Report on the Status of

Marine Protected Areas

in Coral Reef Ecosystems *of the* United States

Volume I

Marine Protected Areas Managed *by* U.S. States, Territories, *and* Commonwealths

Produced by the National Oceanic and Atmospheric Administration Coral Reef Conservation Program
in cooperation with partners from State, Territorial, and Commonwealth Agencies

NOAA Technical Memorandum CRCP 2

Cover Photos - Front (clockwise from top left): Dana Wusinich-Mendez/ NOAA, Paige Rothenberger/ USVI Department of Planning and Natural Resources, Greg Moretti/ Commonwealth of the Northern Mariana Islands Division of Fish and Wildlife, Katrina Adams; **Back**: Jill Komoto/ Hawaii Department of Land & Natural Resources, Greg Moretti/ Commonwealth of the Northern Mariana Islands Division of Fish and Wildlife, Dave Gilliam/ SE Florida Coral Reef Initiative, Bill Millhouser/ NOAA

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

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EXECUTIVE SUMMARY

Seven United States (U.S.) jurisdictions have abundant coral reef ecosystems within their state and territorial waters. These jurisdictions are American Samoa, the Commonwealth of the Northern Mariana Islands, Florida, Guam, Hawai'i, Puerto Rico, and the U.S. Virgin Islands. The governments of all seven jurisdictions have recognized that to successfully conserve coral reef ecosystems, ecologically important reef areas need to be identified and managed distinctively within the broader marine environment. As a result, each of these jurisdictions has formally acknowledged that marine protected areas (MPAs) are an important coral reef management tool and have taken measures to officially incorporate this tool into their local marine resource management regimes. In this report, MPAs are defined as "any area of the marine environment that has been reserved by federal, state, tribal, territorial, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein" (Executive Order 13158, May 26, 2000). In keeping with this broad definition, the term "MPA," refers to a range of types of MPAs, from multiple-use areas that allow fishing or other uses, to "no-take reserves" where extractive uses are prohibited.

This report, the *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,* was developed by the National Oceanic and Atmospheric Administration (NOAA) in conjunction with federal, state, territory, and commonwealth partners on the U.S. Coral Reef Task Force (CRTF). It was produced to help fulfill the goals and objectives of the U.S. National Action Plan to Conserve Coral Reefs (2000) and the National Coral Reef Action Strategy (2002), and also helps to advance the goals of Executive Order 13158 on MPAs. Goal number five in the National Coral Reef Action Strategy calls for "improving the use of marine protected areas in coral reef ecosystems." Objective number one under this goal area is to "conduct and support nation-wide, state and territory assessments of the effectiveness and gaps in the existing system of U.S. Coral Reef MPAs." This report directly addresses that objective by providing an inventory and assessment of existing MPAs that have been established and are managed by the governments of the seven coral reef states and territories. It illustrates the goals and objectives of these areas; describes current efforts to manage them; recognizes common challenges to successful management; and, identifies actions that can increase the effectiveness of MPA initiatives.

Efforts to manage a total of 207 MPAs across the seven coral reef jurisdictions are summarized in this report. The large majority of these MPAs (76 percent) are multiple-use areas that allow some level of extractive activity throughout the entire site. The remaining 49 MPAs include no-take areas in which the harvesting of marine resources is prohibited. One hundred and forty-seven (71 percent) of the MPAs were established to sustain, conserve, restore, and understand the coral reef ecosystems or ecosystem components they contain, while almost one quarter of them were established to support the continued extraction of renewable living resources. Of the 207 sites, 86 percent are permanent sites as opposed to conditional sites whose potential to persist must be considered after a set period of time. Nearly all of the sites (97 percent) provide constant protection throughout the year; only three percent are seasonal sites in which resources are protected during fixed periods of time. Most of the MPAs (78 percent) were established to provide an ecosystem scale of protection through which management measures are intended to protect all of the components and processes of the coral reef ecosystem within MPA boundaries. The remaining 22 percent target a particular habitat, species complex, or single resource.

Many of the MPAs in this assessment contain priority natural resources for coral reef conservation such as fish spawning areas found in 81 sites and the threatened or endangered species observed within 164 sites. Only 20 percent of the MPAs (42 sites) have approved management plans (nine additional plans are in development) suggesting that the development of plans to guide long-term MPA management is a challenge for these sites. However, this finding does not mean that management action is not happening on-the-ground. Of the 194 sites that reported on management actions being implemented, approximately 42 percent have targeted research and outreach and education programs or activities, 45 percent have on-going monitoring activities, and over 74 percent reported the existence of enforcement activities or programs.

Finally, MPA managers and practitioners from 126 of the sites identified several key challenges that impede the effective management of their MPAs. The most commonly noted challenges were enforcement (83 percent) and funding and resources (80 percent). Management capacity (76 percent), monitoring (65 percent), and public support (59 percent) are also challenges for a majority of the sites. Other frequently identified challenges to management were a lack of interagency coordination and insufficient communication between researchers and managers. These problems must be addressed to improve MPA management effectiveness.

Assessments such as this report are critical steps in understanding the use and effectiveness of MPAs as tools to conserve coral reef ecosystems. To successfully apply these tools, it is important to understand the strengths and difficulties of existing efforts. If the goal of conservation efforts is to maintain the function of coral reef ecosystems so that people can continue to enjoy and benefit from the valuable services they provide, it is necessary to assess which components of these ecosystems would be best served by MPAs and identify the gaps in our current MPA management schemes.

This report provides a basic inventory of state and territory MPA efforts in coral reef ecosystems. It does not provide an evaluation of the effectiveness of these MPAs in fulfilling their goals and objectives. Subsequent efforts will be required to fully comprehend the scope and effectiveness of the use of MPAs for coral reef protection in the United States. Two such efforts are currently underway by NOAA and the U.S. CRTF, including the development of a second volume to this report that inventories federal MPA efforts in U.S. coral reef ecosystems, and an analysis of geospatial information to quantitatively assess the total area of coral reef ecosystem habitat types protected by U.S. MPAs. Many MPAs and jurisdictions are also undertaking efforts to evaluate their management effectiveness by developing and implementing monitoring and evaluation programs. As the number of MPAs applying these evaluations increases, there is greater opportunity to identify mechanisms for improving MPA effectiveness. This report is intended to support other assessments that will help increase our capacity as marine resource managers, practitioners, and stewards to conserve our nation's coral reefs.

Introduction

METHODS AND APPROACH:


Matt Ramsey 2006

The National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Program developed this report of MPAs managed by state and territory governments in conjunction with federal, state, territory, and commonwealth partners. The information included in the report was collected in partnership with the National Marine Managed Area (MMA) Inventory that was conducted by the National Marine Protected Areas (MPA) Center from 2001-2006. Inventory data was obtained through direct surveys with managers of coral reef MPAs and review of legal documents and management plans. This data is available in the Inventory of MMAs on the National MPA Center's website at www.mpa.gov (National MPA Center 2006c). This report is based on data extracted from the inventory in July 2005. In the process of writing and reviewing this document, several of the jurisdictions revised and edited their MMA Inventory data.

The report contains seven chapters that focus on the state and territory MPA efforts of each coral reef jurisdiction. It does not include sites which are managed entirely or in cooperation with the federal government because the MMA inventory of federal sites was not completed. Since the report is a collaborative effort between NOAA and the jurisdictions, most chapters have multiple authors representing NOAA staff who work closely with these jurisdictions on their MPA initiatives and MPA leadership in each state and territory. The authors also contacted MPA managers and practitioners in each jurisdiction who contributed valuable information to enrich this report. As a result of this partnership, the authors were able to expand upon and provide insight into the responses provided through the National MMA Inventory including recommendations to enhance local MPA efforts.

SUMMARY OF REPORT CONTENTS:

Each of the seven jurisdictional chapters is organized into seven main components including:

1) INTRODUCTION

This section is an introduction to each state or territory that provides a description of the coral reef resources in the jurisdiction and a broad summary of local MPA efforts.

2) MPA TYPES

As the core of the report, this section explores the various types or "systems" of MPAs in each jurisdiction. The types of MPAs are not necessarily ecologically interconnected systems of MPAs, known as ecological MPA "networks." Instead, they represent legal designations as established by the local government of each state and territory. For each MPA type, the following information is provided:

- **Priority Coral Reef Resources and Habitats Table –** Provides a list of all of the sites represented by each MPA type and an accounting of the priority coral reef resources and habitats that can be found within each site.
- **National Classification –** Categorizes the sites within each MPA type according to the national classification system (see component 7 below).
- **Enabling Legislation and Responsible Agency** - Explains the legal framework for the establishment and management of the MPAs within each type.
- **Goals, Objectives, Policies and Protections –** Describes existing goals and objectives as stated by site managers in management plans and in other legal documents pertaining to individual sites or systems of sites. It also provides information on the specific policies and regulations that distinguish the management of the MPAs from the surrounding marine environment.

- **Management Activities** – Identifies the different management activities that are currently being implemented in the sites within each MPA type. Activities include enforcement, monitoring, research, education and outreach, permitting, restoration, and the development of site management plans.
- **Stakeholder Involvement and Public Participation-** Offers a summary of the level of involvement of relevant stakeholder groups and the general public in the MPA establishment and management process for each MPA type. This involvement ranges from participation in public meetings or hearings to community-based management of MPA sites whereby local stakeholders are given complete management authority over a site or system of sites.

3) CHALLENGES TO MPA EFFECTIVENESS

In order to improve the effectiveness of MPA management, it is necessary to identify and address the challenges or obstacles that MPA managers face. This section provides a discussion of the MPA management challenges specific to each jurisdiction. The National MMA Inventory included a special question on five main challenge areas for the seven coral jurisdictions in this report. These areas were: funding and resources, capacity, public support, monitoring, and enforcement. For each site in the inventory, managers identified which of these areas present challenges to the effective management of their MPAs. Each chapter provides a chart that depicts the predominance of these five challenge areas in the jurisdiction. Several coral jurisdictions also identified other challenges which are discussed in this section.


Mateo Mendez 2006

4) WORKING TOWARDS A NETWORK

This component describes existing state and territory efforts to support the development of networks of MPAs. A network of MPAs is defined as "a set of discrete MPAs within a region or ecosystem that are connected through complementary purposes and synergistic protections. A network of MPAs could focus on ecosystem processes, certain individual marine species, or cultural resources. For example, an ecological network of MPAs could be connected through dispersal of reproductive stages or movement of juveniles and adults" (National MPA Center 2006b).

5) NEXT STEPS/RECOMMENDATIONS

In this section, the authors and contributors of each chapter provide a series of potential next steps and recommendations to enhance local efforts to manage existing sites and to develop effective networks of MPAs.

6) NATIONAL CLASSIFICATION SYSTEM TABLE

The National Classification System was developed by the National MPA Center in an effort to develop a "straightforward and consistent language to accurately describe the many types of MPAs occurring in our waters and to understand their effects on ecosystems and the people that use them" (National MPA Center 2006a). The system describes MPAs in purely functional terms using five objective characteristics common to most MPAs:

- Conservation Focus – each site was assigned one or more of the following three attributes:
  i. Natural Heritage – established and managed to sustain, conserve, restore and understand the biodiversity, populations, communities, habitats, ecosystems, processes and services of an MPA or MPA zone

  ii. Cultural Heritage – established and managed to protect and understand submerged cultural resources
  iii. Sustainable Production – established and managed to support the continued extraction of renewable living resources

- Level of Protection Afforded – each site was assigned one of the following six attributes:
  i. Uniform Multiple-Use – Consistent level of protection and allowable activities throughout the MPA
  ii. Zoned Multiple-Use – Some extractive activities allowed throughout entire site, but use marine zoning to allocate specific uses to compatible places or times
  iii. Zoned Multiple-Use with No-Take Areas – Multiple-use MPAs that contain one or more zones where resource extraction is prohibited
  iv. No-Take – MPA sites that allow human access but prohibit resource extraction throughout the area
  v. No Impact – MPAs that allow human access but prohibit all activities that could harm the site's resources or disrupt the service they provide
  vi. No Access – MPAs that restrict all human access to the area unless specifically permitted for designated special uses

- Permanence of Protection – each site was assigned one of the following three attributes:
  i. Permanent – MPAs whose legal authorities provide protection in perpetuity
  ii. Conditional – MPAs that have the potential to persist over time but whose legal authority has a finite duration and must be actively renewed
  iii. Temporary – MPAs that are designed to address relatively short-term conservation and management needs by protecting a specific habitat or species for a finite duration with no expectation or mechanism for renewal

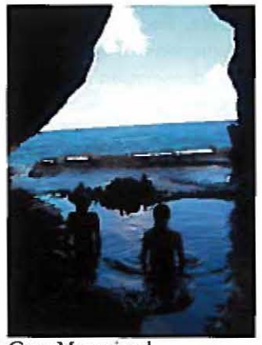
- Constancy of Protection – each site was assigned one of the following three attributes:
  i. Year-round – MPAs that provide constant protection throughout the year
  ii. Seasonal – MPAs that protected specific habitats and resources during fixed seasons or periods
  iii. Rotating – MPAs that cycle among a set of fixed geographic areas in order to meet short-term conservation and management goals

- Ecological Scale of Protection – each site was assigned one of the following two attributes:
  i. Ecosystem – MPAs whose legal authorities and management measures are intended to protect all of the components and processes of the ecosystem(s) within its boundaries
  ii. Focal Resource – MPAs whose legal authorities and management measures specifically target a particular habitat, species complex, or single resource

Every chapter provides a table that uses this system to classify each MPA in the jurisdiction. The table also includes information on the presence of a management plan for each MPA site. A full description of the classification system is available in Appendix B of this report and at www.mpa.gov (National MPA Center 2006a).

7) SUCCESS STORY

The close of each chapter highlights a case study that demonstrates a successful MPA initiative.


Greg Moretti n.d.

SUMMARY STATISTICS:

The following summary statistics provide information on the status of coral reef ecosystem MPAs established by the seven states and territories. In total, 207 MPA sites are represented in this report. The data described in the report does not reflect the management effectiveness of the various sites, nor can it be inferred to indicate the amount of effort spent by the jurisdictions to establish or manage MPAs. As evidenced in the MPA summaries in each chapter, many of these sites have little on-going management activity and are in critical need of resources and support for increased management capacity.

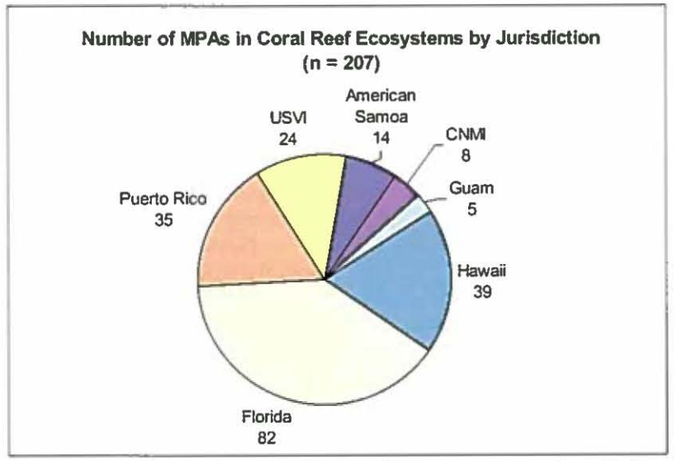


Fig. A: Number of existing MPAs in each of the seven coral reef jurisdictions.

Level of Marine Resource Protection

Ben Mieremet n.d.

In the National Coral Reef Action Strategy, the U.S. Coral Reef Task Force calls for the establishment of "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 5 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" (2002).

Of the 207 sites included in the report, less than one quarter of them (49 sites or 24 percent) offer some level of no-take protection (Fig. B). This category includes all sites classified as no-take, no impact, no access, and zoned multiple-use with no-take areas. The remaining 158 sites are uniform multiple-use and zoned multiple-use areas. Approximately 45 percent of the no-take sites are located in the Atlantic-Caribbean region in the jurisdictions of Florida, Puerto Rico, and the U.S. Virgin Islands (Fig. C). The remaining 55 percent are found in the four Pacific jurisdictions of American Samoa, Commonwealth of the Northern Mariana Islands (CNMI), Guam, and Hawaii. A site's designation as a no-take area is only a characterization of the restrictions established by its authorizing legislation or subsequent regulations; it is not an indication of the level of enforcement of those laws or regulations. Also, there are sites that do not have no-take zones, but do have active fisheries management and enforcement. For example, only one of the five MPAs in Guam's marine preserve system has been designated as a no-take area, but there is a permitting system for the preserves that provides comprehensive fisheries restrictions that are vigorously enforced.

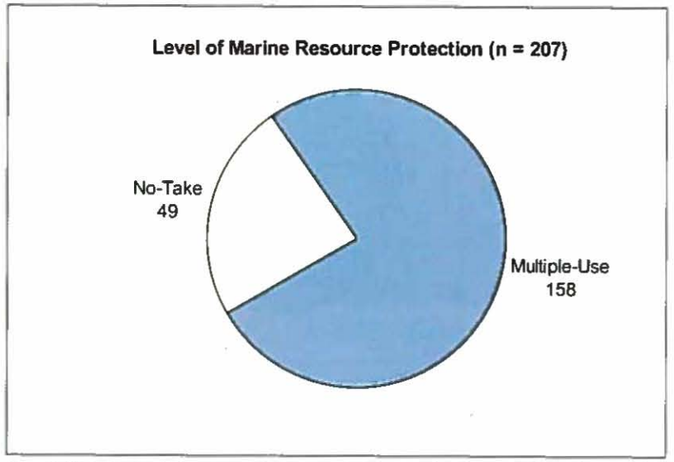


Fig. B: Number of sites providing no-take protection vs. number of multiple-use sites.

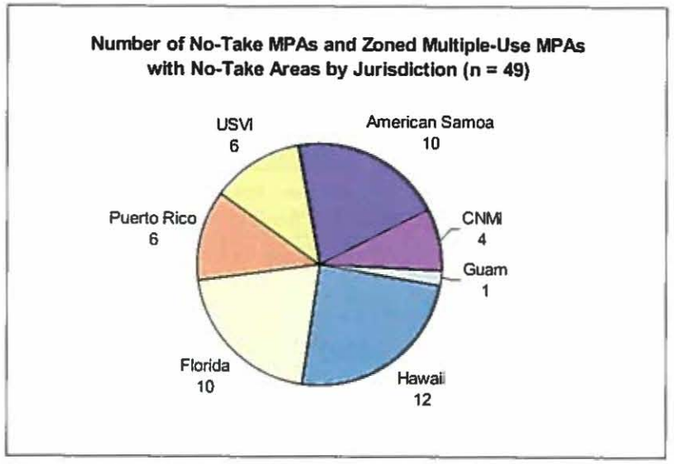


Fig. C: Number of sites providing no-take protection by jurisdiction.

Conservation Focus

In terms of the conservation focus of the sites included in this report, the large majority (71 percent) are natural heritage MPAs, meaning that they are "established and managed to sustain, conserve, restore and understand the biodiversity, populations, communities, habitats, ecosystems, processes and services of an MPA or MPA zone" (National MPA Center 2006a) (Fig.D). Almost one quarter of the sites were established for sustainable production purposes. Observation of regional trends reveals that sustainable production MPAs are more common in the Pacific region than in the Atlantic-Caribbean region (Fig. E). Very few sites in the seven coral jurisdictions have a cultural heritage focus or multiple conservation foci.

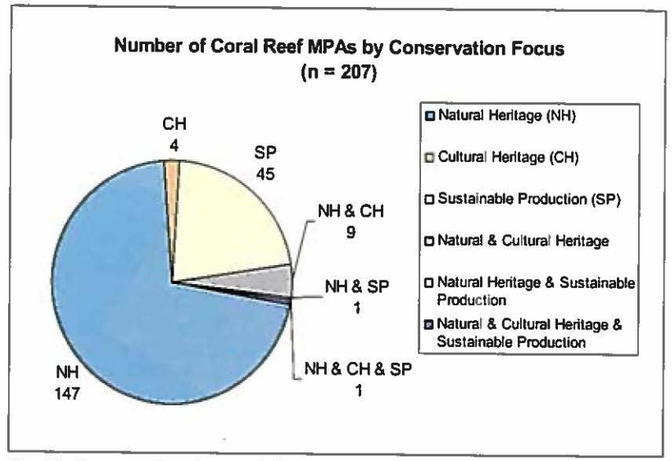


Fig. D: Conservation focus of sites.

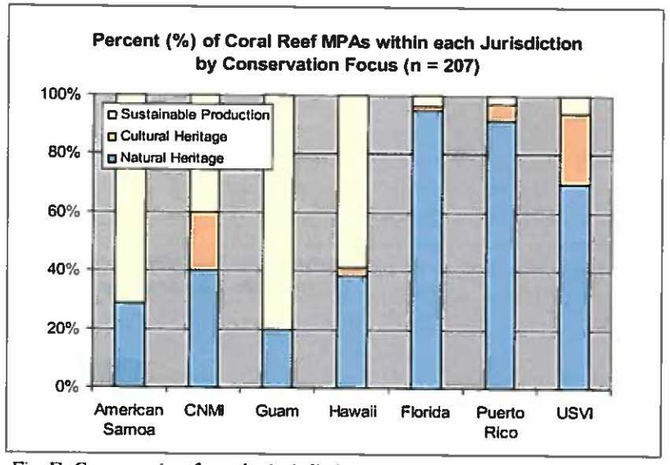


Fig. E: Conservation focus by jurisdiction.

Duration and Scale of Protection

The large majority of sites in the report are permanent (86 percent), provide constant protection throughout the year (97 percent), and are intended to provide ecosystem level protection (78 percent) (Fig. F). Twenty-two MPAs are conditional, meaning that after a specified period of time they will be reevaluated and either continue for another set period of time or be terminated. Seven sites are seasonal areas in which specific habitats and resources are protected during fixed times of the year or periods. Forty-five MPAs in this report have authorities and management measures that target a particular habitat, species complex, or resource rather than focusing management at an ecosystem level.

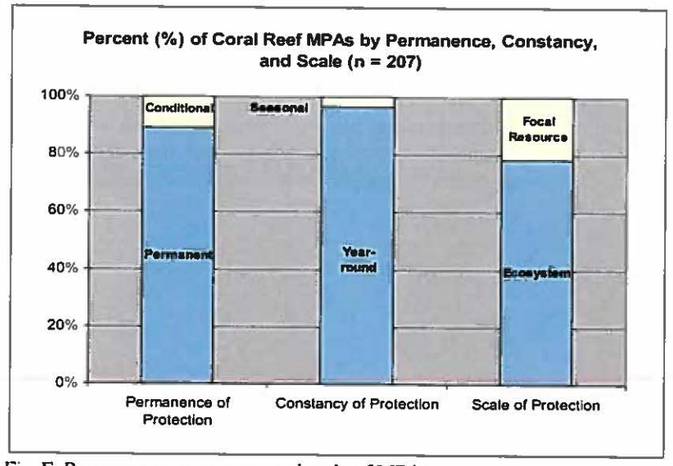


Fig. F: Permanence, constancy, and scale of MPAs.

MPA Characteristics: Resources, Management, and Challenges

Many of the MPAs represented in this report contain significant natural resources whose protection is essential for the effective conservation of coral reef ecosystems. Almost half of the 207 sites contain fish spawning areas. Threatened and endangered species have been observed in almost 80 percent of the sites in this report. This statistic was formulated by calculating the number of sites that reported the presence of federally endangered or threatened sea turtles, marine mammals, and/or birds. Note that two species of coral, the *Acropora palmata* and the *Acropora cervicornis,* were listed as federally threatened species after the completion of the MMA Inventory. The inclusion of these species in this assessment would increase the number of sites with threatened or endangered species significantly.

