reserve staff entitled: "Building the World's Second Largest Marine Protected Area, the Northwestern Hawaiian Islands." Over 440 users registered for the workshop, representing 40 U.S. states and 20 countries.
- "Our Sea of Islands", an international forum on marine managed areas in the Pacific, was co-sponsored by NOAA, USFWS, and the United Nations Educational, Scientific and Cultural Organization (UNESCO). This week-long forum brought together resource managers, scientists, and NGO representatives from 30 Pacific Island nations to discuss the successes and challenges of MPAs in the Pacific. A draft workshop report was prepared, as well as a communiqué that highlighted a call for action.

Management

- Developed and completed the NWHI Reserve Operations Plan (ROP), which guides the management and operations of the NWHI Coral Reef Ecosystem Reserve. The ROP included input from research, education, Native Hawaiian, and policy regulation working groups, reflecting significant public input.
- The document "Advice & Recommendations on development of draft Fishing Regulations Under NMSA Section 304(a)(5)" initiated an opportunity by the FMC to prepare draft regulations consistent with the goals of the proposed sanctuary as required by the National Marine Sanctuaries Act.
- The Reserve completed a draft management plan for the proposed sanctuary and worked with Reserve Advisory Council and jurisdictional partners to solicit input and work towards final plan for the proposed sanctuary. A draft environmental impact statement was also developed to analyze a range of alternatives. The preferred alternative in the draft EIS was never released to the public, but served as the basis for the regulations promulgated for the NWHI Monument (see next bullet).
- A streamlined monument permitting system was established to meet the requirements and mandates of the three co-trustee agencies. A single monument permit authorized by all three co-trustees is now used to permit activities taking place in the NHWI.
- An International Maritime Organization proposal was developed and submitted by NOAA to create sensitive areas for safe passage for vessels transiting through the NWHI.

c. Funding Recipients and Partners

The Papahanaumokuakea Marine National Monument is cooperatively managed by NOAA, USFWS, and the State of Hawaii. NOAA is represented specifically by the National Marine Sanctuary Program monument staff. Other key partners within NOAA listed in Exhibit III-5-17, as well as other external partners and funding recipients.

Exhibit III-5-17
Support the Operations of the Northwest Hawaiian Islands Coral Reef Ecosystem Reserve
Funding Recipients and Partners

NOAA Offices	Other Federal Agencies	States and Territories	Academic Institutions	Non-Governmental Organizations
• NOS - National Marine Sanctuaries Program	• DOI – U.S. Fish and Wildlife Service	• Hawaii	• University of Hawaii	• Waikiki Aquarium
• NOS - National Center for Coastal and Ocean Science	• DOI - National Park Service		• University of Miami Rostential School of Marine and Atmospheric Sciences	• Bishop Museum
• NMFS - Pacific Islands Regional Office	• U.S. Coast Guard			
• NMFS - Pacific Islands Fisheries Science Center	• U.S. Environmental Protection Agency			

d. Outputs

- The draft "Atlas of the Shallow-Water Benthic Habitats of the Northwestern Hawaiian Islands" was released in early 2003 and represents 68% of the estimated 1,349 square miles of shallow-water (depths less than 98 feet) coral reef ecosystems in the islands. The atlas provides baseline information from which to study the changes in reef cover, impacts of marine debris, and effects of global climate change.
- Development and completion of NWHI ROP (final in 2005) that guides the management and operations of the NWHI Coral Reef Ecosystem Reserve. The ROP is still in use until replaced by the Monument Management Plan.

- The "Advice & Recommendations on development of draft Fishing Regulations Under NMSA Section 304(a)(5)" set forth a preferred recommendation to phase out commercial bottomfish fishing in the NWHI.
- Annual RAMP monitoring cruises conducted aboard the NOAA ship Hi`ialakai to NWHI and Johnston Atoll to study ecosystem connectivity, apex predator movement and coral health generated many articles, journals, reports, and podcasts, which are posted on the NWHI multi-agency education project website. The cruise also advanced several research projects jointly initiated by the Monument and the Pacific Island Fisheries Science Center.
- Research findings from the Hawai'i Institute of Marine Biology provided genetic evidence that Johnston Atoll may serve as a key stepping stone for Central and South Pacific fauna dispersal into the NWHI.
- The "Citizen's Guide to NWHI Marine National Monument", a 28-page Monument reference booklet, was developed as an essential outreach tool for the public soon after the Monument was designated.

e. Outcomes

- The newest monument incorporates the former NWHI Coral Reef Ecosystem Reserve, Midway National Wildlife Refuge, Hawaiian Islands National Wildlife Refuge, Battle of Midway National Memorial and the State Marine Refuge. At nearly 140,000 square miles, the NWHI Marine National Monument (later renamed the Papahanaumokuakea Marine National Monument) becomes the largest single conservation area in the U.S. and the largest protected marine area in the world. NOAA plays a leading role in implementing protections of the marine national monument. While USFWS will continue to manage refuges, the State of Hawai'i will manage state-controlled waters and the National Marine Sanctuaries Program will manage Federal waters. This decision was based on many of the activities and accomplishments described above to engage the public in this process.
- A key outcome of the efforts over the last five years is improved coordination and collaboration across Federal, state, and academic institutions to develop tools and strategies for effective management of the NWHI.
- Coordinated research and monitoring efforts with NOAA's Pacific Islands Fisheries Center, the University of Hawai'i, State of Hawai'i, and USFWS have resulted in the development of improved scientific methods and tools that promote an ecosystem-level understanding of the Northwestern Hawaiian Islands. An anticipated outcome of these ecosystem science advancements is that these methods can be adopted by resource mangers in other MPAs. The Monument is working towards developing the capacity to conduct the appropriate workshops for scientific training and technical assistance for other MPAs.
- A significant outcome of this project has been an increased public awareness of the cultural significance of the NHWI. Over the last five years, there has been increased coordination with the Native Hawaiian community to solicit input on appropriate

approaches to perpetuate traditional knowledge and integrate Native Hawaiian perspectives into the management of the NHWI.

- This project has attracted a significant amount of national and international attention due to healthy coral reefs, an intact predator-dominated ecosystem, and the sheer size of this conservation project. Indirect impacts of the project have been an increased awareness of the importance of protecting large stretches of ocean and an increased public understanding of the unique ecological and cultural treasures found under water. Garnering public support to protect areas that most people will never be able to visit remains one of the biggest challenges in creating MPAs.

f. Challenges

The relationship between NOAA's Coral Reef Conservation Program and the Monument changed in 2007 when dedicated funding for its management was appropriated by Congress. Although the CRCP will no longer fund the basic operations of the Monument, it will support continued activities in the areas of research, monitoring, and the removal of marine debris. Challenges will lie in ensuring successful data management and integration between CRCP and the Monument leadership, as well as maintaining close coordination and communication between these two entities.

g. Future Directions

The next major challenge for Monument managers will be to develop an integrated joint-agency Monument Management Plan (MMP) using the draft sanctuary management plan as the foundation. It has been recognized by the co-trustee agencies that the Monument Management Plan will identify priority management needs, goals, objectives, and key strategies and activities for coordinated management of the Papahanaumokuakea Marine National Monument. It is anticipated that significant investments will need to be made in research, mapping, and information management in the next year to successfully implement the priority management needs for the Monument, and CRCP will likely continue to play a critical role in providing funding for this science.