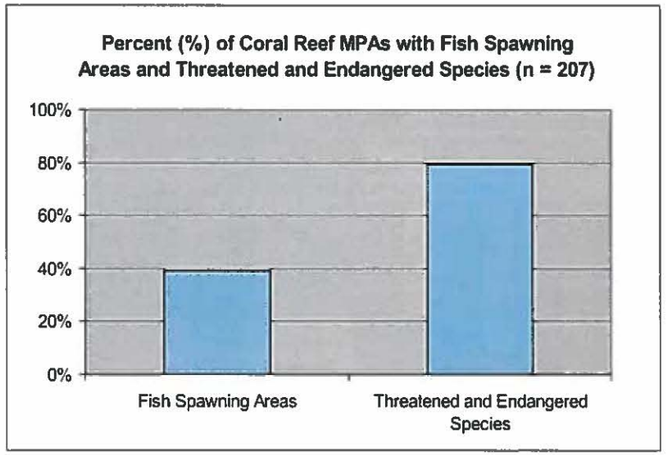


Fig. G: Coral reef ecosystem MPAs with fish spawning aggregations and endangered sea turtles, marine mammals, and/or birds.

Of the 207 sites included in this report, 194 of them provided information on the management activities that are being implemented within the areas. Figures H-K illustrate the proportion of sites in each jurisdiction that are currently implementing education, research, monitoring, and enforcement activities. Some jurisdictions may not have reported the implementation of these activities specific to particular sites, but they have comprehensive programs for education, research, monitoring and enforcement that inherently include these MPA sites as a part of the broader coral reef management efforts. For example, Hawai'i has an extensive coral reef outreach and education campaign that does not focus on any specific MPA sites and therefore was not reported as a management activity for many of the sites in Hawai'i.

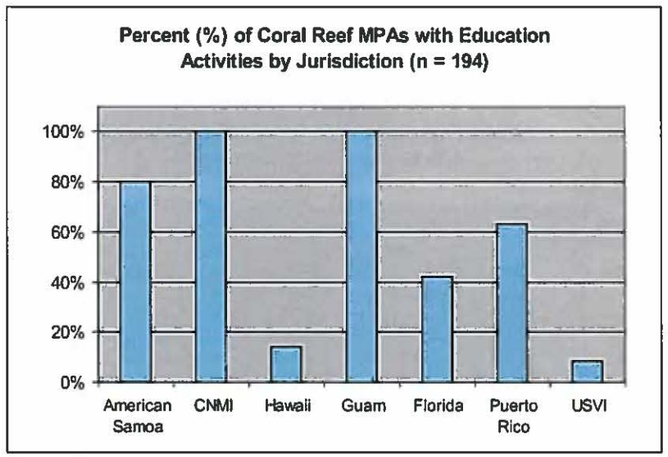


Fig. H: Coral reef ecosystem MPAs with education activities.

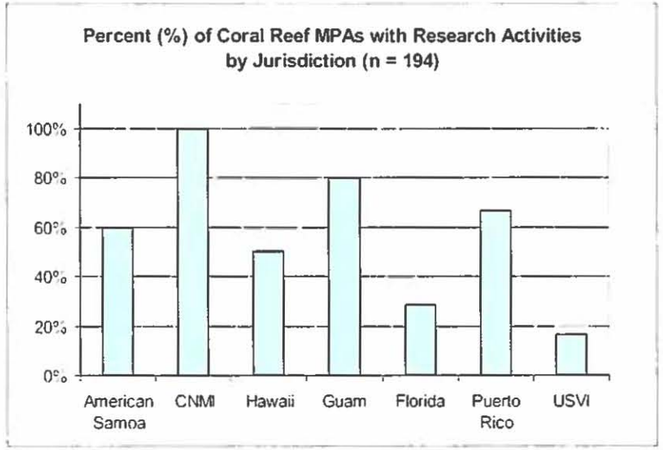


Fig. I: Coral reef ecosystem MPAs with research activities.

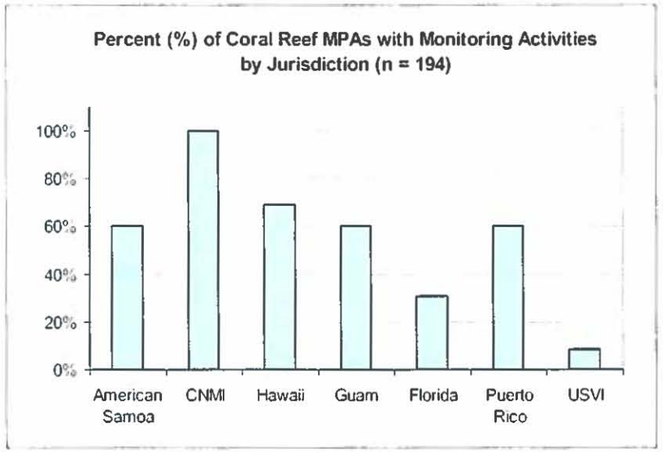


Fig. J: Coral reef ecosystem MPAs with monitoring activities.

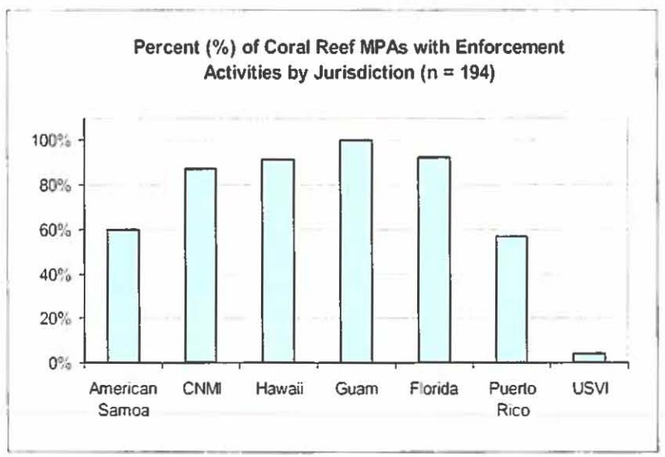


Fig. K: Coral reef ecosystem MPAs with enforcement activities.

The development of a management plan is an important step towards the successful implementation and effective management of an MPA. A management plan serves as the framework for the implementation of an MPA and lays out a series of goals, objectives, and management actions for a particular site or a system of sites. These plans can provide both long-term guidance for the application and adaptation of MPA management strategies as well as short-term actions to be implemented in the immediate future. The development of a robust management plan can be quite challenging depending on the number of management authorities, agencies, and other stakeholders involved in the process, the amount of financial and human resources available to work on the plan, and the level of local support for the MPA. These challenges are reflected in the relatively low number of sites that have approved management plans (Fig. L).

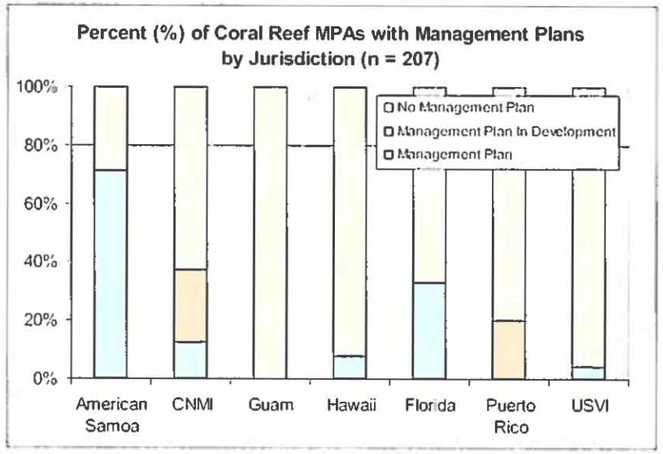


Fig. L: Coral reef ecosystem MPAs with management plans.

It is important to note that presence of a management plan does not necessarily signify that management actions are being implemented in a particular site; nor does the absence of a management plan imply that there is no management action. Many sites without complete management plans have significant management activity, such as permitting systems, fisheries regulations, the implementation of no-take zones, outreach and education initiatives, and coral reef ecosystem monitoring among others.

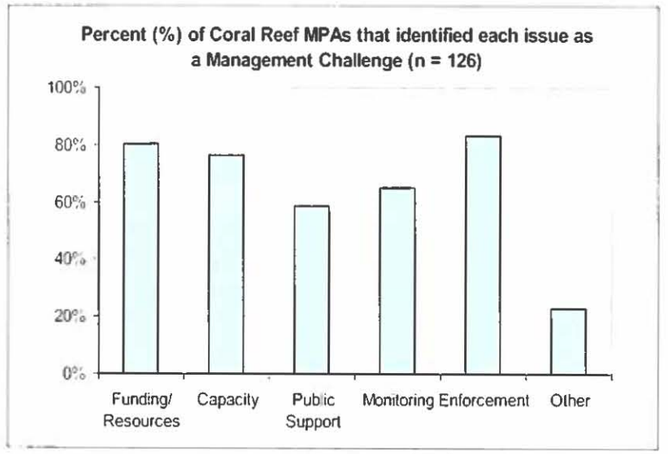


Fig. M: Number of MPAs (out of 126 total responses) that identified each issue as a challenge to effective MPA management. Of the 207 total MPAs, data was not reported for 81 MPAs located in Florida, HI, and CNMI.

Finally, 126 sites responded to a question that asked them to identify the existing challenges to effective MPA management. The list of challenge options included funding and resources, management capacity, public support, monitoring, enforcement, and other. Excluding the "other" options, all of the challenge options were identified in more than 50 percent of the sites indicating that significant effort is required to ensure that MPA goals will be met (Fig. M). Enforcement was the most commonly identified challenge followed by funding and resources, capacity, monitoring, and public support. Several other challenges were identified by inventory respondents, such as balancing use with protection, interagency coordination, a lack of comprehensive management plans, a lack of citation and penalty systems for illegal activity, insufficient communication between researchers and managers, a lack of infrastructure, facilities and administrative support, conflicts with private landowners, and the poorly described or non-existent demarcation of MPA boundaries.

The successful application of MPAs as a management tool is contingent upon the resolution of these obstacles to effective management. If the federal, state, and territory government partners on the U.S. CRTF wish to achieve functioning networks of coral reef ecosystem MPAs, then they must work together to address these challenge areas and provide the resources and assistance required to build state and territory MPA management capacity.

CITATIONS:

National Marine Protected Areas (MPA) Center. 2006a. *A Functional Classification System for Marine Protected Areas in the United States.* NOAA. Silver Spring, Maryland. 6 pp. Available online at: http://www.mpa.gov/pdf/helpful-resources/factsheets/class_system_0806.pdf.

———. 2006b. Glossary. http://www.mpa.gov/glossary.html.

———. 2006c. Inventory of Marine Managed Areas in the United States. http://www.mpa.gov/helpful_resources/inventory.html.

U.S. Coral Reef Task Force. 2000. *The National Action Plan to Conserve Coral Reefs.* Washington, D.C. Available online at: http://coralreef.gov.

U.S. National Oceanic and Atmospheric Administration. *2002. A National Coral Reef Action Strategy: Report to Congress on Implementation of the Coral Reef Conservation Act of 2002 and the National Action Plan to Conserve Coral Reefs in 2002-2003.* NOAA. Silver Spring, Maryland. 120 pp. + appendix.

Chapter 1: American Samoa Coral Reef MPA Summary

American Samoa Coral Reef Advisory Group[1]

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INTRODUCTION

As the southernmost U.S. Pacific Territory, American Samoa lies approximately 4,200 kilometers (km) south of Hawaii in the South Pacific. The territory is comprised of seven islands (five volcanic and two coral atolls) surrounded by shallow water habitats consisting primarily of fringing reefs, a few offshore banks, and two coral atolls. Based on the 2004 NOAA benthic habitat maps, the estimated area of coral-related habitat in the territory is 73 km² (Riolo 2006). This estimate could increase significantly based on the kind of substrates found on the newly delineated seamounts that encircle Tutuila Island.

"Coral reefs are an important natural resource in American Samoa. Not only are they important habitats for fishes, but for traditional and recreational activities as well" (Saucerman 1995). Coral reefs provide protection, food, medicines, and security, as well as other social, cultural, economic, and aesthetic benefits. A recent economic valuation study conducted by Jacobs Inc. indicated that the current total coral reef annual value (US$/year at 2004 market prices) in American Samoa is $10,057,000. The total current product added value of the direct coral reef subsistence fishery in American Samoa is estimated to be about US$ 544,000/year (Jacobs, et al. 2004).

Fig. 1.1: White-spotted surgeon fish (Brown 2006)

American Samoa's reefs have experienced numerous destructive impacts, both natural and human induced. The reefs have proven resilient to tropical storms, bleaching events, and crown of thorn starfish outbreaks in the past. This resilience is aided by high amounts of coralline algae that promote coral recruitment, and high herbivorous fish populations that keep macro-algae populations low. Overall, the coral reefs in American Samoa are considered healthy and coral cover averages about 30 percent (Sabater and Tofaeono 2006; Fenner and Whaylen 2005). Land-based pollution, sedimentation, fishing pressure, global climate change, and population pressure are among the human based threats that are being investigated to better understand their impacts on the reefs. While not all of these factors may have impacted the reefs noticeably up until now, they all potentially pose serious threats for the future.

The reef ecosystem also has been impacted by the significant human population growth that has occurred in the territory over the last two decades. American Samoa has an estimated population of 66,900 people and a population growth rate of approximately two percent per year (Filiga 2006). "Rapid development and the accompanying environmental degradation have affected the South of Tutuila Island in many ways: roads encroach on shoreline, new construction, [and] siltation problems" (Coutures 2003). In addition, fish caught in the inner Pago Pago Harbor are seriously contaminated with heavy metals such as lead and other pollutants. The fish in the inner Pago Pago Harbor are not safe to eat, and the sale of these fish is prohibited (ASEPA 1991). Eutrophication and sedimentation are likely responsible for the degraded condition of many coral reefs in Pago Pago Harbor (Banner, et al. 1970; Caperon, et al. 1971; Smith, et al. 1973 in Dahl, et al. 1977). In recent years, however, water quality in the harbor has improved due to diversion of pollution from local canneries, and reefs in the harbor appear to be recovering as a result.

The American Samoa Environmental Protection Agency (ASEPA) monitors water quality and publishes weekly beach advisory notifications in the Samoa News newspaper. Advisories are issued when *E. coli* bacteria, an indicator of contamination by human and/or animal wastes, concentrations exceed levels determined safe for human exposure (ASEPA 2005). Coral reef organisms are susceptible to diseases caused by pathogens and parasites, as well as to those conditions caused or aggravated by exposures to anthropogenic pollutants and habitat degradation (Peters 1997).

[1] The American Samoa Coral Reef Advisory Group (CRAG) is a collaboration of five different agencies in the territory, all of which have some link to the coral reef environment: the Department of Marine and Wildlife Resources (DMWR); the Department of Commerce (DOC); American Samoa Environmental Protection Agency (ASEPA); the American Samoa Community College (ASCC) and; the National Park of American Samoa.

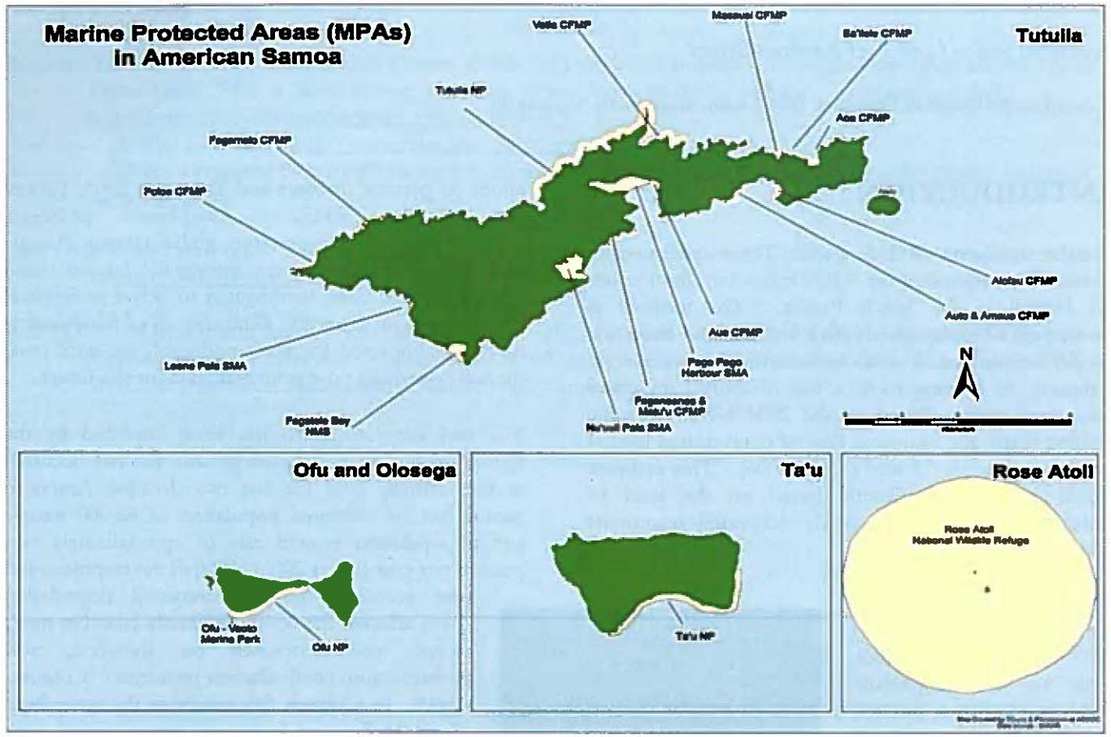

Fig. 1.2: Map of MPAs in American Samoa (Curry and Anderson 2006)

The territorial government of American Samoa and the U.S. federal government have recognized that measures must be taken to protect the unique marine resources in the islands. The first MPA in American Samoa, the Rose Atoll National Wildlife Refuge, was established in 1973. MPAs in American Samoa represent various levels and types of MPAs, from federally managed to community-based. Federal sites include the National Park of American Samoa, Rose Atoll National Wildlife Refuge, and Fagatele Bay National Marine Sanctuary. The Fagatele Bay National Marine Sanctuary is federally funded, but located within territorial waters; because both federal and territorial regulations apply, it is co-managed.

American Samoa has established 14 MPAs on the main islands of Tutuila and Ofu that contain coral reef resources and habitats. These sites represent three types of MPAs: 1) special management areas (SMAs), 2) a territorial marine park, and 3) community-based fisheries management program (CFMP) reserves. The territory is also developing a new program to establish no-take MPAs. Although no MPAs have been established under this program, two sites are proposed to be established by September 2010.

MPA TYPES

Special Management Areas:

National Classification: Uniform Multiple-Use, Natural and Cultural Heritage MPAs

Enabling Legislation and Responsible Agency:

Section 24.0503 of the American Samoa Coastal Management Act of 1990 designated Pago Pago Bay, and the "pala" or wetland areas of Nu'uuli and Leone as special management areas (SMAs) because of "their unique and valuable characteristics and to the imminent threat from development pressures" (ASCA § 24.05). This section also instructed the director of development planning to delineate boundaries and establish rules that impose the highest practical standards for the preservation, restoration, and management of the SMAs' ecological, commercial, recreational, and esthetic values. Future SMAs may be designated by the governor, following a nomination process and pursuant to the Administrative Procedures Act.

The SMAs are primarily managed by the American Samoa Coastal Management Program (ASCMP) within the Department of Commerce, but other agencies also contribute to management. ASEPA oversees stream management, piggery management, solid waste management, and a water quality program in cooperation with ASCMP. The human health aspects of piggery waste management and solid waste management are the responsibility of the Department of Health. The American Samoa Community College (ASCC) Land Grant oversees mangrove replanting and shoreline stabilization. Additionally, the Department of Marine and Wildlife Resources (DMWR) has the power and duty to manage, protect, preserve, and perpetuate the marine and wildlife resources in the territory (ASCA § 24.0304). Finally, local village councils enforce village wetland agreements, monitor their village projects for compliance, and support protection of wetlands by imposing village fines on violations and reporting violations to ASCMP.

coastal zone includes the entirety of all five islands and the two coral atolls out to the three-mile territorial sea limit. Therefore, the main protections afforded to SMAs are development regulations through a permit system. This permit system, as identified in the ASCMP administrative rules, integrates the permitting requirements of each of the territorial agencies concerned with environmental management, and includes special requirements for permits around SMAs.

While the SMAs include a marine component, there are no regulations within the marine area that go beyond general territorial regulations. The regulations that apply to the Pago Pago Harbor SMA are general territorial fisheries and harbor regulations. As previously mentioned, the sale of fish from the inner Pago Pago Harbor is prohibited because they are not safe to eat (ASEPA 1991). In the Leone Pala and Nu'uuli Pala SMAs, territorial fisheries and wetland regulations apply. The wetlands within these sites have been delineated

Table 1.1: Priority Coral Reef Resources and Habitats Found in the Three Special Management Areas (SMAs)

Special Management Areas (SMAs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Leone Pala		x		x	x	x	x	x	x			
Nu'uuli Pala	x	x		x	x	x	x	x	x	x		
Pago Pago Harbor	x	x		x	x	x	x	x	x	x		

Goals, Objectives, Policies, and Protections:

SMAs are specific areas that "possess unique and irreplaceable habitat, products or materials, offer beneficial functions or affect either the cultural values or quality of life significant to the general population of the territory and fa'aSamoa" (Samoan way of life) (ASAC §26.0221). These areas include both terrestrial and marine components. The main purpose of the SMAs is to protect unique marine ecosystems by regulating upland activities that could degrade these systems. The SMAs were selected using biological and ecological parameters (mapped accordingly to maximum extent) of water, soil, and plant coverage (based on U.S. Army Corps of Engineers wetland delineations).

The American Samoa Administrative Code (ASAC) lays out permit procedures and regulations for any development that occurs within the coastal zone and specifically around SMAs. In American Samoa, the through an agreement with the adjacent communities. Within these SMAs, any activities that alter wetlands are regulated, including filling and dumping, dredging, killing or damaging any flora or fauna, and the erection of any structures that affect the tidal flow (ASAC § 26.0222 F. 1. a. & b).

Management Activities:

The SMAs currently do not have written management plans with site-specific rules, regulations, and/or management tools and implementation strategies.

Education and Outreach:
Island-wide public awareness and outreach activities are an on-going part of ASCMP. Over the years, numerous efforts have focused specifically on communities located within the SMAs. One effort has been working with these communities to develop village wetland

agreements, which are based on wetland delineations and traditional village uses. The finalized wetland boundaries are hard-line boundaries in which no development is allowed. Wetland and SMA boundary signs have been proposed and will be installed in the designated SMA villages in the next year. Recently, ASCMP (with the permission of the Department of Parks and Recreation) installed a mangrove-viewing platform in Lion's Park with educational messages about mangroves in English and Samoan.

Enforcement:
Enforcement and monitoring activities within the SMAs are similar to island-wide enforcement and monitoring activities. ASCMP enforcement staff is in the field several days a week conducting site visits and monitoring active construction sites. These activities provide an opportunity to survey the island, including the SMAs, for non-permitted activities. Additionally, enforcement staff regularly receives calls from the public regarding non-permitted or suspicious activities. Lastly, ASCMP now has a designated assistant attorney general to work specifically on ASCMP and Department of Commerce cases.

Permitting:
Development projects within the SMAs are subject to a permitting process implemented by ASCMP, and carried out by the Project Notification and Review System (PNRS) Board, which consists of representatives from various agencies. These agencies include: ASCMP, ASEPA, American Samoa Historic Preservation Office, American Samoa Power Authority, Department of Health, DMWR, Department of Parks and Recreation, and Department of Public Works. The PNRS provides a system of environmental review, along with economic and technical considerations, that is intended to ensure that environmental concerns are given appropriate consideration in the land use decision-making process. Current staff positions that directly work within the SMA includes: ASCMP wetland specialist, a village conservation officer, and a community liaison officer.

Stakeholder Involvement and Public Participation:

While the public was not involved in the designation of the SMAs, all permit reviews of projects around SMAs must include a public hearing to obtain stakeholder input about development around the SMA. Additionally, both Nu'uuli Village and Leone Village were involved in delineating their village wetland boundaries and each supports protection efforts. These villages also monitor the wetland areas and report non-permitted activities to ASCMP. Lastly, the public will be involved in the proposed SMAs for the Malaeimi Valley and Tafuna Lowland Rainforest areas.

Territorial Marine Park

National Classification: Uniform Multiple-Use, Natural Heritage MPA

Enabling Legislation and Responsible Agency:

Ofu Vaoto Marine Park was established on the south coast of Ofu Island in 1994 through American Samoa Territorial Law (PL 23-13; ASCA § 18.0214). The Department of Parks and Recreation (DPR) has management authority for the park, but DMWR maintains primary authority to manage the fisheries within the park.

Goals, Objectives, Policies, and Protections:

The park was established "to protect its unique coral reef wildlife habitat while enabling the public to enjoy the natural beauty of the site" (ASCA § 18.0214). This unique habitat includes a high diversity of corals, in particular blue coral, fish, and hawksbill turtle nesting sites.

Regulations for the park prohibit fishing or shellfish harvesting (ASCA § 18.0214). However, there is an exception that allows Ofu Island residents to continue subsistence fishing and shellfish harvesting in the park in accordance with territorial fishing regulations. No other regulations have been established for the park. However, the ASCMP administrative rules provide additional protections for the park through a land use permit review system for areas adjacent to park and the adjacent National Park of American Samoa. Under this system, applications are reviewed "to ensure minimum adverse impact to marine and coastal resources, including water-quality, habitat, fish and wildlife, and recreational opportunities" (ASAC § 26.0220 F. 7.).

Table 1.2: Priority Coral Reef Resources and Habitats Found in the Ofu Vaoto Marine Park

Marine Park	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Ofu Vaoto	x						x	x	x	x	x	

Management Activities:

There is no management plan for the park and DMWR is not actively implementing any management programs.

Because the park is adjacent to the National Park of American Samoa and shares ecological functions with it, the park benefits from management programs that are being implemented by the National Park Service. Some of these programs include documentation of subsistence fishing harvests, and coral reef research being conducted in conjunction with the University of Hawaii. A current management concern for the park is a proposed extension for the adjacent airport runway. This extension would destroy the reef flat and could have significant impacts on the coral reefs in the park.

Stakeholder Involvement and Public Participation:

The public was not involved in the establishment of the park because it was selected as compensation of habitat loss caused by dredging Faleasao Harbor (as required by the U.S. Army Corps of Engineers). Due to the remote location and lack of accessibility by most American Samoans, the park essentially remains an unknown entity.

Community-based Fisheries Management Program

National Classification: No-Take, Sustainable Production and Natural Heritage MPAs

Enabling Legislation and Responsible Agency:

Based on an initiative of community-based fisheries management reserves in the neighboring country of Samoa, the American Samoan government has implemented a similar effort to incorporate and utilize the distinctive Samoan culture into resource protection. Within the U.S., American Samoa is unique in that villages have maintained virtually all marine and land tenure. As such, the community-based fisheries management program (CFMP), which is administered through DMWR, works with individual village communities to identify resource trends and problems, and to develop management plans that are locally appropriate and accepted.


Fig. 1.3: Ofu-Olesega, Manu'a Islands (Tennant 2006)

The CFMP was designed to assist villages in managing and conserving their inshore fishery resources. There was a collaborative effort to develop and co-manage these sites through a series of meetings in which the village was responsible for developing a management plan for the protected area with advice and technical assistance from DMWR. The management plan details the purpose, duration, and rules and regulations for the site. An agreement is signed between the village council and DMWR to legalize the site. Plans are then reviewed by a legal advisory review team to incorporate the village rules and regulations into the DMWR statutes, to provide more effective protections, and to allow villages to issue citations.

Goals, Objectives, Policies, and Protections:

CFMP reserves are established and managed principally to support the continued sustainable extraction of renewable living resources (e.g., fish, shellfish) within or outside of the reserves by protecting important habitat and spawning, mating, or nursery grounds; or, providing harvest refugia for by-catch species. The reserves also prohibit the extraction or destruction of natural or cultural resources within the reserve boundaries, and restrict access and/or other activities that may adversely impact resources, processes, and qualities, or the ecological or cultural services they provide. There is no formal network among the reserves, but as the number of villages included in the program increases, there are some discussions of creating a social network for village leaders to share information and request assistance.

Each of the reserves prohibits resource extraction. However, in select instances, there may be an exception of subsistence fishing for cultural practices. The village members can still utilize the resources for recreational and educational purposes. At times, certain areas of the reef will be opened for use by elders in the village with

Table 1.3: Priority Coral Reef Resources and Habitats Found in the 10 Community-based Fisheries Management Program (CFMP) Reserves

Community-based Fisheries Management Program (CFMP) Reserves	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Alofau	X		X				X	X	X	X		
Amaua & Auto	X						X	X	X			
Aoa	X				X		X	X	X	X		
Aua	X						X	X	X			
Fagamalo	X				X		X	X	X			
Masausi	X						X	X	X			
Matu'u & Faganeanea	X						X	X	X			
Poloa	X						X	X	X			
Sa'ilele	X						X	X	X	X		
Vatia	X				X		X	X	X	X		

permission from the village council, and as outlined in the individual reserve's management plan. There is also a three-year expiration date on the closure of the site. At this time, the village reviews the management plan and its effects and decides if it would like to continue to have the same regulations, make changes to the regulations, or discontinue the program. Some villages select to open a reserve temporarily for fishing before closing it for an extended period. DMWR is moving towards discussions of more long-term or permanent closures for community reserves.

Management Activities:

Implementation of the reserve management plans is carried out by the village with assistance from DMWR. DMWR staff meets with each village approximately every month to discuss management efforts and address concerns. Management efforts for the reserves include research, monitoring, enforcement, and public awareness.

Research:
Research efforts implemented by DMWR include inshore creel surveys to determine fishing efforts and a "key reef species project" to examine targeted species of the reefs. Previously, some villages were conducting restoration activities by stocking the reef area with giant clams from the DMWR hatchery. However, these efforts are no longer being implemented.

Monitoring:
The DMWR CFMP team has recently developed monitoring protocol to carry out monthly monitoring of each participating village reserve. DMWR extension staff and trained community volunteers from the Management and Enforcement Committee are responsible for conducting the monitoring activities, such as basic fish biomass and diversity surveys. The Fagamalo, Vatia, Aoa, and Amaua & Auto CFMP reserves are also included in the Territorial Monitoring Plan, which surveys corals and fish species.

Enforcement:
Groups of untitled men, in conjunction with the village matai (chief), are primarily responsible for carrying out enforcement efforts. Violators may be brought in front of the village council to determine the punishment. When higher-level enforcement is needed, the village calls on the Enforcement Division of DMWR for assistance because it has the authority to issue citations. An attorney is currently reviewing community regulations that allow the village matai to enforce reserve regulations to determine how to incorporate them into territorial law.

Stakeholder Involvement and Public Participation:

The nature of this program is to encourage communities to actively manage their local resources in collaboration

with DMWR through a series of meetings and trainings. Therefore, the program itself is based on public involvement and would not succeed without major public support.

The first meeting between the village members and DMWR takes place after initial contact by the cultural officer, high talking chief, or director of DMWR. This meeting allows DMWR to explain the extension process of the program, its benefits, and the necessary undertakings by DMWR and the village. The village, through the village council, then decides whether or not to accept the program.

Fig. 1.5: PLA training workshop on resource management and environment stewardship for village mayors (Sauafea-Leau 2006b)

Group meetings with the villages are conducted with the village chiefs, women's group, and untitled men to identify the problems, the causes, and their effects, as well as solutions to the problems. A fisheries management advisory committee (FMAC) is selected from the chiefs and untitled men's group. With DMWR's assistance, this committee puts together the information gathered from the group meetings and a baseline questionnaire form to begin the development of a fisheries management plan (FMP). FMAC continues to meet with the program staff to develop an FMP for the village.

Several public awareness efforts take place at the village level and the territorial level. Village-level awareness efforts occur mostly during village meetings, which allow for an exchange of information between DMWR staff and villagers. DMWR staff helps villagers understand the reef fishery ecosystems, and provide management advice through formal and informal meetings.

Fig. 1.4: CFMP outreach event (Mata'u 2006)

Currently DMWR is conducting monthly community outreach activities at the different church youth groups within the participating villages. At these outreach events, DMWR staff and other environmental agencies educate youth groups on environmental issues that contribute to the destruction of coral reefs, and how they can contribute to saving these unique natural resources. Additionally, DMWR extension staff conducts monthly community reserve visits to informally keep in touch with the village communities about on-going issues and challenges related to the reserve and the program.

To help local villagers monitor and enforce the reserves, DMWR has provided training workshops in monitoring, boating safety, and equipment for the community. Information sheets on fisheries, corals, seaweeds, mangroves, dynamite fishing, and bleaching have been distributed in conjunction with press releases and radio announcements. To ensure stakeholder participation, the use of participatory tools for information gathering, planning, decision-making, monitoring, and evaluation was included in Participatory Learning and Action (PLA) village workshops hosted in partnership with local NOAA Fisheries staff. PLA is a community action program that engages all sectors of the community, especially women and youth. It is based on the philosophy that when people are involved in the information gathering, developing, and implementation phases, they are empowered with responsibility and accountability for their resource use actions.

Federal MPAs

Managing federal MPAs in the context of American Samoa's land tenure system has required the formation of a unique partnership between the federal government, territorial government, and villages. American Samoa is a semi-autonomous territory that operates under its own constitution based on the traditional Samoan governance structure. Matais (chiefs) have control over the land and assign holdings to family members on a lifetime basis. These land holdings include the coastal waters that encompass the nearshore coral reefs. The existing law on land tenure prohibits the transfer of land ownership, except freehold land, to any person who is less than one-half Samoan. In matters pertaining to the use and protection of land, the traditional system of land tenure must be adhered to and is an integral component of the way the resources are managed. Therefore, the federal MPA programs operating in the territory have adapted their procedures and structure to work within the land tenure and management system.

In addition to the cooperative agreements that allow for co-management of the federal MPAs, the National Park of American Samoa and the Fagatele Bay National Marine Sanctuary play pivotal roles in the governor's Coral Reef Advisory Group (CRAG). The National

Park of American Samoa is a voting member of CRAG, and Fagatele Bay National Marine Sanctuary has provided guidance and support throughout CRAG's operation. Both the park and the sanctuary have assisted in the development of capacity building opportunities, marine policy, and research as it relates to MPAs in the territory. Because of American Samoa's unique management framework and partnerships, this chapter includes summary information for the federal MPAs in the territory. These MPAs will be described in more detail in a future report, which will include federal MPAs and geospatial analysis of MPA coverage within coral reef ecosystems.

Fagatele Bay National Marine Sanctuary

Fig. 1.6: Fagatele Bay National Marine Sanctuary (Tennet 2006)

The Fagatele Bay National Marine Sanctuary encompasses 163 acres (0.25 square miles) of fringing coral reef ecosystem nestled within a flooded extinct volcanic crater on the southwest coast of the island of Tutuila. It contains many of the species native to this part of the South Pacific Ocean, including at least 200 coral species, 270 fish species, turtles, whales, sharks, and the giant clam.

The sanctuary was designated in 1986 in response to a proposal from the American Samoa government to NOAA's National Marine Sanctuary Program. While NOAA has primary responsibility for the sanctuary, it co-administers the sanctuary with ASCMP, and the sanctuary staff consists of federal, territorial, and local village resident employees. The sanctuary's official purpose is "to protect and preserve an example of a pristine tropical marine habitat and coral reef terrace ecosystem of exceptional productivity, to expand public awareness and understanding of tropical marine ecosystems; to expand scientific knowledge of marine ecosystems; to improve resource management techniques, and to regulate uses within the Sanctuary to ensure the health and well-being of the ecosystem and its associated flora and fauna" (Federal Register 1986).

Currently, the sanctuary regulations prohibit taking invertebrates and sea turtles, and any historical artifacts found in the bay. The only fishing allowed in the sanctuary is line fishing in the outer part of the bay. Local conservation officers and the NOAA Office of Law Enforcement are responsible for enforcing the regulations in the sanctuary. Local landowners provide an additional layer of surveillance by overseeing the visitors that access the sanctuary via land. The sanctuary continues to develop its relationship with landowners with the hope that they will extend protections to the coral reef area that was traditionally part of their titled lands.

In addition to partnerships with landowners, the sanctuary uses other management tools to protect the resources, including research, monitoring, education, regulation, and enforcement. Research and monitoring efforts include collaborations with DMWR, ASEPA, NOAA's Coral Reef Ecosystem Division, and numerous researchers from around the world. The sanctuary's educational and outreach efforts inform the public about the unique resources found in the sanctuary, promote environmental stewardship, and encourage marine science and research. In 2007, the sanctuary will be undergoing a management plan review that will engage the public to revise, if needed, the purpose, regulations, boundaries, and relevance of the sanctuary.

The National Park of American Samoa

The National Park of American Samoa is located on three islands in the territory (Tutuila, Ofu and Ta'u), and includes portions of land in the following villages: Fagasa, Vatia, Afono, Pago Pago, Ofu, Faleasao, and Fitiuta (NPS 2006). The park contains approximately 8,000 acres of paleotropic rainforests and 2,500 acres of coastal waters, including coral reefs that extend from the shoreline to 0.25 miles offshore.

The National Park of American Samoa was established through Public Law 100-571 in 1988 after the National Park Service and the American Samoan government completed a comprehensive feasibility study. Earlier attempts to establish the park failed because there was not a feasible way for the federal government to acquire traditionally owned village lands. After decades of discussion, the High Court of American Samoa and the U.S. Congress developed a compromise that allows a lease of the parklands that permits traditional (subsistence) uses of the land and marine resources by Samoans (NPS 2006). The park was officially established in 1993 when a 50-year lease was signed.
The purpose of the park is "to preserve and protect the tropical forest and archeological and cultural resources of American Samoa, and of associated reefs, to maintain the habitat of flying foxes (fruit bats), to preserve the ecological balance of the Samoan tropical forest, and, consistent with the preservation of these resources, to provide for the enjoyment of the unique resources of the Samoan tropical forest by visitors from around the

world" (NPS 2006). Only subsistence uses of park lands and marine resources by local villagers is permitted. However, there is limited surveillance and enforcement of this regulation.

The park has a five-year Resource Management Plan that includes management activities from 1995 to 2000. Although the plan has not been updated, the park continues to implement several management programs. Considerable surveys and research occurs in the park, often in cooperation with other organizations such as the University of Hawaii, which is examining global warming impacts to corals. The park has also produced a variety of education and outreach tools, including a detailed website and the Natural History Guide to American Samoa in both English and Samoan. To continue to involve the villages and the public, the park has liaisons in all seven villages with parklands, and it holds annual independent advisory group meetings that are open to the public.

Rose Atoll National Wildlife Refuge

The Rose Atoll National Wildlife Refuge (RANWR), located 14 degrees south of the equator and 2,500 miles south of Hawaii, is the smallest atoll in the world, with 15 acres in total size and 39,236 acres of submerged land. The square-shaped reef protects two small, emergent islands. The atoll is uninhabited by people, but is home to 12 species of migratory seabirds, numerous fish species, and a population of rare giant clams. It also provides nesting ground for threatened green sea turtles (USFWS n.d.).

RANWR was established on July 5, 1973 via a cooperative agreement between the U.S. Fish and Wildlife Service and the government of American Samoa, and both are responsible for cooperatively managing the area (USFWS n.d.).

NEW NO-TAKE MPA PROGRAM

In 2005, DMWR received funds from the U.S. Fish and Wildlife Service's Sport Fish Restoration Grant Program (Sport Fed Aid) to continue the development of a no-take MPA program. This program will address former Governor Sunia's goal of protecting 20 percent of the territory's coral reefs as no-take areas.

A no-take program manual is currently being developed, which will describe the guiding principles for selecting areas to become no-take MPAs. The two primary concepts considered during site selection are diversity and reproductive potential. Social, economic, enforcement, pragmatic, regional criteria, MPA size, and the period of closure are also integral parts of the no-take site selection process. The process for no-take MPA site selection is detailed in the no-take program manual and Federal Aid in Sport grant (Brookins, et al. 2005). The no-take program manual also describes the management plans, which are required for every no-take MPA.

Over the next five years (2007-2011), the no-take MPA program intends to build the staff's technical skills to design socio-economic and governance studies of MPAs, conduct interviews, analyze data, write reports, and make management decisions based on this data. The capacity to conduct regular effectiveness evaluations of MPAs will also be developed through this program. Annual public meetings will be held throughout the duration of the no-take MPA program in the islands of Tutuila, Ofu & Olosega, and Ta'u. Two permanent no-take MPAs with site-level management plans are proposed to be established by September 2010. Additionally, the CFMP intends to create three no-take areas within its participating villages by the end of 2011.

CHALLENGES TO MPA EFFECTIVENESS

MPA Management Capacity:
Managers identified a lack of human capacity as one the biggest challenges in managing MPAs. Due to the remote nature of the island, its small population, and its need for higher educational facilities, there is a lack of qualified staff to develop and implement management plans. A few highly experienced local managers implement MPA programs with the assistance of a number of transient workers, and frequent staff turnover results in reduced program continuity and a lag time before projects become fully active again. There is a serious need to train additional local staff and community college students in order to build and maintain human capacity in the management agencies.

Additionally, the limited number of experienced staff present during the establishment of some of the MPAs has impacted the effectiveness of several sites. While all of the sites were established with the good intention of protecting natural resources, many do not have clear goals and objectives developed through an extensive public participation process. Inadequate public participation has led to a lack of clear understanding by the public about the purpose of MPAs. Additionally, the effectiveness of the sites is difficult to determine, as management plans are not comprehensive or non-existent.

ASCC continues to expand its Marine Science Program, providing improvements in the relevantly trained local work force. Students, however, must still leave the territory in order to obtain a bachelor's degree. The community-based sites are also improving capacity through outreach programs and community involvement in site development.

Enforcement:
A lack of human capacity also affects enforcement, which MPA managers identified as another significant management challenge. Insufficient enforcement within and around MPAs is likely to reduce the effectiveness of the regulations, and can weaken support for these programs. Even community-based programs that are implemented and enforced by local villagers have cited enforcement as the greatest challenge. In these instances, community members are unable to get offshore to cite illegal activity by outsiders. The lack of both equipment (e.g., boats, binoculars) and training inhibits proper enforcement.

Another enforcement challenge is the long legal process that is required to prosecute violators, which negates the regulations. DMWR is working to incorporate village rules into the ASAC to improve their enforceability, but delineating the enforcement authority of the villagers remains a challenge. Within the community-based MPAs, villagers serve mainly as surveillance, and they are expected to initiate legal enforcement processes upon witnessing a violation. It has not been clear among villages, however, who should assume enforcement authority.

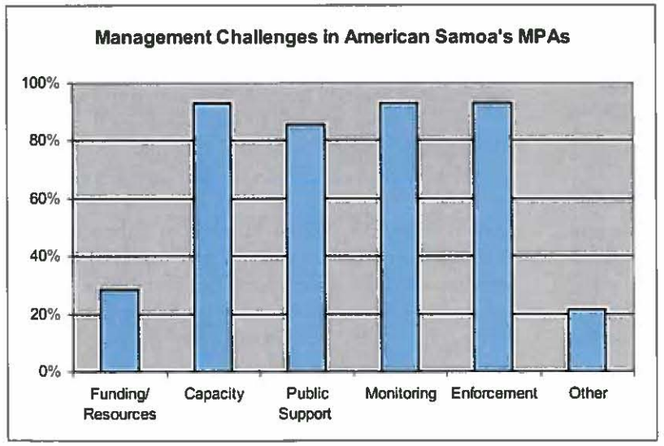

Fig. 1.7: Percent of MPAs (out of 14 total MPAs) that identified each issue as a challenge to effective MPA management. Under "other" challenges, three of the sites noted that management activities are difficult due to the lack of a comprehensive management plan.

Population:
The limited livable land area of the islands, combined with an ever-increasing population size, present additional challenges for managers. Some villages are asking for compensation for their inability to build on their village wetlands, as well as for other conservation efforts such as monitoring and enforcement.

WORKING TOWARDS A NETWORK

The American Samoa Coral Reef Advisory Group (CRAG) is currently in the process of generating an MPA network strategy to better integrate the existing and planned MPAs throughout the territory. This strategy will include local, territorial, and federal MPA sites. CRAG is a collaboration of five different entities in the territory, all of which have some link to the coral reef environment: DMWR; the Department of Commerce, ASEPA, ASCC, and the National Park of American Samoa (CRAG 2006).

In 1999, CRAG organized a workshop to create a five-year plan for coral reef management in American Samoa. During that workshop, CRAG identified the need for an MPA network. CRAG was identified as the lead on this issue, but the MPA network was not funded at that time (Craig, et al. 1999).

In 2000, the U.S. Coral Reef Task Force (CRTF) adopted the Coral Reef National Action Plan that set the goal of establishing 20 percent of all U.S. coral reefs in no-take MPAs (CRTF 2000). Following this recommendation, former Governor Tauese Sunia directed CRAG to develop a plan (MPA Plan) for coral reef protection to reach the goal of protecting 20 percent of the territory's coral reefs as no-take MPAs (Sunia 2000). In 2002, CRAG sponsored an MPA workshop with the objective of producing an integrated plan for the identification of potential marine areas that would become part of the territory's network of MPAs. The workshop proceedings focused primarily on expanding the existing CFMP, which relies on the volunteer participation of villages.

CRAG identified the need for an MPA coordinator to finalize and implement the MPA Plan, and to work closely with other local, regional, and federal partners to assure that current and future MPA efforts in American Samoa are coordinated and utilize best management practices. In January 2004, CRAG hired an MPA

coordinator with funds from its NOAA State and Territory Coral Reef Management grants (FY2004, 2005, and 2006). The MPA coordinator, with assistance from the MPA working group, revised the workshop proceedings from the 2002 MPA workshop and produced several drafts of the MPA network strategy. CRAG is using the final year of funds to complete the MPA network strategy to further the coordination and integration of the existing territorial and federal MPA programs.

Because the National Park Service (National Park of American Samoa) and the National Marine Sanctuaries Program (Fagatele Bay National Marine Sanctuary) manage sites within the territory, their participation in the territorial MPA network is vital. These federal programs work collaboratively with CRAG and provide MPA support through partnerships and information sharing. These MPAs will be described in more detail in a future report, which will include federal MPAs and geospatial analysis of MPA coverage within coral reef ecosystems.

Fig. 1.8: Matu'u CFMP (Oram 2006)

NEXT STEPS/ RECOMMENDATIONS

The following recommendations are based on-site visits and discussions with MPA management staff, both territorial and federal, within the territory:

MPA Outreach:
The various territorial and federal MPA programs should work together to develop a toolkit that can be used for outreach with communities. The toolkit could be used as a means to work with communities in determining threats to resources and management actions. It could also serve as an institutional certification program for local staff that would help them in community outreach and participation. The toolkit should holistically and comprehensively address watershed management issues and utilize the existing efforts and expertise. It should include information on:

- fisheries biology and management,
- coastal ecology and the connection between land and sea (done in coordination with local ASCMP and ASEPA offices that have the expertise),
- various management options, including what actions are needed and their potential impacts, that the community can choose between; these options can include permanent no-take areas, seasonal closures, species take restrictions (particularly food fish species), best management practices for reducing sediment and nutrient loading (e.g., vegetating cleared areas or stream banks), etc., and
- community-based monitoring and assessment of managed areas (what, who, why, where, and how).

Development of the toolkit will take time and additional staff training to increase their familiarity with the information prior to presenting it to villagers. Staff trainings should target educators, enforcement officers, and other MPA management staff who work with the public. Additional trainings for MPA staff should be identified in the budget planning and include topics such as watershed management, basic MPA concepts, monitoring techniques, and MPA effectiveness. Finally, the effectiveness of the toolkit should be a measured so that changes can be made to improve its overall success.

MPA Effectiveness:
A monitoring program (with biological and social measures) for MPA management efforts should be developed and implemented to determine the effectiveness of the MPAs. Such monitoring would provide a means to evaluate the progress of reaching MPA goals and to identify gaps to improve MPA management. This information should be used to update and improve existing, or to develop new, management plans by further defining clear, measurable objectives. Additionally, the CFMP's existing community-based monitoring should be enhanced so that community members can better document the effects of their actions on fisheries populations. Such documentation has been shown to improve the acceptance of long-term closures because community members see first-hand the fisheries data before and after the temporary opening of a site.

Existing MPAs (community, territorial, and federal) should be incorporated into the on-going efforts to develop MPA networks. These sites should be reviewed or evaluated to determine their effectiveness in reaching the goals of protecting American Samoa's resources and way of life.

Agency Collaboration:
While DMWR is primarily responsible for managing American Samoa's living marine resources, its programs should be integrated with other MPA efforts and agency programs that impact marine resources. Agency staff collaborate on a variety of outreach activities, but these efforts should be expanded through a greater understanding of the relationship between upland threats and management actions. The next steps should include the development of a framework through which villages and agencies can develop integrated management plans to improve the effectiveness of

MPAs. This framework would establish a comprehensive approach to managing land and marine resources, provide a targeted and efficient use of limited funds, and improve the likelihood of successful management efforts.

Additionally, territorial and federal MPA programs should collaborate on reaching the goals and objectives of the MPA network strategy currently under development by CRAG. One such effort would be an assessment of the current effectiveness of the territorial and federal MPAs in supporting territorial goals. Although all of the MPA programs, both territorial and federal, lack sufficient human capacity and enforcement capabilities, collaboration and the sharing of information and resources could help to fill some of the gaps. The MPA network strategy will provide a framework for this cooperation.

Integrated Coastal Management Approach:
While American Samoa faces limited human and financial resources, it is important to effectively utilize the existing resources to their fullest capacity to achieve resource management goals. To enhance existing MPA effectiveness, an integrated coastal management approach should be applied. Such an approach would require that natural resource agencies work together to identify site specific threats and opportunities to address those threats within each agency's mandate and expertise. This approach could also help prioritize projects for funding and provide a focused effort where collaboration is feasible and appropriate. Any of these collaborative efforts should have clear and measurable objectives. As mentioned above, the MPA network strategy is expected to provide a framework for this integrated approach to MPA management and collaboration.

Table 1.4: National Classification System for American Samoa's 14 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Ofu Vaoto Marine Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Leone Pala SMA	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Nu'uuli Pala SMA	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Pago Pago Harbor SMA	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Alofau CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes
Amaua & Auto CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes
Aoa CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes
Aua CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes
Fagamalo CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes
Masausi CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes
Matu'u & Fagancanea CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes
Poloa CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes
Sa'ilele CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes
Vatia CFMP reserve	Sustainable Production	No Access	Conditional	Year-round	Ecosystem	Yes

SUCCESS STORY

Aoa, a village on Tutuila, adopted DMWR's Community-based Fisheries Management Program (CFMP) in December 2005. Aoa community members have become more optimistic about the MPA because of daily sightings of rays swimming inshore, which has also made fishermen wish that they could fish inside the MPA. Aoa fishermen have also witnessed the long-absent bluefin, trevally, unicornfish, and schools of mullets swimming inshore. CFMP staff continue to work with fishermen to encourage their commitment to the agreed upon time period of at least two years for the fishing closure.

Two months into the program, community members were excited about participating in the monitoring efforts coordinated by the CFMP staff. After the monitoring survey, the community members were eager to spread the word about what was seen. The community members' perception is that there are more fish, and the fish have increased greatly in size now, as compared to before the MPA was established. The community does not realize that these fish have always been in their village bay. The MPA may be providing a safe place for these fish to hide, thus giving the community the perception that the waters of Aoa have come alive. This perception has led to increased commitment and participation from the community members of Aoa, and their anticipation builds as the fish and resources replenish and multiply before their eyes.

The CFMP aims to assist communities to conserve and preserve their marine resources for the people of American Samoa today, and for years to come. To support this effort, a Participatory Learning and Action (PLA) workshop was held in June 2006 for the Aoa community. Participants from the neighbor CFMP village of Sa'ilele also participated in the workshop. During the two-day workshop, community members learned tools and techniques for: 1) identifying problems, causes and solutions, 2) ranking and prioritizing problems or threats, 3) conducting stakeholder analysis, and 4) developing a community action plan (CAP). Visionary maps were utilized to explore and develop a community conservation vision for their reef for the next 10-20 years. The CAP also included a list of activities that the community can implement and facilitate to improve their coral reef resources. The next phase of this project will be to develop and conduct projects that support the goals of the CAP. As a result of these efforts, it is hoped that villages or communities will form a cooperative that can broaden their ability to pursue grants and funds to support their management efforts (Sauafea-Leau 2006a).

CITATIONS

16 U.S.C 1431-United States Code. Title 16: Conservation, Chapter 32: Marine Sanctuaries, Section: 1431: Findings, purposes, and policies; establishment of system. United States Government.

American Samoa Administrative Code (ASAC) § 26.0220 F. 7. Title 26 Environmental Safety and Land Management, Chapter 02 Coastal Management, Section 26.0220 F. 7. Standards and criteria for review. Available online at http://www.asbar.org.

American Samoa Administrative Code (ASAC) § 26.0221. Title 26 Environmental Safety and Land Management, Chapter 02 Coastal Management, Section 26.0221 Special Management Areas. Available online at http://www.asbar.org.

American Samoa Administrative Code (ASAC) § 26.0222 F. 1. a & b. Title 26 Environmental Safety and Land Management, Chapter 02 Coastal Management,

Section 26.0222 F. 1. a & b Wetlands regulated activities. Available online at http://www.asbar.org.

American Samoa Code Annotated (ASCA) § 18.0214. Title 18 Parks and Recreations, Chapter 02 Department of Parks and Recreation, Section 18.0214 Establishment of Ofu Vaoto Marine Park. Available online at http://www.asbar.org.

American Samoa Code Annotated (ASCA) § 24.0304. Title 24 Natural Resources and Environment Ecosystem Protection and Development, Chapter 03 Department of Marine and Wildlife Resources, Section 24.0304 Powers and duties. Available online at http://www.asbar.org.

American Samoa Code Annotated (ASCA) § 24.05. Title 24 Natural Resources & Environment Ecosystem Protection & Development. Chapter 05 Coastal Management Program. Available online at http://www.asbar.org.

American Samoa Environmental Protection Agency (ASEPA). December 6, 1991. Public Health Directive: Contaminated Fish in Harbor.
———. 2005. Beach Advisory: Supporting efforts to clean up our shores. *Samoa News*, 2005.

Banner, A. H., and J. H. Bailey. 1970. The effect of urban population upon a coral reef system. *Hawaii Inst. Mar. Biol. Tech. Rep. 25*. Honolulu, Hawaii.

Brookins, K., R. Oram, M. Sabateur, S. Vaitautolu, and S. Mariner. 2005. Fisheries Projects for American Samoa, Project F-2-R-29, Fiscal Year 2006. Federal Aid in Sport.

Brown, D. Paul. May 5, 2006. Fig. 1.1. National Park of American Samoa.

Caperon, J., A., Catell, and G. Krasnick. 1971. Phytoplankton kinetics in subtropical estuary-eutrophication. *Limnol. Oceanogr.* 16:599-607.

Coutures, Emmanuel. 2003. *The Shoreline Fishery of American Samoa: Analysis of 1-yr data (April 02 – March 03) and Implementation of a New Sampling Protocol.* DMWR Biological Report Series, No 102. The Department of Marine and Wildlife Resources, Pago Pago, American Samoa.

Coral Reef Advisory Group (CRAG). 2006. About CRAG. http://doc.asg.as/crag/.

Craig, P., N. Daschbach, S. Wiegman, F. Curren, and J. Aicher. 1999. *Workshop Report and Development of 5-year Plan for Coral Reef Management in American Samoa (2000-2004) by the American Samoa Coral Reef Advisory Group.* Pago Pago, American Samoa.

Curry, T. and P. Anderson. 2006. Fig. 1.2. American Samoa Government Department of Commerce. Data provided by the American Samoa Department of Marine and Wildlife Resources.

Dahl, A. L., and A. E. Lamberts. 1977. Environmental Impact on a Samoan Coral Reef: A Resurvey of Mayor's 1917 Transect. *Pacific Science* 31(3).

Federal Register. April 29, 1986. 51 Fed. Reg. 15878.

Filiga, Vaitoelau. 2006. Personal Communication. American Samoa Government Department of Commerce Statistics Division.

Jacobs in association with MRAG Americas, Inc., National Institution of Water and Atmospheric Research, NZ, and the University of Newcastle, UK. 2004. *Economic Valuation of Coral Reefs and Adjacent Habitats in American Samoa.* Final Report for the American Samoa Department of Commerce.

Mata'u, Champion. February 24, 2006. Fig. 1.4. American Samoa Department of Marine and Wildlife Resources.

National Park Service (NPS). August 29, 2006. National Park of American Samoa. *nps.gov*. NPS. http://www.nps.gov/npsa/index.htm.

Oram, Risa. July 11, 2006. Fig. 1.8. American Samoa Government.

Peters, E. C. 1997. Diseases of Coral-Reef Organisms. In: C. Birkeland (ed.), *Life and Death of Coral Reefs.* p. 114. New York, NY: Chapman & Hall and International Thomson Publishing.

Riolo, Francesca. 2006. Personal Communication. American Samoa Department of Marine and Wildlife Resources and CRAG.

Sabater, Marlowe and Saolotoga Tofaeono. 2006. *Spatial Variation in Biomass, Abundance, and Species Composition of "Key Reef Species" in American Samoa.* American Samoa Department of Marine and Wildlife Resources. Funded by Sportfish Restoration Grant, U.S. Fish and Wildlife Service.

Sauafea-Leau, Fatima. 2006a. Personal Communication. NOAA Fisheries.
———. 2006b. Fig. 1.5. NOAA Fisheries.

Saucerman, S. 1995. *Assessing the Management Needs of a Coral Reef Fishery in Decline.* Presented at the Joint FFA/SPC Workshop on the Management of South Pacific Inshore Fisheries (Noumea, New Caledonia, 26 June – 7 July 1995).

Smith, S. V., K. E. Chave, and D. T. O. Kam. 1973. *Atlas of Kaneohe Bay: A reef ecosystem under stress.* UNIHI-SEAGRANT-TR-72-01. University of Hawaii Sea Grant Program.

Sunia, T. 2000. Letter from Governor Tauese Sunia to Lelei Peau (Chairperson of the American Samoa Governor's Coral Reef Advisory Group) regarding coral reef protection. August 2, 2000. American Samoa Government.

Tennet, M. September 8, 2006. Figs. 1.3 and 1.6. American Samoa Government.

United States Coral Reef Task Force (CRTF). 2000. *The National Action Plan to Conserve Coral Reefs.* March 2, 2000. Washington, D.C. Available online at http://coralreef.gov.

U.S. Fish and Wildlife Service (USFWS). n.d. Pacific Islands – Rose Atoll NWR. USFWS. http://www.fws.gov/pacificislands/wnwr/prosenwr.html.

Whaylen, L., and D. Fenner. 2005. *Report of 2005 American Samoa Coral Reef Monitoring Program (ASCRMP).* Prepared for the Department of Marine and Wildlife Resources and Coral Reef Advisory Group.

Chapter 2: Commonwealth of the Northern Mariana Islands Coral Reef MPA Summary

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INTRODUCTION

The Commonwealth of the Northern Mariana Islands (CNMI) is part of the 290 kilometer (km) long Mariana Islands Archipelago that encompasses the 14 islands of the CNMI, numerous offshore banks, and the U.S. Territory of Guam. The southernmost islands of the CNMI, Rota, Tinian, and Saipan, are volcanic in origin and nearly all covered with uplifted limestone derived from coral reef. These islands have the oldest and most developed reefs in the CNMI (predominantly located along the western/leeward sides), and are where the majority of the CNMI's residents live.

Fig. 2.1: The Mañagaha Marine Conservation Area, at the northern-most portion of the Saipan Lagoon, as seen from above (Kessler n.d.)

Saipan, the capitol of the CNMI and the largest of the Northern Mariana Islands, is where all but one of the CNMI's MPAs can be found. Saipan has a land area of 122 km^2 and is approximately 20 km long and 9 km wide. The island has the most diverse types of coral reefs and associated habitats in the CNMI. A fringing and barrier reef system protects the majority of the beaches along the western and coastal plains. The western side of the island is the most populated and coral reefs along these areas have been negatively affected by human activities, primarily land-based sources of pollution, extractive uses, and recreational activities.

Although the first MPAs in the CNMI were established in 1981, the first no-take area was not established until 1994. Efforts to develop a network or system of more restrictive MPAs in the CNMI first arose in 1985, when the Coastal Resources Management Office (CRMO) commissioned a study to investigate potential sites for marine parks. The goal of the study was to identify representative examples of the naturally, culturally, and recreationally important resources on Saipan, Tinian, and Rota, and to suggest the protection of these sites through a marine parks program. The objectives of this proposed program were conserving natural, cultural, and historical resources, research, promoting visitor use and safety, and providing outreach and educational opportunities. While the exact process for site selection is not clear, the study provides some insight into the criteria that were used, "Considerable effort was given to choosing locations that were accessible, close to shore, on public lands, easily developed, and in a relatively safe location in regards to wave action, currents and water depth. High priority for the underwater parks was finding a location where there was a well developed reef with good live coral coverage, [and] abundant fish and other marine life" (Pacific Basin Environmental Consultants 1985). Although no sites were established as a direct result of this study, and the marine parks program at CRMO never came to fruition, the study and the recommended sites likely influenced the future direction of MPA efforts in the CNMI. In fact, the study proposed the designation of three sites, one each on Saipan, Tinian, and Rota. The areas recommended for protection on Saipan and Rota eventually became MPAs. The Tinian site was proposed at least once, but it was never established.

The first no-take MPA in the CNMI was established on October 13, 1994 with the passing of Rota Local Law 9-2. The remaining no-take sites, three areas on Saipan, were established by law between 2000 and 2001. Multiple attempts were made in 1998, 2001, 2002, and 2004 to establish additional MPAs in Tinian and around the terrestrially protected Northern Islands, but the respective pieces of legislation failed to pass. Beginning in 1981, four multiple-use, single-species/family sanctuaries were established by Division of Fish and Wildlife (DFW) regulations to prohibit the harvest of sea cucumber species or the topshell *Trochus niloticus*. Two of those sanctuaries were later overlapped by no-take MPAs.

Management of the CNMI's MPAs has traditionally been an intra-agency effort spread over various sections within DFW, namely the Fisheries Research Section, the Enforcement Section, and the Planning Section.

Recently, however, there has been a move towards creating a single MPA program within DFW, not unlike the one proposed in the 1985 Marine Parks Management Plan. To date, there has been little active management of the MPAs, primarily due to the lack of dedicated funding for such a program. There have been a number of federally funded efforts to improve MPA management, including the 2005 development of a management plan for the Mañagaha Marine Conservation Area (MMCA) (State Wildlife Grant funds), the hiring of three marine enforcement officers (NOAA Coral Reef Initiative funds), and two years of funding for an MPA coordinator (NOAA Coral Reef Conservation Program funds). State Wildlife Grant funding is also supporting a contractor who is currently developing management plans for the Bird Island and Forbidden Island Sanctuaries.

Management authority for all of the MPA sites in the CNMI lies in DFW. Public Law 12-12, passed in 2000, gives DFW exclusive authority to manage marine conservation areas and calls for the establishment of a Marine Conservation Section within DFW. Although this section does not formally exist, management activities such as planning, enforcement, and monitoring are spread across existing DFW sections. Management responsibilities related to MPAs are growing, especially for highly used sites such as the MMCA, reinforcing the need for a formal MPA program within DFW and an overall MPA program coordinator.


Fig. 2.2: DFW Conservation Officers (Moretti n.d.)

Enforcement of the MPAs is the responsibility of DFW's Enforcement Section. The 12 armed conservation officers are tasked with enforcing the laws and regulations that fall under DFW's jurisdiction. The officers are responsible for protecting the natural and wildlife resources of the islands, including the marine environment, and fish, game, and endangered and threatened species. The enforcement officers have recently been cross-deputized as federal enforcement officers by the NOAA Office of Law Enforcement in order to enforce provisions of federal laws such as the Magnuson-Stevens Act. Three of DFW's enforcement officers are tasked exclusively with enforcing the regulations for the marine environment, with a focus on the MPAs. These officers currently receive federal funding to cover salaries, benefits, training, and equipment, but the local government (DFW) is expected to assume responsibility for funding these enforcement officers when federal funding is no longer available.

There are various monitoring efforts led by different government agencies that collect data in the CNMI's MPAs. Monitoring of the MPAs is primarily done by DFW's Fisheries Research Section. The Fisheries Research Section established a Marine Sanctuaries Program (MSP) in 1998, and has been surveying MPAs since 1999. The primary goal of the surveys is to monitor annual trends in reef fish abundance and diversity. Secondary goals include monitoring changes in benthic habitat composition, macroinvertebrate abundance, and habitat heterogeneity. The MSP does fish counts, counts invertebrates of commercial interest, maintains a fish species checklist, and conducts a basic benthic habitat characterization (coral, sand, rubble, etc.) at each of its monitoring sites.


Fig. 2.3: Members of the interagency MMT beginning a research dive (Moretti n.d.)

In addition to DFW's MSP, the Division of Environmental Quality (DEQ) and CRMO have a well-established Marine Monitoring Team (MMT) that regularly monitors a number of parameters at sites throughout the CNMI. The MMT documents how reef communities change over time in response to natural fluctuations, large disturbances (typhoons), and pollution. Monitoring activities are focused on characterization of nearshore marine habitats and documentation of their spatial distribution. The 1996-97 Laulau Bay Non-point Source Pollution Watershed Protection Program marked the initiation of the Marine Monitoring Program. Although this program was not specifically designed to monitor changes in MPAs, many of the monitoring sites happen to be located in MPAs and can provide insight into those sites as they change over time. In fact, the MMT monitors at least one site in each of the MPAs. The discussion under each MPA type provides more information about the types of MSP and/or MMT monitoring sites that are present in the MPAs.

There are two main components to the monitoring program, water quality surveys and biological surveys. The water quality surveys monitor salinity, temperature, nutrients, dissolved oxygen, turbidity, pH, *Enterococci*, and fecal coliform. Water quality is tested by DEQ staff on an eight-week rotational basis at sites that represent swimming, boating, or fishing areas used by the public, and weekly at sites on the western Saipan beaches. Continuous temperature recorders have been placed at Laulau Bay and Sasanhaya Bay in order to measure seasonal fluctuations in temperature. Additionally, four sediment traps have been placed in Laulau Bay, where terrigenous sediment input is of concern.

The MMT biological surveys measure benthic coverage, coral communities, macroinvertebrate abundance, fish abundance, coral recruitment, and biological diversity. For benthic coverage, 0.5 meter x 50 meter (m) video belt transects are used to estimate benthic cover. Coral communities are measured via the point quadrat method to assess coral population structure and relative abundance. All macroinvertebrates encountered within two meters of each side of the transect line are identified and counted. Fish surveys are completed along each of the 50 m transect lines and counts are made of all fish, to the family (or functional group) level, within 5 m of each side of the transect line. To measure coral recruitment, all corals less than 5 centimeters in 0.5 m x 10 m belt transects are identified to the genus level and counted. Biological diversity is measured at each site via a checklist list of all fish, corals, and other invertebrates and algae that have been identified.

Population dynamics are assessed at a few sites using four permanently placed one m^2 quadrats that allow for estimates of coral recruitment, death, growth, and survival rates. Permanent quadrats have been established at the Laulau Bay Sea Cucumber Sanctuary in Saipan, the Sasanhaya Bay Fish Reserve in Rota, and a few other non-MPA sites. In addition, the MMT conducts regular reef flat monitoring at Laulau Bay, Forbidden Island, Tank Beach, Bird Island, and Sasanhaya Bay (all within MPAs).

CNMI's MPA efforts have included the establishment of eight MPAs that contain coral reef resources and habitats. These sites are categorized into four types: marine conservation areas, marine sanctuaries, fish reserves, and focal resource sanctuaries.

MPA TYPES

Marine Conservation Areas

National Classification: No-Take, Natural Heritage and Cultural Heritage MPA

Enabling Legislation and Responsible Agency:

The Mañagaha Marine Conservation Area (MMCA) was established on August 8, 2000 with the passing of Public Law 12-12, the Mañagaha Marine Conservation Act. The initial bill to protect Mañagaha Island and its surrounding waters first surfaced in 1999, but it did not become law until late the following year. The law states that the Department of Lands and Natural Resources (DLNR) "shall have the exclusive authority to manage marine conservation areas" (CNMI Public Law 12-12 §5). It is unclear whether or not this authority applies to similar MPAs that have titles other than "marine conservation area," but DFW has interpreted it to apply to other types of MPAs, regardless of name. Public Law 2-51 gives DFW the authority and responsibility for the protection of fish, game, and endangered and threatened species. Public Law 12-12 further outlines DFW's specific management responsibilities and gives DFW authority to prohibit activities that would negatively affect the conservation area.

On August 7, 2006, the CNMI attorney general issued the Attorney General Legal Opinion No. 06-11, stating that the Department of Public Lands has "the exclusive authority to manage and dispose of public lands in the Commonwealth, which necessarily includes Mañagaha Island" (Office of the Attorney General 2006). At the time of writing, the extent of DFW's authority over the island is unclear. However, DFW clearly maintains authority over the marine portion of the conservation area.

Goals, Objectives, Policies, and Protections:

The MMCA includes 1.952 square miles (mi^2) of marine and terrestrial habitat (1.933 mi^2 marine). The legislation denotes the boundaries of the conservation area as four Universal Transverse Mercator (UTM)-based coordinates, representing the four corners of the box that is the conservation area. The boundaries were designated with consideration of existing markers and navigational areas (the shipping channel), historical World War II shipwrecks (eight submerged historic

Table 2.1: Priority Coral Reef Resources and Habitats Found in the Mañagaha Marine Conservation Area

Marine Conservation Area	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Mañagaha	x						x	x	x	x	x	x

properties lie within the conservation area boundaries), and the inclusion of at least some of the reef habitat lying outside of the lagoon.

The MMCA was established to protect the historical, cultural, and natural resources found within its boundaries. According to Public Law 12-12, the purpose of the MMCA is "to protect and preserve, by strict regulatory enforcement, the land and water resources, flora, fauna, and marine life that are found in the conservation area for the enjoyment of future generations of commonwealth residents and visitors"

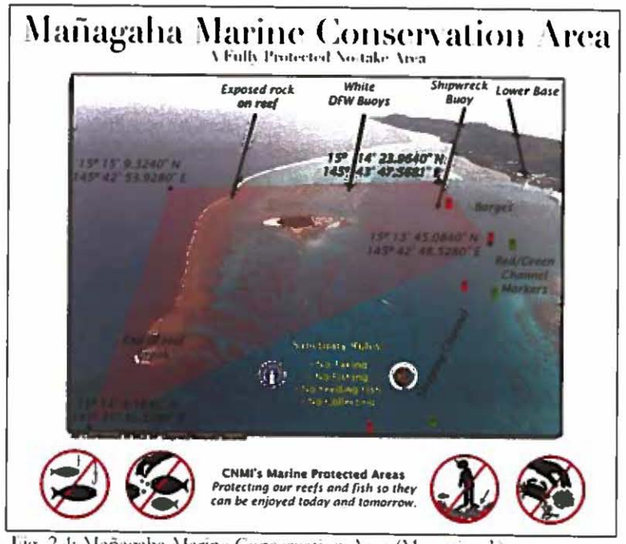

Fig. 2.4: Mañagaha Marine Conservation Area (Moretti n.d.)

(Public Law 12-12 §4(b)). The area is designated as a recreational and educational area that aims to provide "safe habitats for fish and other marine life to exist and propagate for the continued use and enjoyment for the people of the commonwealth and its visitors" (Public Law 12-12 §2). This dual purpose, natural resource protection and protection for recreation, poses significant management challenges associated with the impacts of visitor use.

Public Law 12-12 prohibits the harvesting or catching of fish or other marine life or natural resources, except as approved by regulation for scientific research, cultural and traditional practices, or educational studies. No motorized or non-motorized watercraft, whether floating or submersible, or other means of aquatic transport are permitted within the conservation area. Again, the regulations allow for exceptions for enforcement, scientific, recreational and educational purposes, or for the transport of persons to and from the isle of Mañagaha. No swimming, diving, snorkeling, or other human activity is permitted within the conservation area, except as provided by regulation. DFW has the authority to further prohibit by citation, order, rule or regulation, any activity that in any way would cause a significantly negative or long-lasting impact on the conservation area. Public Law 12-12 sets the fines for violations of this act between $500 and $10,000, and it enables seizure of items pursuant to enforcement of the act. Violators of the act or any rule, regulation, or order related to the act are subject to an administrative proceeding as provided under the Administrative Procedure Act (1 CMC § 9101 et seq.).

Public Law 12-12 gave DFW a period of 180 days to promulgate regulations for the conservation area. Emergency regulations were passed in September 2001 that simply added the MMCA to the existing DFW regulations on marine reserves (DFW Non-Commercial Fishing and Hunting Regulations, Part 5, §120). The regulations were adopted on an emergency basis in order to address inconsistencies between the regulations' prohibition on commercial activities within marine reserves and the Agreement for Special Recreational Concession between the CNMI and Tasi Tours and Transportation, Inc. that allowed them to operate a commercial concession on Mañagaha Island. Under the emergency regulations, commercial activities on Mañagaha Island are exempt from the regulatory prohibition on commercial activities in marine reserves. The regulations prohibit the take of any marine animal or plant, using food to attract fish, anchoring vessels, removing or damaging artifacts, natural objects, or structures, removing substrate, and littering and dumping. Although the law and existing regulations prohibit a number of activities, the only rules that are currently enforced are the no-take provisions. Rules on swimming, anchoring, vessel use, feeding fish, etc. are not enforced. More comprehensive regulations were drafted in the summer of 2006 in order to aid and clarify enforcement efforts. This draft set of comprehensive regulations is expected to go through a public review process by the end of 2006 as a part of the adoption process.

The small 0.019 mi² (five hectares) island, which is part of the MMCA, has an additional level of protection under the Commonwealth Constitution. The constitution mandates that "the island of Mañagaha shall be maintained as an uninhabited place and used only for cultural and recreational purposes" (Commonwealth Constitution Article XIV, Section 2).

Management Activities:

A management plan for the MMCA was completed in April 2005, and it is the first (and to date, the only) management plan to be written for an MPA in the CNMI. Development of the plan was overseen by the DFW natural resources planner. It should be noted, however, that a management plan for the Mañagaha Island Marine Park was written for CRMO by a consultant in 1985, before any such park existed. The plan was essentially a proposal for the designation of a marine park surrounding Mañagaha Island. This 1985 plan was never implemented.

The following are the management goals articulated in the 2005 Management Plan for the Mañagaha Marine Conservation Area:

- **Goal 1:** Develop and promulgate regulations, permit fees, and visitor use guidelines
- **Goal 2:** Dedicate staff and material resources to implement the Mañagaha management plan and to enforce associated regulations.
- **Goal 3:** Survey and monitor natural, cultural, and historical resources, and visitor uses to assess their status through time.
- **Goal 4:** Inform and educate visitors about the conservation area resources, potential impacts of their uses, and the regulations and guidelines for the conservation area.
- **Goal 5:** Annually evaluate the effectiveness of the conservation area management and regulations.


Fig. 2.5: Visitor use impacts are one of the primary management concerns for the MMCA (Moretti n.d.)

The management plan details measurable, time-bound objectives for each goal, as well as short and long-term strategies for accomplishing these goals. A 15-year budget of $1.641 million is estimated for the full implementation of the management plan, considering existing DFW budgets. As part of the budget, the management plan outlines a schedule, staffing, materials, and equipment needed, and specific tasks that will be accomplished.

CNMI's MPA systems specialist working for DFW coordinates many of the management activities for the MMCA, with the exception of the Fisheries Sanctuary Monitoring Program. Recent management activities have involved drafting regulations and legislation, installation of signage, outreach efforts, and efforts to secure permanent sources of funding for the implementation of the management plan. Since there is currently no budget for the MPA, implementation of management activities has been primarily restricted to activities that the MPA systems specialist can accomplish without funding. It is becoming evident that, as DFW assumes true responsibility for the management of the MMCA and other MPA sites, an MPA program manager, and eventually site managers, will be needed.

Research and Monitoring:
DFW's MSP regularly carries out several monitoring activities in the MMCA. The MSP does fish counts, counts invertebrates of commercial interest, maintains a fish species checklist, and conducts a basic benthic habitat characterization (coral, sand, rubble, etc.) at each of its monitoring sites within the conservation area. Biological monitoring is also conducted by the interagency MMT at three monitoring sites within the MMCA. DEQ samples water at 11 sites equally spaced around Mañagaha Island on a weekly basis. See the "Background" section for details on the Marine Monitoring Program.

Enforcement:
Enforcement activities fall under the jurisdiction of the head of the Enforcement Section. The MMCA is patrolled periodically by the DFW conservation officers, primarily via boat patrol since the conservation area is difficult to view from land. The MMCA's location in the Saipan Lagoon makes it relatively easy to patrol by boat, both during the day and at night.

Stakeholder Involvement and Public Participation:

A single public hearing on the MMCA was held on December 7, 1999, eight months prior to the establishment of the site. In general, the public was supportive of the idea of establishing an MPA around Mañagaha Island. According to a December 9, 1999 news article in the Saipan Tribune that documented the hearing, "Legislation restricting activities on Mañagaha Island and surrounding waters drew wide support at a public hearing held Tuesday night as residents and government agencies underscored the need to protect fish species and marine resources found in the area" (Saladores 1999). There is no information available on individual comments received, or opinions expressed, during the hearing.

Currently, there is little to no public involvement in management decisions and activities related to the MMCA. However, DFW has expressed a desire to increase involvement of local communities. It is expected that at least one (required) public hearing on

the proposed regulations for the MMCA will be held during 2006 in order to give the public an opportunity to comment on the proposed regulations.

Marine Sanctuaries

The two sanctuaries benefit from significantly sized adjacent terrestrial conservation areas that were established through separate processes. The Bird Island Sanctuary is a 0.568 mi² protected area which consists of 0.563 mi² of marine habitat and a small, 0.003 mi² (1.3 hectare) island. The Forbidden Island Sanctuary is a 0.979 mi² protected area which consists of 0.967 mi² of marine habitat and a small, 0.012 mi² (3 hectare) island.

National Classification: No-Take, Natural Heritage MPAs

Enabling Legislation and Responsible Agency:

The two sanctuaries were legally established on April 20, 2001 through CNMI Public Law 12-46. At both locations, Public Law 12-46 protects waters from the low tide line to 1000 feet seaward. At the Bird Island site, it also includes protection for land that is 500 feet up the face of the cliff line, provided that it does not conflict with private property. As mentioned previously, Public Law 12-12 gives exclusive management authority of marine conservation areas to DFW. Public Law 12-46 reiterates this authority and places management and monitoring responsibilities under DFW. However, Public Law 12-46 also clearly states that DFW shall work with Public Lands, CRMO, and the Marianas Visitors Authority to collaborate on management activities. Under Public Law 12-46, DFW has the authority to charge a "nominal entry fee for the purposes of maintenance of these sanctuaries and for enforcement, research and improvement of these sanctuaries" (Public Law 12-46 §4).

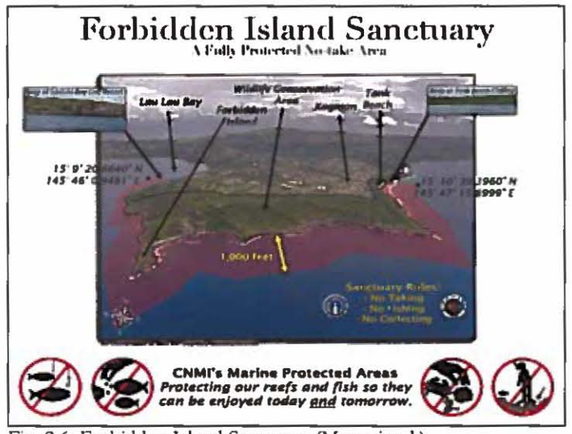

Fig. 2.6: Forbidden Island Sanctuary (Moretti n.d.)

Goals, Objectives, Policies, and Protections:

The legislative purpose of the sanctuaries is the conservation of wildlife and marine life, and they were designated to serve as "natural laboratories for continued propagation of wildlife and marine species, which gradually and naturally can re-populate depopulated areas of [the] lagoon and island" (Public Law 12-46 §1).

The enabling legislation prohibits the "destruction, harassment and/or removal of plants, wildlife including birds, turtles, fish and marine species of any kind, fishing in any form, operation of jet skis, walking on exposed sections of the reef, harvesting or removal of fish, shellfish or marine life in any form" within the confines of the sanctuaries (Public Law 12-46 §5). A fine of $500 and/or a prison sentence of not more than one year shall be imposed on any individual who engages in any of the prohibited activities within the sanctuaries.

Table 2.2: Priority Coral Reef Resources and Habitats Found in the Two Marine Sanctuaries

Marine Sanctuaries	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Bird Island	x						x	x	x	x	x	x
Forbidden Island	x						x	x	x	x	x	x

Fig. 2.7: Bird Island Sanctuary (Moretti n.d.)

Management Activities:

Although no formal management plans currently exist for these two sanctuaries, a contract was awarded in mid-2006 to a private consultant to develop plans for the sites. DFW's Natural Resource Planning Section is leading this effort in conjunction with the development of plans for the adjacent terrestrial protected areas.

Research and Monitoring:
DFW's MSP regularly carries out monitoring activities in the Bird Island and Forbidden Island Marine Sanctuaries. The MSP does fish counts, counts invertebrates of commercial interest, maintains a fish species checklist, and conducts a basic benthic habitat characterization (coral, sand, rubble, etc.) at each of its monitoring sites within the sanctuaries. Biological and reef flat monitoring are also conducted by the interagency MMT at three monitoring sites within the sanctuaries (Bird Island, Forbidden Island, and Tank Beach). DEQ samples water at three sites (Bird Island, Forbidden Island, and Tank Beach) on an eight-week rotational basis. See the "Introduction" section for details on the Marine Monitoring Program.

Enforcement:
Enforcement activities fall under the jurisdiction of the head of the Enforcement Section. The sanctuaries are patrolled periodically by DFW conservation officers, primarily via land patrol. The sanctuaries' location on the east side of Saipan means that boat patrols are often difficult, though not impossible. Much of the Bird Island and Forbidden Island Sanctuaries is visible from a variety of vantage points on land, although these vantage points are not always easily accessible. Nighttime patrolling of these sanctuaries is logistically challenging.

Stakeholder Involvement and Public Participation:

There is no record of any stakeholder involvement or public participation in the establishment of these two sites.

Although there have not been opportunities for direct public involvement in developing the management plans, DFW intends to receive public input during the development and promulgation of regulations for these sites.

Fish Reserves

The 0.326 mi² reserve is located on the island of Rota.

National Classification: No-Take, Natural Heritage and Cultural Heritage MPA

Enabling Legislation and Responsible Agency:

The Sasanhaya Bay Fish Reserve (SBFR) was established on October 13, 1994 with the passing of Rota Local Law 9-2. Six years later, the Rota local law was reinforced with the passing of the DFW Non-Commercial Fishing and Hunting Regulations (Part 5, §120), which became effective on August 18, 2000. Enforcement and management of this law is the responsibility of the secretary of DLNR, in consultation with the director of DFW and Rota's resident director of DLNR. DFW regulations are enforced by DFW conservation officers pursuant to the provisions in Public Law 2-51, the legislation that originally established DFW. Additionally, Public Law 12-12, passed in 2000, states that DLNR "shall have the exclusive authority to manage marine conservation areas" (Public Law 12-12 §5).

Goals, Objectives, Policies, and Protections:

According to Rota Local Law 9-2, the SBFR was established to "preserve the natural beauty, pristine marine environment and the historical wreckage in the Sasanhaya Bay of Rota" (Rota Local Law 9-2 §1). The protected area was found to be a valuable tourist attraction and it was determined that its preservation would be a boost to the tourist industry. In addition to prohibiting any activities that are exploitive or destructive to marine life, the reserve specifically prohibits killing or removing, or attempting to remove, any marine animal, including but not limited to any fishes, coral (live or dead), lobster, shellfish, clams, octopus, and shells. Any activities that are exploitive or

destructive to the World War II shipwrecks are also strictly prohibited.

Management Activities:

There is no management plan for the SBFR. No individual at the DLNR office on Rota is tasked with management of the SBFR.

In 1996, via requests from the CNMI governor and the mayor of Rota, the director of the CNMI Emergency Management Office asked the U.S. Navy to detonate the live depth charges on a World War II sub chaser wreck at the popular coral gardens dive site in the SBFR. It was felt by some that the charges posed a hazard to recreational divers and fishermen, although there were protests by some members of the general community and the dive community. The force of the detonation caused significant damage to the SBFR, the oldest of the CNMI's MPAs. The blast killed numerous fish, decimated coral, and killed an endangered hawksbill turtle. In addition, considerable secondary damage was caused by the blast's extensive sediment plume, which blanketed a large area in and around the coral gardens site. Two typhoons subsequently caused further damage, and expanded the impacted area to approximately 29,000 m^2. Estimates based on a value of $2,833/$m^2$ resulted in a total estimated economic impact of $82 million.

Research and Monitoring:
DFW's MSP regularly carries out monitoring activities in the SBFR. The MSP does fish counts, counts invertebrates of commercial interest, maintains a fish species checklist, and conducts a basic benthic habitat characterization (coral, sand, rubble, etc.) within the SBFR. Biological and reef flat monitoring are also conducted by the interagency MMT at a monitoring site within the reserve. DEQ regularly monitors beach water quality in the reserve. See the "Introduction" section for details on the Marine Monitoring Program.

Education and Outreach:
The 2006-2008 NOAA coral reef management fellow is

Fig. 2.8: Sasanhaya Bay Fish Reserve, Rota (Moretti n.d.)

working out of the DEQ office on Rota and has begun some small projects aimed at increasing public awareness of the SBFR and the benefits it provides. There are also plans to get Rota High School biology students involved with reserve activities.

Enforcement:
Enforcement activities fall under the jurisdiction of Rota's DLNR. The SBFR is monitored by the Rota DFW conservation officers, primarily via land patrol. There are six conservation officers on Rota tasked with the enforcement of all terrestrial and marine fish and wildlife laws and regulations, including the SSBFR. These officers report to the resident director of DLNR on Rota, who reports to the mayor of Rota. The enforcement officers have one boat available for patrol, but there is purportedly a perpetual shortage of fuel available for the vessel. The reserve's location in the relatively calm waters of the Sasanhaya Bay means that the reserve is highly accessible, either by land or by boat. Much, if not all, of the reserve is visible from a variety of vantage points on land. The reserve also contains a popular dive site so there are often a number of boats in the area that can report violations. Dive operators stated that they used to report violations to DFW, but they no longer bother to report them because of a lack of response.

Table 2.3: Priority Coral Reef Resources and Habitats Found in the Sasanhaya Bay Fish Reserve

Fish Reserve	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Sasanhaya Bay	x						x	x	x	x		

Stakeholder Involvement and Public Participation:

There is no record of any stakeholder involvement or public participation in the establishment of this site.

In 2006, DLNR undertook a number of community involvement projects aimed at increasing public awareness of the MPA and increasing public involvement in management activities. These activities included holding a fishermen's forum, conducting social science survey research, developing and distributing outreach materials, community monitoring of reef flats, and leading a week-long eco-camp with an MPA module.

Focal Resource Sanctuaries

The four focal resource sanctuaries provide protections for either the topshell *Trochus (Trochus) niloticus* (known locally as "trochus") or sea cucumbers (including families *holothuridae, synaptidae,* and *stichopodidae*). Two of the four sanctuaries, Bird Island Sea Cucumber Sanctuary and Tank Beach Trochus Sanctuary, are overlapped entirely by no-take MPAs (Bird Island Sanctuary and the Forbidden Island Sanctuary). The Laulau Bay and Bird Island Sea Cucumber Sanctuaries include 0.759 mi^2 and 0.309 mi^2 marine of marine habitat, respectively. The Bird Island Sea Cucumber Sanctuary also includes a small terrestrial habitat so its total area is 0.314 mi^2. The 0.429 mi^2 Lighthouse Reef and 0.066 mi^2 Tank Beach Trochus Sanctuaries include only marine habitat.

National Classification: Uniform Multiple-Use, Sustainable Production MPAs

Enabling Legislation and Responsible Agency:

The Laulau Bay Sea Cucumber Sanctuary and Bird Island Sea Cucumber Sanctuary were established by the DFW Non-Commercial Fishing and Hunting Regulations, Part 5, §60.2 on August 18, 2000. The sanctuaries encompass the waters from the mean high tide line to the 40-foot depth contour. DFW is the responsible agency, with the authority to promulgate and enforce fish and wildlife regulations as allowed under Public Law 2-51.

The Lighthouse Reef Trochus Sanctuary and Tank Beach Trochus Sanctuary were established by the DFW Non-Commercial Fishing and Hunting Regulations, Part 5, §50.2 in 1981. The Lighthouse Reef Trochus Sanctuary extends from the inshore edge of the reef to the 40-foot depth contour. The Tank Beach Trochus Sanctuary extends from the mean high tide line to the 40-foot depth contour. DFW is the responsible agency, with the authority to promulgate and enforce fish and wildlife regulations as allowed under Public Law 2-51.

Goals, Objectives, Policies, and Protections:

Collection of sea cucumber and trochus is currently prohibited by law due to a sea cucumber moratorium, and the lack of an open harvest season for trochus. However, the reserves were established in anticipation of possible open seasons in the future.

Sea Cucumber Sanctuaries:
In 1995, a fishery for sea cucumbers was started on the island of Rota that targeted *Actinopyga mauritiana,* with incidental captures of the black teatfish, *Holothuria whitmaei.* In 1996, after depleting much of the resource on Rota, the fishery moved to Saipan (Trianni 2002c). As a condition on the original fishing permits, harvesting was not allowed in Laulau Bay or around

Table 2.4: Priority Coral Reef Resources and Habitats Found in the Four Focal Resource Sanctuaries

Focal Resource Sanctuaries	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Bird Island Sea Cucumber *	x						x	x	x	x		
Laulau Bay Sea Cucumber	x						x	x	x	x		
Lighthouse Reef Trochus	x						x	x	x	x		
Tank Beach Trochus *	x						x	x	x	x		

*These sites are entirely overlapped by Bird Island and Forbidden Island Sanctuaries.

Fig. 2.9: Lau Lau Bay Sea Cucumber Sanctuary (Moretti n.d.)

Bird Island. At that time, these sites were not yet formally established as MPAs. After the fishery was closed in 1997 due to declining catch, DFW conducted a post-harvest study on Saipan and found that 80-100 percent of the population had been harvested there (Trianni 2002a). DFW also conducted a pre-harvest study on Tinian because the fishery had expressed intentions to move to that island next. The results of these studies demonstrated a near total depletion of sea cucumber at the harvested islands. In response, a CNMI-wide moratorium on the harvest of sea cucumber (and seaweed and sea grass) was put into effect with the passing of Public Law 11-63 on February 18, 1999. The moratorium is effective for a period of at least ten years and is set to expire in early 2009.

The goals of the sea cucumber sanctuaries are to minimize the impacts of the (currently inactive) sea cucumber fishery, and to ensure a sustainable harvest of sea cucumber if and when the fishery is reopened. These goals are not explicitly stated in the regulations that created the reserves.

Trochus Sanctuaries:
The topshell "trochus", *Tectus (Tectus) niloticus* (synonymous with *Trochus niloticus*), was introduced to the Mariana Islands in March 1938, when 2,974 individuals were planted in Saipan. According to historical records, peak harvest was in 1956. From 1947-1976, trochus harvest was restricted to a 14-day period between May and July. From 1976 to 1981, harvest was unrestricted. In 1981, Public Law 2-51 established DFW, and the first set of DFW regulations was adopted. The regulations included the two trochus sanctuaries, making them the first formally established MPAs in the CNMI. The DFW regulations also imposed size restrictions and a CNMI-wide moratorium on the harvest of *Trochus niloticus*, and gave the DLNR secretary the authority to declare open seasons at any time after consultation with the director of DFW. Since 1981, an open season has been declared only once, in 1996, for a period of three months (Trianni 2002b). The declaration of an open season does not affect the restrictions on harvest in the trochus sanctuaries.

The goals of the trochus sanctuaries are to "ensure continuous high levels of productivity of trochus" (DFW Non-Commercial Fishing and Hunting Regulations, Part 5, §60.2). It is prohibited to take trochus from the trochus sanctuaries at any time, even during open seasons.

Fig. 2.10: Lighthouse Reef Trochus Sanctuary (Moretti n.d.)

Management Activities:

There are little to no management activities related to the sea cucumber or trochus sanctuaries, except for the continued enforcement of the CNMI-wide prohibition on the harvest of these resources.

Research and Monitoring:
The interagency MMT conducts biological monitoring, water quality monitoring, and reef flat monitoring (including counts of macroinvertebrates) at two monitoring sites within the Laulau Bay Sea Cucumber Sanctuary. The MMT also regularly surveys two sites at Bird Island and Tank Beach (for more details, see the "Research and Monitoring" section for Bird Island Sanctuary and Forbidden Island Sanctuary). The CRMO/DEQ Lagoon Monitoring Project also collects benthic habitat data at the Lighthouse Reef Trochus Sanctuary.

Enforcement:
Enforcement activities fall under the jurisdiction of the head of the Enforcement Section. Because there is a moratorium on the harvest of trochus and sea cucumber, the sanctuaries do not have any additional level of protection over other CNMI waters. Therefore, the sanctuaries are not specifically patrolled. Conservation officers have periodically cited individuals for illegal collection of trochus.

Stakeholder Involvement and Public Participation:

There is no record of any stakeholder involvement or public participation in the establishment of these sites. However, the 1981 adoption of the DFW regulations and the 2000 adoption of the amendments to the DFW regulations required a 30-day public notice and public comment period. No public comments were received related to these sanctuaries.

CHALLENGES TO MPA EFFECTIVENESS

MPAs in the CNMI face many of the same challenges to effectiveness that other MPA sites around the world face, including funding issues, lack of capacity, lack of community support, and enforcement issues. The current economic crisis that the CNMI is facing contributes to these challenges, making it difficult to garner the necessary political and financial support for an effective MPA program. DFW, along with other resource management agencies, has made some significant strides in recent years by developing management plans and monitoring programs. However, these efforts have existed outside of a dedicated management framework for MPAs. Without funding and staff dedicated to an MPA program, much of what needs to get done will be difficult to accomplish. There is currently only one person working exclusively on MPA issues, and that person is on a temporary (two-year), federally funded contract.

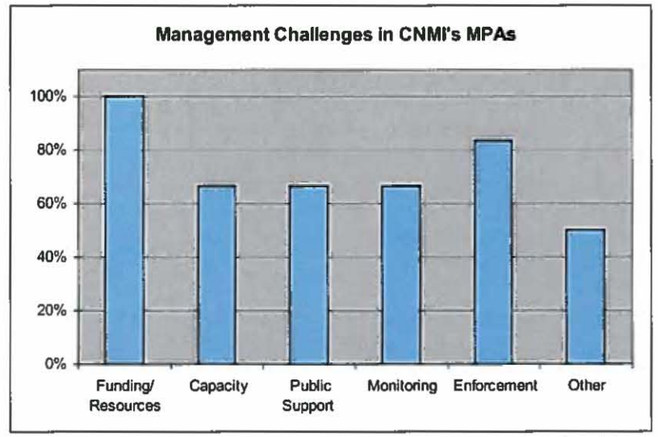

Fig. 2.11: Percent of MPAs (out of 6 total responses) that identified each issue as a challenge to effective MPA management. Bird Island Sea Cucumber and Tank Beach Trochus Sanctuaries were not included because they are entirely overlapped by other MPAs (Bird Island and Forbidden Island Sanctuaries). Examples of "other" challenges include demarcation of boundaries, compliance, need for on-site staff, interagency cooperation, and identification of human carrying capacity.

The management plan for the MMCA provides a detailed budget (including human resources) for the site, which DFW has been using as a starting point to lobby for funds for an MPA program. Legislation has been written, and is expected to be introduced during 2006, that will provide a budget in the range of $200,000 annually for an MPA program within DFW. This money is to come from charging tourists fees to enter the MMCA. Increased funding would address many of the existing gaps by funding an MPA program coordinator, 24-hour enforcement officers/rangers on Mañagaha Island, and a community outreach and education coordinator. This funding would also support any projects that these staff would implement, including assisting, coordinating, and improving on existing monitoring efforts. Other operating costs, such as equipment and fuel, would also be covered by this budget.

The CNMI's capacity to implement and manage an MPA program of this scale is somewhat limited. As is the case in other U.S. territories, it is often difficult to find local residents who are qualified and willing to work in the positions that need to be filled. Though the situation has been improving, the effectiveness of current MPA efforts has been negatively affected by a lack of cooperation between natural resource management agencies with similar and overlapping authorities. In addition, socio-political arrangements that are prevalent in many small-island societies create challenges to effective leadership and enforcement.

Although local communities have expressed some levels of support for the concept of protected areas, the CNMI has not sufficiently engaged with communities to build support for an MPA program. In a place where capacity is limited, engaging the community can be a great source of support, volunteerism, and motivation for MPA efforts. In general, one of largest problems facing the CNMI is the public's lack of understanding and awareness of issues surrounding MPAs. It will be difficult to generate support for MPAs without a basic level of awareness of the need for MPAs and the benefits they provide.

An effective enforcement regime is another one of the CNMI's biggest challenges. Current enforcement efforts lack the political support, motivation, and

organization needed to be truly effective. It should be noted, however, that the capacity for effective enforcement exists.

WORKING TOWARDS A NETWORK

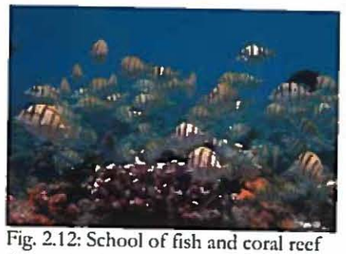
Fig. 2.12: School of fish and coral reef (Moretti n.d.)

The CNMI has already taken some of the first steps towards creating a network of MPAs. The creation of an MPA program plan (to be completed by early 2007), the creation of site management plans (three of four no-take MPAs will have plans by 2007), and efforts towards securing a permanent source of funding for MPAs are critical to the development of an effective network of sites. The consensus among agency officials is that it is best to work to improve the effectiveness of existing sites before attempting to designate new sites. If the CNMI lacks the capacity to effectively manage its existing sites, there is no point in adding new sites to an ineffective system.

While noting the point above, there have been efforts to add a few sites to the current list of MPAs in the CNMI. Of the three significantly inhabited islands of the CNMI, Tinian is the only one without an MPA. Tinian has made at least two attempts in recent years to establish an MPA in Barcinas Bay, but the attempts have failed due to a lack of political support. The CNMI Fisheries Act, which has been introduced multiple times (most recently in 2003), had language in it that would have protected waters around four of the terrestrially protected Northern Islands. Three of the islands were the island chain's northernmost, while one was more centrally located. The act failed because of controversy surrounding the ownership of submerged lands, which has since been resolved. Interest in re-introducing the Fisheries Act and an act to protect Tinian's Barcinas Bay has resurfaced recently.

If Barcinas Bay and the marine waters around the four Northern Islands were protected, they could contribute to a system of MPAs. Including these potential MPAs with current and proposed protections in Saipan, Tinian, and Rota, and Guam's system of MPAs, would constitute a geographically representative system of MPAs in the Mariana Islands. The creation of such a system, combined with biological representativeness, is a goal the CNMI MPA program may choose to strive towards in the future.

NEXT STEPS/ RECOMMENDATIONS

As the CNMI works towards establishing an MPA program, there are two main priorities for the next year. First, a source of funding for the program needs to be secured. Secondly, DFW needs to complete the MPA program plan in order to strategically guide the program through the next three to five years. Support of MPAs has been building up over the last few years, and it is important that this momentum be built upon.

In future years, two related areas that will need attention are enforcement and engagement of the local communities. There is hope that money brought into the Enforcement Section through a recent Memorandum of Understanding with the NOAA Office of Law Enforcement, as well as separate funding and management by the MPA program, will aid in the development of an effective enforcement and outreach regime. Current enforcement efforts are plagued by a complicated and colorful past that, by some accounts, included somewhat selective enforcement of certain rules and regulations. This history, combined with a very heavy handed, top-down approach, has led to a loss of trust and confidence in enforcement officers by the local community. Enforcement officers, along with other government representatives and non-governmental organizations (NGOs), are going to be important players in re-engaging local communities. Working with the extremely diverse communities present in the CNMI to build support for the islands' MPAs will be the key to increasing compliance and having effective enforcement in the future. Educating the public will likely require a full-time education and outreach coordinator. This person will be tasked with the development and implementation a large-scale public outreach campaign, with a goal of bringing the issue of MPAs to the public's attention.


Fig. 2.13: Fisherman (Moretti n.d.)

One final recommendation is to engage and train high school students through a natural resource management vocational education program. Many of the students who leave the CNMI to attend college do not return; many of those who stay end up working entire careers at government agencies. The government employs a large percentage of CNMI locals, and there is competition for these lucrative government jobs. Establishing a vocational education program for high school students is one way to slowly build capacity at the agencies, where it is very much needed. By providing students with the skills and background they need to work with natural resource managers, the CNMI can create the skilled labor force that is currently so hard to find.

Table 2.5: National Classification System for CNMI's Eight MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Mañagaha Marine Conservation Area	Natural & Cultural Heritage	No-Take	Permanent	Year-round	Ecosystem	Yes
Bird Island Sanctuary	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	In development
Forbidden Island Sanctuary	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	In development
Sasanhaya Bay Fish Reserve	Natural & Cultural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Bird Island Sea Cucumber Sanctuary*	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	N/A
Laulau Bay Sea Cucumber Sanctuary	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Lighthouse Reef Trochus Sanctuary	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Tank Beach Trochus Sanctuary*	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	N/A

* These sites are entirely overlapped by Bird Island and Forbidden Island Sanctuaries.

SUCCESS STORY

The no-take Mañagaha Marine Conservation Area (MMCA) is the most commonly recognized MPA in the CNMI because it is a very popular tourist attraction, it lies in the protected Saipan Lagoon, and it is an important part of the cultural history of the CNMI's Carolinian inhabitants. Although it was established in August 2000, effective enforcement of Public Law 12-12 required additional enforcement staff and equipment. Starting in September 2002, the NOAA Coral Reef Conservation Program provided funds for enforcement staff and equipment. The federal funding was used to hire three local agency marine conservation officers to enforce the MPA laws on Saipan, and they began to hand out citations for violations in 2003. At the same time, education efforts were initiated, including ads in local magazines, publication of brochures, school presentations, and fishermen's forums to discuss fishery issues, such as MPAs.

In contrast, the no-take Sasanhaya Bay Fish Reserve (SBFR) in Rota was established in 1994, and additional enforcement staff were never made available for the enforcement of the site. Outreach efforts were also limited. Unpublished research from DFW's Fisheries Research Section suggests a vast difference in fishery recovery rates between the two MPAs. Researchers began seeing positive trends in the size of certain fish species in the MMCA, while such trends have not been observed in the SBFR. Although it is difficult to account for all of the variables that may have caused this disparity, it is commonly held that the difference in enforcement presence, enforcement actions, and education efforts account for much of the difference between the recovery rates at the two sites.

CITATIONS

1 CMC § 9101 et seq. Administrative Procedure Act.

CNMI Public Law 2-51. Fish, Game, and Endangered Species Act of 1981.

CNMI Public Law 11-63. An act to establish a moratorium on the harvesting of seaweed, sea grass, and sea cucumber in the Commonwealth waters; and for other purposes.

CNMI Public Law 12-12. Mañagaha Marine Conservation Act of 2000.

CNMI Public Law 12-46. An act to designate Bird Island and Forbidden Island as sanctuaries for the conservation of wildlife and marine life; and for other purposes.

Division of Fish and Wildlife (DFW) Non-Commercial Fishing and Hunting Regulations, Part 5, §120. Marine Reserves.

Division of Fish and Wildlife (DFW) Non-Commercial Fishing and Hunting Regulations, Part 5, §60.2.

Division of Fish and Wildlife (DFW) Non-Commercial Fishing and Hunting Regulations, Part 5, §50.2.

Kessler, Curt. n.d. Fig. 2.1:. U.S. Fish and Wildlife Service.

Moretti, Greg. n.d. Figs. 2.2 - 2.13. CNMI Division of Fish and Wildlife.

Office of the Attorney General. August 7, 2006. Attorney General Opinion No. 06-11.

Pacific Basin Environmental Consultants, Inc. March 1985. *CNMI Marine Parks Management Plan.* Prepared for the Coastal Resources Management Office, Saipan.

Rota Local Law 9-2. An act to create a fish reserve in Sasanhaya in Rota which shall extend from Puña Point to the Coral Gardens, and for other purposes.

Saladores, Benhur C. 1999. Limited marine activities on Mañagaha draw support. *Saipan Tribune*, December 9, 1999. Available online at www.saipantribune.com.

The Commonwealth Constitution, Article XIV, Section 2.

Trianni, Michael S. 2002a. Evaluation of the resource following the sea cucumber fishery of Saipan, Northern Mariana Islands. In: M. K. Kasim Moosa, S. Soemodihardjo, A. Nontji, A. Soegiarto, K. Romimohtarto, Sukarno and Suharsono (eds.), *Proceedings of the Ninth International Coral Reef Symposium, Bali, Indonesia, October 23-27 2000.* Ministry of Environment, the Indonesian Institute of Sciences and the International Society for Reef Studies.

————.2002b. Summary of data collected from a declared trochus season on Saipan, Northern Mariana Islands. *SPC Trochus Information Bulletin* 9: 2-5.

————.2002c. Summary of data collected from the sea cucumber fishery on Rota, Northern Mariana Islands. *SPC Beche-de-mer Information Bulletin* 16: 5-11.

Chapter 3: Florida Coral Reef MPA Summary

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INTRODUCTION

Florida is the only state in the continental United States with shallow coral reef formations near its coastline. The Florida reef tract stretches from the Dry Tortugas, west of Key West, to the Saint Lucie Inlet in Martin County, an extension of approximately 530 kilometers (km). Rohmann, et al. (in press) estimate that 30,801km² of Florida's nearshore shallow waters may support coral reef resources. The development of these reefs is attributed to Florida's broad, shallow continental shelf and the Gulf Stream, which carries flora, fauna and warm waters to the area. Florida's primary coral habitats include patch reefs, bank reefs, and hardbottom communities - the latter being the most extensive (Andrews, et al. 2005). Mangroves, wetlands, algal beds, and seagrass beds are also important components of the reef ecosystem. More than 460 species of fish have been observed in this region by expert-level Reef Environmental Education Foundation fish identification volunteers (via more than 8,000 surveys) since 1993 (REEF 2001). Although there have been a few studies reporting the existence of corals along Florida's west coast, research and data collection are incomplete.

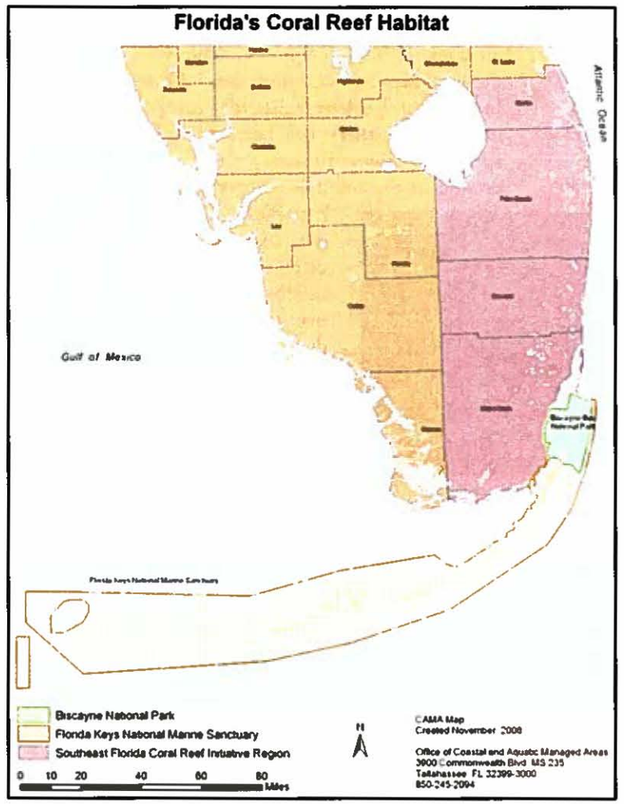

Fig. 3.1: Map of Florida reef tract, including the Southeast Florida Coral Reef Initiative (SEFCRI) area and the Florida Keys National Marine Sanctuary (FDEP CAMA 2006)

The coral reefs off Florida's coast provide over $1.9 billion in annual income and 71,300 jobs to the residents of Miami-Dade, Broward, Palm Beach, and Monroe Counties (Johns, et al. 2001). These coral reefs and associated ecosystems provide vital biological, socioeconomic, and recreational resources to the residents of Florida and the United States.

Like many coral reefs throughout the world, Florida's reefs are threatened directly and indirectly by human activities. Large coastal infrastructure projects can contribute to shoreline erosion and can damage coral habitat by increasing turbidity. Beach nourishment projects can cause severe impacts to reefs. Sediments can smother corals, and the reduced water clarity from these projects can deprive corals of the light they require for photosynthesis. Dredge and fill projects, and construction of seawalls and docks, can negatively impact seagrasses, mangroves, and other benthic communities that are important to the entire coral reef ecosystem, and can impact corals directly and indirectly. Runoff from residential, industrial, and agricultural areas may contain contaminants and debris, which are carried through storm drains to Florida's waterways. Sewage discharges from waste treatment facilities, boats, and developed land areas may contribute to coral diseases and death. Even treated sewage may contain high nutrient levels

that may trigger algal blooms that can smother reefs, and may also contain bacteria and viruses that threaten the health of the marine environment and humans. Physical contact from fins, hands, or equipment of boaters, divers, snorkelers, and fishermen can damage delicate corals. Abandoned, improperly discarded, or lost fishing gear like line, nets, and traps can cause physical damage to reef systems. Ships and other vessels that run aground or drop anchor on reefs can dislodge, overturn and crush corals.

Acknowledging the significance of Florida's coral reef system, and the threats it faces, federal and state agencies initiated efforts to protect the reefs. The state's first effort was the establishment of John Pennekamp Coral Reef State Park in 1963 - the first underwater park in the United States. The federal government recognized the need for additional protection and established the Key Largo National Marine Sanctuary and Looe Key National Marine Sanctuary, in 1975 and 1981, respectively. To comprehensively manage all the reefs and associated reef resources of the Florida Keys, the Florida Keys National Marine Sanctuary (FKNMS) was established in 1990. NOAA cooperatively manages the sanctuary with the Florida Department of Environmental Protection (FDEP) and the Florida Fish and Wildlife Conservation Commission (FWC). Other federally designated and managed areas within the reef system include national parks, national wildlife refuges, federal fishery habitat conservation zones, and federal fishery management zones.

Fig. 3.2: Reef in SEFCRI area (Gilliam n.d.)

The state of Florida has implemented many additional programs and management designations to protect its coral reefs and other coastal and marine resources. These designations include fisheries areas, manatee safety havens and speed zones, critical wildlife areas, outstanding Florida waters, surface water improvement and management areas, wildlife management areas, state parks, and aquatic preserves. More recently, with guidance from the United States Coral Reef Task Force, FDEP and FWC coordinated the formation of a team of interagency marine resource professionals, scientists, non-governmental organizations, and other interested stakeholders to address management needs of the northern extension of the Florida reef tract. The Southeast Florida Coral Reef Initiative (SEFCRI) Team first gathered to develop a local action strategy (LAS) in May 2003, targeting the reefs from Miami-Dade County, through Broward, Palm Beach, and Martin Counties. This region was chosen because its reefs are close to an intensely-developed coastal region, where, prior to the development of SEFCRI, there was no coordinated public education or management effort for reefs located north of the Florida Keys (FDEP CRCP 2004). The formation of SEFCRI acknowledged the importance of coral reefs throughout the full extent of Florida's reef tract (530 km), with the entire tract falling within the SEFCRI region or the FKNMS.

Several monitoring efforts are in place to help address some of the threats to Florida's reefs. Water quality, seagrass, and coral reef monitoring are required under the FKNMS enabling legislation and were initiated in 1995-96 (U.S. DOC 1996). The Southeast Environmental Research Center Water Quality Monitoring Network consists of more than 200 stations within the FKNMS and on the shelf, and 100 stations within Florida Bay, Biscayne Bay, and the southwest shelf. Monitoring data from this program has revealed significant changes in water quality in the Florida Keys (Andrews, et al. 2005).

The status of corals and benthic biota in the Florida Keys is tracked through FWC's Coral Reef Evaluation and Monitoring Project (CREMP). CREMP was initiated in 1996 and is a collaborative effort between the sanctuary, FWC, and the University of Georgia, Institute of Ecology. CREMP surveys from 1996-2003 indicate that there has been a decline in stony coral species richness throughout the Florida Keys, and a decline in the number of species at 70 percent of the monitoring stations. Monitoring data also reveal concerns about coral disease trends, with increases in the number of stations where disease has occurred, the number of types of diseases, and the number of coral species infected. Also of note, is the decline in coral cover from 1996-1999, likely due to bleaching episodes and hurricanes; from 1999-2003, there was no significant change (Andrews, et al. 2005). North of the Florida Keys, coral health, status, and trends are monitored by a partnership program established through SEFCRI to extend the CREMP to Miami-Dade, Broward, Palm Beach, and Martin Counties. This program, known as the Southeast Florida Coral Reef Evaluation and Monitoring Project (SECREMP), commenced in 2003. SECREMP is a collaborative effort between FDEP, FWC, and the National Coral Reef Institute at Nova Southeastern University.

Most fisheries data from the Florida Keys has focused on commercial landings, but the NOAA Southeast Fisheries Science Center has used the reef fish visual census (RVC) method to assess fish communities and habitat associations. Based on the information

collected, Ault, Bohnsack, and Meester (1998) determined that 65 percent of the 35 assessed exploited reef fish stocks (including groupers, snappers, and grunts) in the Florida Keys were below the federal standards for sustainability at that time. A positive change has been documented for goliath grouper, with evidence that the stock is rebuilding after closure of the goliath grouper fishery in Florida and Atlantic waters in 1990 and in the Gulf in 1992 (Porch, Eklund, and Scott 2003). After the implementation of the Tortugas Ecological Reserve in the FKNMS, increases in abundance and sizes of groupers and snappers were recorded in the Tortugas region (Ault, et al. 2006). Similar studies have shown the same trends with lobster and other popular fish species. Numerous other monitoring programs are underway in the Florida Keys, including monitoring of spiny lobsters and queen conch by FWC.

The designation of MPAs is an important tool for protecting and managing Florida's reef system. MPAs can provide a range of protections for a variety of resources, as reflected in the assortment of types of MPAs in Florida. This chapter will highlight the eight types of state MPAs that are found within Florida's reef tract: fisheries areas, manatee safety havens and speed zones, critical wildlife areas, outstanding Florida waters, surface water improvement and management areas, wildlife management areas, state parks, and aquatic preserves. Eighty-two MPAs and numerous manatee speed zones have been established within these eight categories.

MPA TYPES

Fisheries Areas

National Classification: Uniform Multiple-Use, Natural Heritage MPAs

Enabling Legislation and Responsible Agency:

FWC has the authority, under the Constitution of the State of Florida, Article 4, Section 9, to exercise the regulatory and executive powers of the state with respect to wild animal life, fresh water aquatic life, and marine life. Thus, FWC has the authority to establish areas and regulations to protect fisheries resources, and to enforce those regulations.

Goals, Objectives, Policies, and Protections:

Florida Statute 370.025 declares that it is the policy of the state to manage and preserve its renewable marine fishery resources, and its paramount conservation and management concern is the continuing health and abundance of the marine fisheries resources of the state. FWC established three fisheries areas within Biscayne Bay to protect specific fisheries resources. In the Biscayne Bay-Card Sound Spiny Lobster Sanctuary, it is unlawful to molest, take, or trap any spiny lobster (68B-11, F.A.C.). The other two areas protect marine resources in Biscayne National Park. In the park, it is illegal to harvest, possess, or land sponges (68B-28.004 (1)(a), F.A.C.), and to harvest tropical ornamental marine life and plant species, unless granted a collecting

Table 3.1: Priority Coral Reef Resources and Habitats Found in the Three Fisheries Areas

Fisheries Areas	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Other reefs (oyster, worm, etc.)	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Biscayne Bay-Card Sound Spiny Lobster Sanctuary *					x						x			
Biscayne National Park, Sponge Harvest Prohibited Area +					x									
Biscayne National Park, Tropical Ornamental Marine Species Harvest Prohibited Area +					x									

* Information about resources in Biscayne Bay can be found under the Biscayne Bay SWIM Area and Biscayne Bay Aquatic Preserve (Tables 3.5 and 3.8).

\+ Information about resources in Biscayne National Park will be presented in a future report, which will include federal MPAs and geospatial analysis of MPA coverage within coral reef ecosystems.

permit from the park superintendent (68B-42.0036). Recreational and commercial fishng are allowed in these areas unless otherwise specified in the Florida Administrative Code (F.A.C.). These areas do not restrict any other activities.

Management Activities:

Because of the nature of these areas as regulatory designations, they do not have management plans. However, the areas are managed through enforcement activities to address the primary management concern, which is poaching.

Stakeholder Involvement and Public Participation:

Public involvement in the designation of these areas is obtained through a public comment period when the rules are first proposed. Any changes to the rules would also require a public comment period.

Manatee Safety Havens and Speed Zones

National Classification: Uniform Multiple-Use and No Access, Natural Heritage MPAs

Hundreds of manatee safety havens and speed zones have been established in 18 counties along Florida's eastern and gulf coasts to protect the endangered Florida manatee. All types of zones are found within the coral reef system, including two motorboats prohibited zones, seven no entry zones, and numerous idle, slow, and maximum speed zones. These zones are located in the coastal bays, estuaries, canals, and rivers that serve as migration routes, resting areas, breeding areas, and feeding areas for Florida manatees. An important habitat in many of these zones is seagrass beds as seagrass is the manatees' primary food source.

Table 3.2: Priority Coral Reef Resources and Habitats Found in the Nine Manatee Safety Havens and Numerous Speed Zones

Manatee Safety Havens and Speed Zones	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Other reefs (oyster, worm, etc.)	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Biscayne Canal No Entry Zone													x	
Black Greek Canal No Entry Zone			x										x	
Coral Gables Canal No Entry Zone													x	
Fisher Island Motorboats Prohibited Zone			x										x	
FPL Riviera Beach Power Plant Motorboats Prohibited Zone			x										x	
Lauderdale Power Plant No Entry Zone			x										x	
Little River No Entry Zone													x	
Port Everglades Power Plant No Entry Zone			x										x	
Virginia Key No Entry Zone			x										x	
Manatee Speed Zones*			x										x	

* The Manatee Speed Zones include an assortment of Idle Speed Zones, Slow Speed Zones, and Maximum Speed Zones. The total number of these zones within the Florida reef tract has not yet been determined.

Enabling Legislation and Responsible Agency:

The Florida Manatee Sanctuary Act designated the state of Florida as a refuge and sanctuary for the Florida manatee. Under the act, it is unlawful for any person "to annoy, molest, harass, or disturb or attempt to molest, harass, or disturb any manatee; injure or harm or attempt to injure or harm any manatee; capture or collect or attempt to capture or collect any manatee; pursue, hunt, wound, or kill or attempt to pursue, hunt, wound, or kill any manatee; or possess, literally or constructively, any manatee or any part of any manatee" (Florida Statute 370.12(2)(d)).

FWC's Bureau of Protected Species Management is responsible for establishing manatee safety havens and speed zones, and enforcing the regulations in these areas. Local governments can also establish manatee speed zones through the adoption of a local ordinance, but the zones must be approved by FWC before they can take effect.

Goals, Objectives, Policies, and Protections:

Fig. 3.3: Power plant discharge canal (FWC Manatee Program n.d.)

Manatee safety havens and speed zones are established to protect Florida manatees and their habitats from harm caused by motorboats. There are a variety of zones and associated regulations depending on the level of protection needed. Within the zones, there may be year-round regulations, seasonal regulations, or a combination of seasonal regulations. Slow speed zones, idle speed zones, and maximum speed zones restrict what speeds boats may travel at within the zone. In motorboats prohibited zones, "all vessels equipped with any mechanical means of propulsion are prohibited from entering the marked area unless the mechanical means of propulsion is not in use and, if possible to do so, is tilted or raised out of the water" (68C-22.002(3), F.A.C). No entry zones further restrict activities by prohibiting "all vessels and all persons, either in vessels or swimming, diving, wading, or fishing (except from an adjacent bank or bridge when using poles or lines which are not equipped with a fishing line retrieval mechanism, e.g., a cane pole)" from entering (68C-22.002(11), F.A.C).

Exceptions to these rules may be made, by permit, for certain activities (68C-22.003, F.A.C.). Permits are available for the following activities: commercial fishing and professional guiding; owners or residents of waterfront property in limited entry areas; boat and motor manufacturing testing; boat races; and, research, education, construction, maintenance, or repairs.

Management Activities:

Fig. 3.4: Regulatory sign (FWC Manatee Program 1999-2005)

Although there are no management plans for manatee safety havens or speed zones, these zones are incorporated into county manatee protection plans and FWC's Manatee Program protection efforts. FWC utilizes several programs to manage these zones, including permitting, education, enforcement, research, and public use management. As discussed above, FWC may issue permits for certain activities in manatee speed zones and safety havens. Signs serve as both enforcement and education tools. Educational signs at marinas and boat ramps include information about Florida manatees, what to do and not to do, and how to know when you are traveling at slow or idle speed. Regulatory signs post the allowable speed and associated rule and permit numbers (FWC Manatee Program 1999-2005). Speed zones are often the focus of manatee enforcement activities, particularly newly established zones and zones with high vessel traffic (FWC Fish and Wildlife Research Institute n.d.). FWC performs numerous research activities, such as population assessments and behavioral ecology studies, which may lead to the revision or establishment of speed zones. Human-dimension research efforts have focused on using research results to achieve cost-effective manatee protection, such as increasing voluntary compliance with speed zones to relieve the burden on enforcement personnel (FWC Fish and Wildlife Research Institute n.d.).

Stakeholder Involvement and Public Participation:

Public involvement in the designation of these zones is obtained through a public comment period when the zones are first proposed. Any changes to the zones would also require a public comment period.

The public may indirectly contribute to general manatee protection and management efforts by contributing to the Save the Manatee Trust Fund through the purchase

of a manatee license plate, decal donation, or direct donation. This fund supports environmental education, research, and protection and recovery efforts. Although it is not applicable to the coral reef system, FWC cooperates with Tampa BayWatch to offer volunteer opportunities through the Tampa Bay Manatee Watch program.

Critical Wildlife Areas

National Classification: No Access, Natural Heritage MPAs

Critical wildlife areas are found throughout the state, with 17 in coastal or marine waters. They encompass waters and lands that provide important habitat for birds, such as mangroves, wetlands, mudflats, and coral rubble. The two critical wildlife areas within the coral reef system, Bill Sadowski Critical Wildlife Area and Pelican Shoal Critical Wildlife Area, contain important foraging and nesting habitat for numerous bird species.

Fig. 3.5: Roseate terns on Dry Tortugas (Hood 2006)

The Bill Sadowski Critical Wildlife Area is in Miami-Dade County, near Miami and Biscayne Bay. It was established to protect shorebirds, herons, and egrets that forage within the site, and regulations apply year-round. The Pelican Shoal Critical Wildlife Area is located in the Straits of Florida, in southern Monroe County, about five miles south-southeast of Boca Chica Key. Regulations apply seasonally (from April 1 – September 1) to the area to protect nesting roseate terns and bridled terns. The area supports the only native substrate-breeding colony of threatened roseate terns in Florida, and it's the site of North America's first (and only) bridled tern breeding colony.

Management Activities:

While there are no management plans for these areas, FWC is responsible for implementing several management activities. Because these areas prohibit public access, the activities are focused on monitoring and enforcement. Biologists monitor the sites to determine the types of species and number of nests present, and whether the sites are used for nesting, resting, and/or feeding habitat (FWC n.d.(a)). The primary enforcement activity is the posting of signs to inform the public about the regulations and the importance of the areas. FWC law enforcement personnel coordinate protection efforts with local governments, other agencies, and organizations, and encourage the public to report violations (FWC n.d.(a)).

Table 3.3: Priority Coral Reef Resources and Habitats Found in the Two Critical Wildlife Areas (CWAs)

Critical Wildlife Areas (CWAs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Other reefs (oyster, worm, etc.)	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Bill Sadowski					x									
Pelican Shoal					x									x

Enabling Legislation and Responsible Agency:

FWC has the authority to establish critical wildlife areas with prior concurrence from the property owner (68A-19.005 (1), F.A.C). FWC is responsible for managing and enforcing the rules in these areas.

Goals, Objectives, Policies, and Protections:

Critical wildlife areas are established to protect critical habitats for birds that are in danger of extinction and subject to human disturbance. During the designated period, public access is prohibited within critical wildlife areas. No person can take or disturb any wildlife, or enter or operate a vehicle or vessel within the areas (68A-19.005 (2), F.A.C). To further prevent disturbance, no person can knowingly allow a dog under their care to enter the areas.

Stakeholder Involvement and Public Participation:

There are no specific opportunities for public involvement in the designation or management of these areas. The public can contribute to the management of critical wildlife areas by reporting violations to FWC.

Outstanding Florida Waters

National Classification: Uniform Multiple-Use, Natural Heritage MPAs

One hundred and eighty-four outstanding Florida waters (OFWs) have been designated in estuarine or marine waters, 36 of which are in the coral reef system.

Most OFW's overlap with existing state and federal MPAs, such as state parks, aquatic preserves, national wildlife refuges, and national parks. The OFW designation provides another level of protection to the waters within these MPAs. However, some OFWs are established independently of any existing MPAs. By protecting water quality, OFWs provide benefits to numerous species and habitats, including seagrass beds, mangroves, wetlands, coral reefs, and mudflats.

Table 3.4: Priority Coral Reef Resources and Habitats Found in the 36 Outstanding Florida Waters (OFWs)

Outstanding Florida Waters (OFWs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Other reefs (oyster, worm, etc.)	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Bahia Honda State Park	x	x	x	x	x	x			x	x	x	x	x	x
Bill Baggs Cape Florida State Park	x	x	x	x	x	x			x	x		x	x	x
Biscayne Bay Aquatic Preserve	x	x	x		x	x		x	x	x	x	x	x	
Biscayne National Park +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coupon Bight Aquatic Preserve	x	x	x	x		x		x	x	x	x	x	x	x
Coupon Bight			x	x										
Crocodile Lake National Wildlife Refuge +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Curry Hammock	x	x	x	x				x	x	x		x	x	
Dry Tortugas National Park +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
East Everglades				x										
Everglades National Park +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Florida Keys *, +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fort Zachary Taylor State Historic Site	x		x						x	x		x		x
Great White Heron National Wildlife Refuge +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hobe Sound National Wildlife Refuge +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hugh Taylor Birch State Recreation Area		x			x					x		x		
Jensen Beach to Jupiter Inlet Aquatic Preserve	x	x	x	x	x	x		x	x	x	x	x	x	
John D. MacArthur Beach State Park	x	x	x		x		x		x	x		x	x	x
John Pennekamp Coral Reef State Park	x	x	x			x			x	x	x	x	x	x

Table 3.4 (cont.): Priority Coral Reef Resources and Habitats Found in the 36 Outstanding Florida Waters (OFWs)

Outstanding Florida Waters (OFWs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Other reefs (oyster, worm, etc.)	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
John U. Lloyd Beach State Park	x	x		x	x				x	x		x	x	x
Jonathan Dickinson State Park		x			x					x			x	x
Key Largo Hammock State Botanical Site		x	x						x	x				x
Key Largo National Marine Sanctuary +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Key West National Wildlife Refuge +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lignumvitae Key Aquatic Preserve	x	x	x	x		x		x	x	x	x	x	x	x
Lignumvitae Key Botanical State Park	x	x	x	x	x	x			x	x		x	x	x
Long Key State Recreation Area	x		x	x	x	x	x		x	x		x	x	x
Looe Key National Marine Sanctuary +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Loxahatchee River-Lake Worth Creek Aquatic Preserve			x	x	x	x	x	x	x	x		x	x	
Martin County Tracts			x											
National Key Deer National Wildlife Refuge +	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
North Beach				x	x								x	
North Fork, St. Lucie Aquatic Preserve		x		x	x	x	x	x	x	x			x	x
North Key Largo Hammock			x	x	x									
Oleta River State Park		x	x	x	x				x	x			x	x
San Pedro State Underwater Archeological Preserve	x		x						x	x		x		
Seabranch		x	x		x				x	x			x	x
St. Lucie Inlet Preserve State Park	x	x	x	x	x		x		x	x		x	x	x
Westlake		x			x								x	
Windley Key Fossil Reef Geological State Park		x		x	x					x				x

Most OFWs entirely overlap existing state and federal MPAs, and thus contain the same resources.
* The Florida Keys OFW overlaps with the Florida Keys National Marine Sanctuary.
+ Information about resources in the national wildlife refuges, national parks, and national marine sanctuaries will be presented in a future report, which will include federal MPAs and geospatial analysis of MPA coverage within coral reef ecosystems.

Enabling Legislation and Responsible Agency:

Under Florida Statute 403.061, FDEP has authority to control and prohibit pollution of air and water, and to establish rules that provide for a special category of water bodies referred to as outstanding Florida waters, which are worthy of special protection because of their natural attributes, and to adopt rules that may include stricter permitting and enforcement provisions within these waters.

Anyone can propose waters for OFW designation, but the Florida Environmental Regulation Commission must approve the designation. FDEP's Water Quality Standards and Special Projects Program is responsible for enforcing the regulations.

Goals, Objectives, Policies, and Protections:

OFWs are established to prevent the reduction of existing water quality in areas worthy of special protection because of their natural attributes. Within OFWs, degradation of water quality, except as allowed in subsections 62-4.242 (2) and (3), F.A.C., is prohibited (62-302.700 (1), F.A.C.). Some of the exceptions include permitted activities that are grandfathered in, maintenance of existing facilities, activities to allow or enhance public usage, and construction activities that temporarily lower water quality. In practice, the rule means that FDEP cannot issue permits for direct pollutant discharges to OFWs that would lower ambient (existing) water quality, or indirect discharges that would significantly degrade nearby OFWs (FDEP Water Quality Standards and Special Projects Program 2006a). Additionally, permits for new dredging and filling must be clearly in the public interest. If an activity results in direct discharge of stormwater to OFWs, it is required to retain or treat a larger amount of stormwater than if the discharge was to non-OFW waters (FDEP Water Quality Standards and Special Projects Program 2006a). However, there are exemptions for agriculture and silviculture activities.

Management Activities:

No management plans exist for these areas. However, OFWs often overlap existing MPAs, which have management plans in place to address other resources and activities in the areas. Because the major management concerns in OFWs are point and non-point source pollution and dredge and fill activities, management activities focus on permitting and enforcement. For activities in OFWs that require a FDEP permit, the Water Quality Standards and Special Projects Program ensures that OFW criteria are used in the permitting decision (FDEP Water Quality Standards and Special Projects Program 2006a). Permits are reviewed periodically to ensure that the conditions are met; if there is a violation, enforcement action is taken.

Stakeholder Involvement and Public Participation:

Although the public does not participate in the management of OFWs, it can nominate waters to be designated as OFWs. The public is also involved in the designation of these areas through at least one fact-finding workshop in the affected area and a public comment period. A final public hearing is held in the affected area during which the Florida Environmental Regulation Commission, a seven-member citizens' body, votes on each proposal (FDEP Water Quality Standards and Special Projects Program 2006a). Any changes to the rules would also require a public comment period.

Surface Water Improvement and Management Areas

National Classification: Uniform Multiple-Use, Natural Heritage MPA

Thirty-three surface water improvement and management (SWIM) areas have been established throughout the state. Fifteen areas contain coastal or marine waters, but the Biscayne Bay SWIM Area is the only one within the coral reef system. In order to better protect and manage the bay, the SWIM area includes

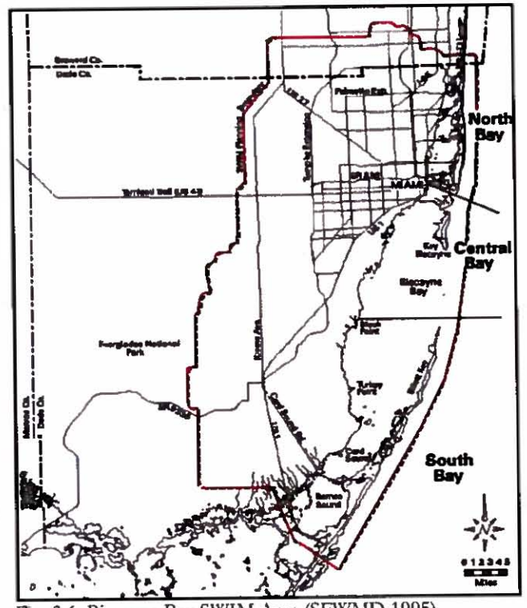

Fig. 3.6: Biscayne Bay SWIM Area (SFWMD 1995)

Table 3.5: Priority Coral Reef Resources and Habitats Found in the Biscayne Bay Surface Water Improvement and Management (SWIM) Area

Surface Water Improvement and Management (SWIM) Area	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Other reefs (oyster, worm, etc.)	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Biscayne Bay	x	x	x	x	x			x	x	x	x	x	x	x

significant inland areas. Coastal and marine habitats within the Biscayne Bay SWIM Area include mangroves, wetlands, submerged aquatic vegetation, and coral reefs. These habitats support commercial fish species, and numerous other ecologically important species, such as sea turtles, marine mammals, and endangered birds.

Enabling Legislation and Responsible Agency:

The 1987 Surface Water Improvement and Management Act (Florida Statute 373.451 - 373.4595) requires each water management district to develop plans and programs for the improvement and management of surface waters within their districts. Each water management district, in cooperation with FDEP and other government entities, must prepare and maintain a list that prioritizes water bodies of regional or statewide significance within each water management district (Florida Statute 373.453). Once FDEP approves the priority lists, the water management districts, in cooperation with FDEP and other government entities, may develop surface water improvement and management plans (SWIM plans) for water bodies based on the priority lists.

FDEP's Watershed Management Program and the appropriate water management district are responsible for managing SWIM areas and enforcing the rules. For the Biscayne Bay SWIM Area, the South Florida Water Management District is the responsible district.

Goals, Objectives, Policies, and Protections:

SWIM areas, including the Biscayne Bay SWIM Area, were established to restore surface waters that have been degraded, or are in danger of becoming degraded, and to enhance the environmental and scenic values of these waters.

For each SWIM area, the responsible district must develop a SWIM plan that includes a description of strategies for restoring or protecting the water body sufficient to meet Class III standards or better, and a description of the measures needed to manage and maintain the water body once it has been restored to prevent future degradation (62-43.035 (1), F.A.C.). To meet Class III standards, the waters must support recreation, and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife (FDEP Water Quality Standards and Special Projects Program 2006b). SWIM plans should have programs to address point and non-point source pollution, destruction of natural systems, correction and prevention of surface water problems, and research that may improve the management of surface waters and associated natural systems.

The intent of the Biscayne Bay SWIM Plan is to prevent further decline in the quality of surface water resources in Biscayne Bay through reducing or eliminating pollution; cleaning up, isolating, or removing the pollutants from the system; and, restoring, preserving, and protecting the bay ecosystem, including the watershed components that are critical to the health of the bay (SFWMD 1995).

Management Activities:

The first Biscayne Bay SWIM Plan was written in 1988, and updated in 1995. The three management goals identified in the 1995 Biscayne Bay SWIM Plan include maintaining and improving water quality; improving the quantity, distribution, and timing of freshwater flows and circulation characteristics of Biscayne Bay; and, protecting environmental resources of Biscayne Bay and adjacent areas (SFWMD 1995). These goals are further refined in 16 objectives. The plan also contains a list of proposed projects to address the needs and objectives, which incorporate a range of management techniques. Some of the management programs used to meet these goals and objectives include enforcement, research, monitoring, restoration, education, permitting, and water quality and habitat management.

Research:
A significant amount of research has been done to better understand the relationship between hydrology, water quality, and the environment. One project, Minimum Flows and Level Requirements for Biscayne Bay, was conducted to determine past water flows into the bay and to establish minimum flow requirements. Two projects have focused on the hydrology of the C-111 basin: one assessed the marsh hydroperiod and the needs of fish; the other quantified the relationship between hydrological conditions and vegetation patterns (SFWMD 1995).

Monitoring:
As expected, numerous water quality monitoring efforts are underway in the SWIM area, including general surface water quality monitoring for pollutants. Other monitoring activities have focused on sediments and biological parameters. For example, one monitoring project has involved sampling tissue from bivalves and other marine organisms to determine levels of contaminant compounds and metals (SFWMD 1995).

Restoration:
Hydrological and habitat restoration activities have been closely linked, such as the reintroduction of the fresh water that was cut off by the L-31E levee. The freshwater flow was reintroduced to the mangrove wetlands to facilitate the restoration of these habitats. Other restoration activities include a cooperative wetlands restoration project at the Bulk Carrier Site, and the development of the South Dade Watershed Restoration Plan (SFWMD 1995).


Fig. 3.7: Mangroves (FKNMS n.d.)

Education and Outreach:
A variety of education and outreach materials and methods have been utilized within the SWIM area. There have been several projects focused on the importance protecting and restoring wetlands, including a mentoring program by high school students for lower grade levels. The Don Diego Campaign targeted Hispanic children, and established Don Diego, an actual historical figure, as an icon that protects the bay. Lastly, a speaker's bureau was formed to educate the business community about water resources and how they can have a positive impact on water quality and the bay environment (SFWMD 1995).

Enforcement:
One of the most effective enforcement programs has been compliance on the Miami River. The program focuses on responding to water quality violations, point source pollution, and illegal dumping. In Biscayne Bay, increased signage marking the shallow areas of the bay has helped to reduce damage to seagrass beds and hardbottom communities (SFWMD 1995).

Stakeholder Involvement and Public Participation:

There were no specific opportunities for public involvement in the designation of this area. During the development and update of the SWIM plan, the water management district is required hold at least one public hearing and public workshop in the vicinity of the water body. Representatives from the public may also serve on committees that are appointed as necessary to assist in developing protection and restoration strategies.

Wildlife Management and Wildlife and Environmental Areas

National Classification: Uniform Multiple-Use, Natural Heritage MPA

The wildlife management area (WMA) system covers more than five million acres in Florida. Lands and waters in the system are established as wildlife

Table 3.6: Priority Coral Reef Resources and Habitats Found in the Florida Keys Wildlife and Environmental Area (WEA)

Wildlife and Environmental Area (WEA)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Other reefs (oyster, worm, etc.)	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Florida Keys		x	x	x					x	x		x		x

management areas (WMAs) or wildlife and environmental areas (WEAs), and include mitigation parks. Of the 131 areas, seven contain coastal or marine components, but only one is within the reef system. The Florida Keys Wildlife and Environmental Area is an archipelago of small sites stretching 80 miles from Key Largo almost to Key West. The WEA is predominantly tropical hammock, which provides feeding and resting areas for migratory birds. The WEA also has extensive coastal salt marshes, mangrove swamps, and open water habitats that are used by the migratory birds.

Fig. 3.8: Florida Keys WEA, which consists of several parcels stretching over 80 miles (FWC n.d.(b))

Enabling Legislation and Responsible Agency:

FWC, "with the approval of the Governor, may acquire, in the name of the state, lands and waters suitable for the protection and propagation of game, fish, non-game birds, or fur-bearing animals, or for hunting purposes, game farms, by purchase, lease, gift or otherwise to be known as state game lands" (Florida Statutes 372.12). FWC has the authority to make and enforce regulations to protect, manage, or develop lands and waters owned by the commission for fish or wildlife management purposes, including the right of ingress and egress (Florida Statutes 372.121).

Some WMAs are cooperatively managed by FWC and another state agency. In those areas, the cooperative agency is primarily responsible for management, but FWC contributes to management and enforcement. In the case of the Florida Keys WEA, FWC is the lead agency so it is responsible for managing the area and enforcing the laws and regulations.

Goals, Objectives, Policies, and Protections:

WMAs are managed to sustain the widest possible range of native wildlife in their natural habitats (FWC 1999-2005). WMAs offer recreational opportunities, but they do not have developed amenities like the state parks. The Florida Keys WEA was acquired to protect and restore tropical hardwood hammocks and many rare plants and animals, including Key deer and migratory birds (FWC 2004). The WEA also helps protect the OFWs, the recreational and commercial fisheries, and the reefs surrounding the area. Further, it provides more natural areas for residents and visitors to enjoy.

Regulations regarding the management of WMAs and WEAs are in 68A-17.004, F.A.C. The disturbance or removal of any plants, rocks, minerals, animal life, or manmade, cultural, or other natural materials is prohibited. Building and hunting are allowed with restrictions or permits. The general regulations allow fishing, but the regulations for specific WEAs may restrict some fishing activities. Other activities may be further restricted within individual areas, depending on their purpose. For example, the Florida Keys WEA lands were acquired as single use properties, with a focus on ecosystem preservation and management (FWC 2004). However, as the WEA developed the site-specific management strategies, it considered multi-use management. In preparation for multi-use management, the activities deemed inconsistent with the goals of the Florida Keys WEA include hunting, horseback riding, off-road vehicle use, developed camping, cattle grazing, apiaries, linear facilities, and citriculture and other commercial agriculture (FWC 2004). Boating, fishing, and wildlife watching are approved uses that are consistent with the goals of the WEA.

Management Activities:

Conceptual management plans are prepared for all WMAs and WEAs. The Florida Keys WEA was established in 1997, and its first conceptual management plan was completed in 1998. The most recent plan, the Florida Keys Wildlife and Environmental Area Conceptual Management Plan 2004-2014, was approved in February 2004 (FWC 2004).

FWC uses several programs to manage WMAs and WEAs. For the Florida Keys WEA, the programs include education, monitoring, enforcement, research, restoration, habitat management, and public use management. The Florida Keys WEA also has an advisory group that contributed to the development of the management plan, and volunteers who assist with restoration and education projects. Recreational facilities and trails have not been developed on the WEA. However, as discussed above, the WEA is considering allowing some activities, in certain areas, that are consistent with the protection of the natural resources.

Research:
FWC has developed Memorandums of Understanding with the National Audubon Society, The Nature Conservancy, U.S. Fish and Wildlife Service, and other non-governmental organizations (NGOs) to encourage research on the WEA. One project, contracted through the Audubon of Florida's Tavernier Science Center, is an inventory and study of the habitat use of neotropical migrant songbirds (FWC 2004). The results will guide habitat management and bird monitoring efforts.

Education and Outreach:
To date, the primary educational activity has been the development of brochures with maps explaining locations and resources. Other efforts include updating the Nature-based Recreation Program website, and completion of an information kiosk. The WEA has also been investigating the feasibility of an environmental education and interpretive center on Dove Creek (FWC 2004).

Enforcement:
Because the Florida Keys WEA consists of several parcels stretched over 80 miles, enforcement can be challenging. The WEA has investigated several strategies for improving enforcement, such as establishing closed areas and community watch programs. While enforcement activities deal with looting and dumping on the lands of the WEA, many activities have focused on the submerged lands, including the enforcement of fishing and boating regulations (FWC 2004).

Objective-based Habitat Management:
An objective-based habitat management approach will be implemented on the Florida Keys WEA. The first step in the approach is the monitoring and mapping of plant community types. Based on this information, the WEA will delineate management units and determine management objectives for each unit. These objectives will be indicator based and will seek to achieve preferred habitat conditions for specified plant or animal species. In the process of identifying management objectives and developing strategies, the WEA will also develop recreational use and restoration plans. Habitat management and restoration techniques will then be applied to achieve the identified management objectives, and the applicable indicators will be monitored to determine if the objectives were met (FWC 2004). The process to implement this management approach is currently underway.


Fig. 3.9: Coastal salt marsh (Kautz n.d.)

Stakeholder Involvement and Public Participation:

There were no specific opportunities for public involvement in the designation of this area.

However, there are several opportunities for public participation in the management of the Florida Keys WEA, including volunteering and commenting on the management plan. Volunteer programs offer both occasional and regular service opportunities. To assist with management, the WEA provides training to volunteers on plant identification and invasive species removal. Volunteers are also encouraged to educate the public about invasive species.

When updating the conceptual management plan, a management advisory group is convened to participate in a consensus meeting. FWC invites spokespersons for the various stakeholder groups to serve as members of the management advisory group (FWC 2004). This group provides their input about how the area should be protected and managed by generating a list of ideas and prioritizing them by vote. The ideas generated, and their priorities, are considered in the development of the conceptual management plan. The general public also has an opportunity to comment on the plan during a public hearing.

State Parks

National Classification: Uniform Multiple-Use, Zoned Multiple-Use, and No-Take, Natural Heritage and Cultural Heritage MPAs

Florida's state park system includes 159 parks, 80 of which contain coastal or marine components. Within Florida's coral reef system, there are 19 state parks. These parks cover a range of habitats, from coral reefs to mangrove estuaries and tidal wetlands. Numerous endangered species, such as sea turtles and seabirds, are also found within the parks. The diversity of resources offers unique opportunities for recreation and conservation.

Enabling Legislation and Responsible Agency:

The authority to establish state parks rests with FDEP's Division of Recreation and Parks under Florida Statute

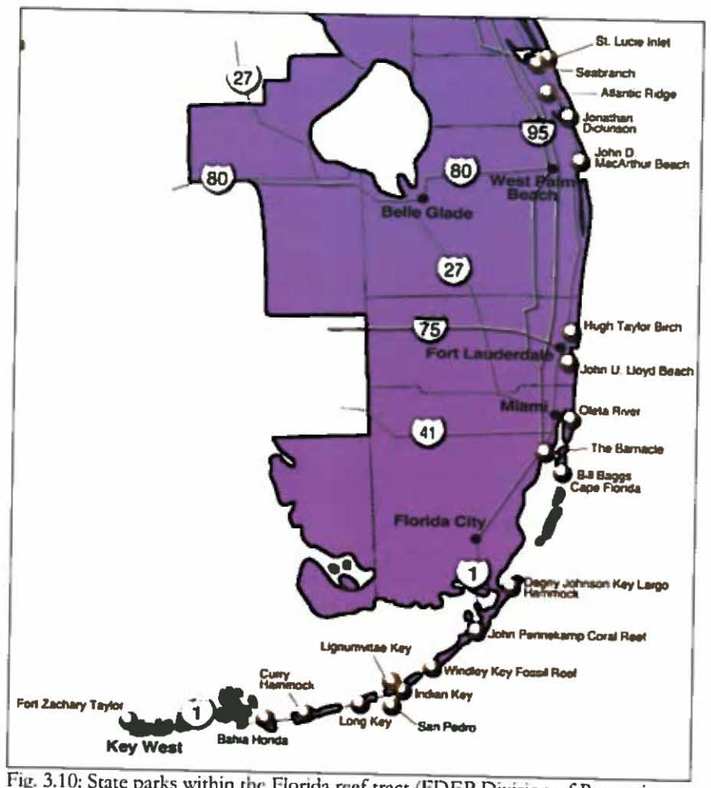

Fig. 3.10: State parks within the Florida reef tract (FDEP Division of Recreation and Parks n.d.(a))

258.007. The division's policy is to promote the state park system for the use, enjoyment, and benefit of the people of Florida and visitors; acquire properties that are accessible to all people and that emblemize the state's natural values; conserve these natural values for all time; and to administer the development, use, and maintenance of these lands to enable the people of Florida and visitors to enjoy these values without depleting them (Florida Statute 258.037).

In addition to establishing parks, the division has responsibility for managing the parks and enforcing regulations within the parks. Other state entities that are responsible for enforcement are the Florida Park Patrol and FWC.

Goals, Objectives, Policies, and Protections:

State parks are established and managed to provide resource-based recreation while preserving, interpreting, and restoring natural and cultural resources. A suite of regulations (62D-2.013 and 2.014, F.A.C.) exists to ensure that these goals are achieved. In general terms, the regulations prohibit the destruction, disturbance, or removal of anything within the park area, and waters thereof. This prohibition applies to a range of objects, including structures and buildings, historic artifacts, sand, rocks, minerals, animals, and plants. There is an exception for fishing, which is discussed below. Park regulations also prohibit the introduction of any plant or animal species into the parks.

State parks allow recreational activities such as boating, kayaking, surfing, snorkeling, and fishing. However, spearfishing is prohibited in the parks (62D-2.014 (9)(d), F.A.C.). The state parks do not regulate commercial fishing because that authority rests with FWC. Activities prohibited in the parks include oil and gas and mineral extraction, and hunting (except in reserves as authorized by FWC) (62D-2.014 (10), F.A.C.). Building, seabed alteration, and research are activities that are restricted, or require permits, in the parks. These activities are authorized only if they are deemed consistent with park management practices.

In addition to the general regulations, some state parks further restrict activities. Boating is allowed in the submerged areas of the state parks, but many parks restrict boating activities, including prohibiting anchoring and establishing combustible engine exclusion zones or no wake zones. For example, in Lignumvitae Key Botanical State Park and John Pennekamp Coral Reef State Park, combustible engine exclusion zones were established to protect seagrass beds and hardbottom communities. Other parks, such as Oleta River State Park, have no wake zones to protect manatees and reduce erosion. In San Pedro Underwater Archaeological Preserve State Park, only kayaks and glass bottom or dive boats are allowed, and they must use park mooring buoys; no anchoring is allowed. Additionally, no fishing is allowed in San Pedro Underwater Archaeological Preserve State Park. These restrictions exist to protect the wreck, as well as the corals and seagrass beds.

John Pennekamp Coral Reef State Park is the only park in which fishing is specifically regulated. The Lobster Harvest Prohibited Areas, and the Prohibition on Harvest of Certain Species, Size Limit rules were established by FWC because such fishing activities are inconsistent with park management goals. The Lobster Harvest Prohibited Areas rule identifies ten specific

Table 3.7: Priority Coral Reef Resources and Habitats Found in the 19 State Parks

State Parks	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Other reefs (oyster, worm, etc.)	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Bahia Honda	x	x	x	x	x	x			x	x	x	x	x	x
Bill Baggs Cape Florida	x	x	x	x	x	x			x	x		x	x	x
Curry Hammock	x	x	x	x				x	x	x		x	x	
Fort Zachary Taylor State Historic Site	x		x						x	x		x		x
Hugh Taylor Birch State Recreation Area		x			x					x		x		
Indian Key State Historic Site	x	x	x						x	x	x	x	x	x
John D. MacArthur Beach	x	x	x		x		x		x	x		x	x	x
John Pennekamp Coral Reef	x	x	x			x			x	x	x	x	x	x
John U. Lloyd Beach	x	x		x	x				x	x		x	x	x
Jonathan Dickinson		x			x					x			x	x
Key Largo Hammock State Botanical Site		x	x						x	x				x
Lignumvitae Key Botanical	x	x	x	x	x	x			x	x		x	x	x
Long Key State Recreation Area	x		x	x	x	x	x		x	x		x	x	x
Oleta River		x	x	x	x				x	x			x	x
San Pedro Underwater Archaeological Preserve	x		x						x	x		x		
Seabranch Preserve		x	x		x				x	x			x	x
St. Lucie Inlet Preserve	x	x	x	x	x		x		x	x		x	x	x
The Barnacle Historic		x	x	x	x				x	x			x	
Windley Key Fossil Reef Geological		x		x	x					x				x

patch reefs where it is illegal to harvest spiny (genera *Panulirus*) or slipper (genera *Scyllerides*) lobsters or to deploy traps, and it closes the entire park to the harvesting of spiny (*Panulirus argus*) lobster during the two-day mini season (68B-24.0065 (2), F.A.C.). The Prohibition on Harvest of Certain Species, Size Limit rule prohibits the harvest of 47 families/generas/species of popular tropical ornamental reef species within the park, and establishes an eight-inch minimum size limit for unregulated species, with the exception of some baitfish, jack, and mullet species (68B-5.002, F.A.C.).

Management Activities:

All of the 19 state parks in the coral reef ecosystem have up-to-date management plans. As required by Florida Statute, these plans are updated every five years. The state parks employ a variety of management programs, including education, monitoring, enforcement, research, restoration, permitting, habitat management, and public use management. On-site staff, advisory committees, and volunteer programs also contribute to park management. Water quality management programs and visitor centers are found in some parks.

Research:
All of the parks have undertaken significant efforts to inventory and map park resources. However, efforts to map submerged areas and inventory marine resources are just beginning in many of the parks. In addition to general data collection, the parks support research to address management concerns, including beach erosion, algal blooms, and sponge and seagrass die-offs.

- *John Pennekamp Coral Reef State Park:* Since records have been kept, 229 research permits have been issued for work in the park. Some of the projects include research on seagrass die-off, prop scarring, butterfly reintroduction, and ocean currents. Park staff have conducted studies to evaluate visitor impact on the reefs, which involved the establishment of closed areas to serve as controls. The closed areas were compared to visited areas, some of which had mooring buoys and others that were unmarked. Species composition, number of fish, and coral damage were monitored at all of the sites. The study results will quantify the type and severity of reef damage with varying levels of usage, and the impacts or benefits of mooring buoys (FDEP Division of Recreation and Parks 2004).


Fig. 3.11: Scuba divers in John Pennekamp State Park (FDEP Division of Recreation and Parks 2005a)

Monitoring:
Monitoring programs for nesting sea turtles and shorebirds are common in many of the parks. The parks collect information about the number of turtles or birds, the species, the number of nests, and the miles of beach surveyed, which is used to determine trends. The results are published in the resource management annual reports and used to inform management activities, such as the need for predator control or the regulation of lighting and heavy equipment use on the beach. Other monitoring efforts include the monitoring of restoration projects, prop scars, and water quality.

- *Jonathan Dickinson State Park water quality and quantity monitoring:* The park works with several federal, state, and local agencies to monitor water quality and quantity within the park. The primary concerns to the river and estuary are non-point source pollution (stormwater runoff), and the shift from agricultural lands to urban development in the surrounding areas. With population growth, there has been increasing groundwater removal, which could impact the park's wetlands. The park and the South Florida Water Management District have established monitoring wells to determine any affects, such as water depression, on the wetlands (FDEP Division of Recreation and Parks 2000).

Restoration:
The state parks conduct a variety of programs to restore habitats and hydrology. Hydrological restoration projects seek to restore the original hydrology by filling or plugging ditches, removing obstructions to surface water sheet flow, installing culverts under roads, and installing water control structures to manage water levels. Habitat restoration projects range from invasive species removal, to beach rebuilding, to wetland and mangrove planting.

- *Bill Baggs Cape Florida State Park habitat restoration:* Since 1992, there has been a significant effort by county, state, and federal agencies to restore the park's habitats to their original diversity and density. While much of the effort has focused on upland coastal strand and maritime hammock communities, there has been a significant wetland restoration component. The restoration of coastal dune lakes, mangroves, and tidal wetlands has provided resting and foraging habitat for shorebirds and wading birds, and attracted state threatened and endangered species previously not found in the park (FDEP Division of Recreation and Parks 2001).
- *Curry Hammock State Park hydrological restoration:* The park is working with the South Florida Water Management District on a project to restore the tidal connection between two of the islands. Construction of U.S. Highway 1 had closed the natural gap and a culvert under the highway is now being proposed to restore the tidal flow, which will support the restoration of tidal wetlands (FDEP Division of Recreation and Parks February 2005).


Fig. 3.12: Curry Hammock State Park (FDEP Division of Recreation and Parks 2005b)

Education and Outreach:
The state parks offer a variety of educational and outreach opportunities. Some of the activities include nature walks, estuary walks, birding tours, kayak tours, glass bottom boat tours, and lecture series. Six of the state parks within the coral reef system have visitor centers, which include educational exhibits. Educational efforts range from an ecosystem-wide perspective to a focus on specific species (manatees, sea turtles, etc.) or resource management issues such as boat groundings.

- *John D. MacArthur Beach State Park:* The park runs a kindergarten through sixth grade in-park educational program and summer camps that get children out into the water. More specific educational efforts target manatees, the worm reef, and sea turtles. During the summer months, park staff conduct sea turtle watches, which include a slide presentation and a walk along the beach to witness nesting female loggerhead sea turtles (FDEP Division of Recreation and Parks April 2005).

Enforcement:
Enforcement in state parks is a cooperative effort between the Division of Recreation and Parks and several other state entities, including the Division of Law Enforcement, Park Patrol, and FWC. In the state parks within Florida's reef ecosystem, many enforcement activities are related to boating. Parks maintain channel markers and post regulatory signs and buoys to protect hardbottom and seagrass communities from boat groundings and prop scars. The installation of mooring buoys prevents anchor damage to these sensitive communities. Law enforcement personnel patrol the parks to enforce speed zones and motor boat prohibited areas that protect submerged communities and manatees, and reduce erosion of intertidal communities (mangroves).


Fig. 3.13: Boat properly tied up to a mooring buoy (Collier 2006)

Carrying Capacity:
The Division of Recreation and Parks established Visitor Carrying Capacity Guidelines, which all of the state parks use to inform management. The use of such guidelines protects both the natural environment and users' experiences by preventing overcrowding, which can lead to the deterioration of natural resources. Some of the activities with established carrying capacities include hiking, camping, swimming, surfing, fishing, and boating (FDEP Division of Recreation and Parks n.d.(b)).

Stakeholder Involvement and Public Participation:

There are several opportunities for public participation in the designation and management of state parks. Prior to the designation of a state park, a public meeting is held to seek input on how the park should be used. After a draft management plan is developed, a second public meeting is held to obtain additional comments. Another opportunity for public participation is as a member of an advisory group. Advisory groups are appointed to assist in the development of new management plans and to review draft management plan updates. These groups include several government members, but also include citizen representatives and other stakeholders (such as tour outfitters and nonprofit organizations). In addition to commenting on the draft plans, the advisory groups can provide suggestions about issues that need to be addressed, or ways in which management may be improved.

The public can contribute to the management of state parks through an extensive network of volunteers, with over 7,000 annual volunteers (for the entire park system) (FDEP Division of Recreation and Parks 2005c). These volunteers lead tours, remove invasive species, and maintain beaches, waterways, and trails. In many state parks, volunteer efforts are further organized through the establishment of citizen support organizations (CSOs). Thirteen of the nineteen (68 percent) state parks within the reef system have a CSO.

Aquatic Preserves

National Classification: Uniform Multiple-Use and Zoned Multiple-Use, Natural Heritage MPAs

Over 1.8 million acres of submerged lands are protected in 41 aquatic preserves, 37 of which are marine or estuarine. There are six preserves within the coral reef system, which contain a diversity of habitats, including mangroves, seagrass beds, wetlands, oyster reefs, and coral reefs. These habitats support numerous fish, bird, marine mammal, and sea turtle species. The aquatic preserves provide important protection to these habitats and resources, while also allowing for recreational activities.

Enabling Legislation and Responsible Agency:

The state designated the first aquatic preserve, Estero Bay Aquatic Preserve, in 1966. Several other aquatic preserves, including Biscayne Bay Aquatic Preserve, were established in subsequent years. In 1975, the aquatic preserves were codified in the Aquatic Preserve Act. The designation of aquatic preserves has continued since that time. Under the Florida Aquatic Preserve Act, state-owned submerged lands with exceptional biological, aesthetic, and scientific value are to be set aside forever as aquatic preserves or sanctuaries for the benefit of future generations (Florida Statute 258.36).

FDEP's Office of Coastal and Aquatic Managed Areas (CAMA) is responsible for managing the aquatic preserves. FDEP and FWC are responsible for

enforcing the laws and regulations within the aquatic preserves.

Goals, Objectives, Policies, and Protections:

Aquatic preserves are established to protect submerged lands that have exceptional aesthetic, biological, and scientific values for the enjoyment of future generations. These areas are managed primarily for "the maintenance of essentially natural conditions, the propagation of fish and wildlife, and public recreation" (18-20.0001, F.A.C.). Several more specific long-term goals have also been established for the preserves. These goals are to: (a) protect and enhance the ecological integrity of the preserves; (b) restore areas to their natural condition; (c) encourage sustainable use and foster active stewardship by engaging local communities in the protection of preserves; and, (d) improve management effectiveness through a process based on sound science, consistent evaluation, and continual reassessment (FDEP CAMA June 2006).

An extensive set of laws and regulations govern activities within aquatic preserves. Although there are some exceptions, the following activities are prohibited within aquatic preserves: relocation or setting of bulkhead lines waterward of the line of mean high water, dredging or filling of submerged lands, dredging seaward of a bulkhead line, drilling of gas or oil wells, excavation of minerals, erection of structures, and discharge of wastes or effluents (Florida Statute 258.42). Docking facilities, including commercial, industrial, and residential facilities, are allowed, but are subject to numerous standards and criteria (18-20.004(5), F.A.C.). Additional rules include: 1) use of state-owned lands for the purpose of providing private or public road access

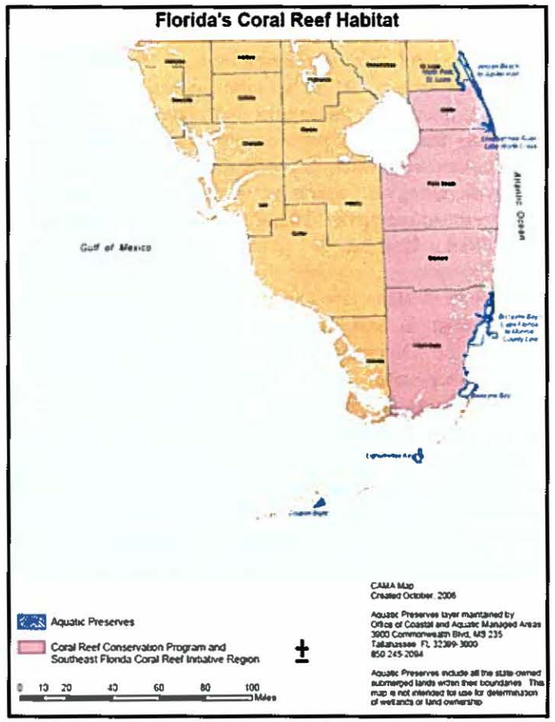

Fig. 3.14: Aquatic preserves within the Florida reef tract (FDEP CAMA 2006)

or water supply to islands where such access or supply did not previously exist is prohibited, 2) utility cables, pipes and other structures must be located in a manner that will cause minimal disturbance to submerged land resources and not interfere with traditional uses, and 3) spoil disposal within the preserve is strongly discouraged (18-20.004(1) and (3), F.A.C.). The rule

Table 3.8: Priority Coral Reef Resources and Habitats Found in the Six Aquatic Preserves

Aquatic Preserves	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Other reefs (oyster, worm, etc.)	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Biscayne Bay	x	x	x		x	x		x	x	x	x	x	x	
Coupon Bight	x	x	x	x		x		x	x	x	x	x	x	x
Jensen Beach to Jupiter Inlet	x	x	x	x	x	x		x	x	x	x	x	x	
Lignumvitae Key	x	x	x	x		x		x	x	x	x	x	x	x
Loxahatchee River - Lake Worth Creek			x	x	x	x	x	x	x	x		x	x	
North Fork, St. Lucie		x		x	x	x	x	x	x	x			x	x

regarding indigenous life prohibits the taking of indigenous life forms for sale or commercial use, except for the commercial taking of finfish, crustacean, or mollusks (18-20.012, F.A.C.).

Some aquatic preserves (Coupon Bight, Jensen Beach to Jupiter Inlet, and Lignumvitae Key) have management zones to ensure that potential upland development is compatible with the preserves' management goals. Preserve management areas are classified based on their resource value and the designated upland land uses, which include agriculture, single-family, multi-family, commercial-industrial, public recreation, and preservation. Each management area has a set of allowable uses that guide development. The range of allowable uses includes residential and commercial docks, piers, boat ramps, signs, boardwalks, mooring buoys, highway maintenance/improvements, and utility easements (FDEP CAMA 1992).

Although there are a significant number of restrictions in aquatic preserves, the preserves allow recreational activities such as boating, kayaking, surfing, snorkeling, and fishing. The aquatic preserves do not regulate commercial fishing because that authority rests with FWC. The exception is Biscayne Bay Aquatic Preserve, which prohibits the use of seines or nets, except when the fishing is for shrimp or mullet, and is otherwise permitted by state law or rules (Florida Statute 258.397(4)(c)). In some aquatic preserves, there are vessel restrictions to protect sensitive resources, such as seagrass beds. Research, aquaculture, and beach re-nourishment are allowed, but require permits or other approval.

Management Activities:

The majority of aquatic preserves have management plans. CAMA has recently developed a Program Overview, which establishes an updated and proactive framework for the development and implementation of aquatic preserve management plans (FDEP CAMA June 2006). Working within this framework, CAMA will be updating the individual aquatic preserve management plans over the next few years. As identified in the Program Overview, there are six focus areas for management: community outreach and stewardship, adjacent land uses and conservation, public access and use, water resource monitoring, water quantity, and habitat impacts (FDEP CAMA June 2006). The specific types of management programs utilized vary across the preserves. For the preserves within the coral reef system, the most common programs are restoration, volunteers, education, monitoring, and permit review. Habitat management and water quality management are also common management programs in the preserves.

Other programs and activities that are used by some preserves include research, resource inventories, enforcement, public use management, visitor centers, marketing, natural resource damage assessment authority, and emergency spill operations.

Research and Monitoring:
CAMA considers monitoring of water resources to be one of the most important tools available to protect the preserves. The current monitoring strategy focuses on water chemistry and physical measurements as indicators of ecosystem health. The goal is to develop this strategy into a comprehensive program that will include biological monitoring and other critical ecosystem components (FDEP CAMA June 2006).

- *Coupon Bight - Aquatic Preserve:* The preserve is currently involved in juvenile fish studies, research reviewing the larval recruitment of spiny lobster, and studies on the effectiveness of fishing exclusion zones (FDEP CAMA April 2006).
- *North Fork, St. Lucie - Aquatic Preserve:* In cooperation with FWC, the preserve conducts biological monitoring of fish and invertebrates at hydrologic restoration sites to support preserve management and Comprehensive Everglades Restoration Plan studies (FDEP CAMA April 2006).

Restoration:
Many aquatic preserves in the state are involved in restoration efforts. These efforts range from spoil islands, to bird and turtle habitat, to seagrass beds. As a result of boat groundings and propeller scars, replanting of seagrass beds is a common restoration activity.

Fig. 3.15: Seagrass bed (FKNMS n.d.)

- *North Fork St. Lucie River - Aquatic Preserve:* The preserve and the county are working with local NGOs on a combined effort to restore local spoil island habitats. There is also a joint effort to clean-up and restore habitats damaged by ghost fishing gear.
- *Loxahatchee River – Lake Worth - Aquatic Preserve:* The restoration of Kitching Creek is a partnership between Martin County, South Florida Water Management District, and FDEP that redirects freshwater flows to Kitching Creek, increases flows to the Loxahatchee River for habitat restoration, raises groundwater levels, restores degraded wetlands, and reduces nutrient loads (FDEP CAMA April 2006).

Education and Outreach:
CAMA has developed a successful outreach campaign based on the images of Florida artist Clyde Butcher. *Living Waters: Aquatic Preserves of Florida* is a documentary film that highlights the environmental and economic significance of the preserves and encourages stewardship. Other related materials include a book of photographs, a traveling photograph exhibit, a photo calendar, and a CD of natural sounds (FDEP CAMA 2005).

- *Coupon Bight and Lignumvitae Key Aquatic Preserves:* The preserves participate in the Seagrass Outreach Partnership (SOP), which educates people about the importance of seagrasses to the local economy and ecology, and how to minimize boater impacts (FDEP CAMA April 2006).
- *Biscayne Bay Aquatic Preserve:* The preserve participates in several community events, including marine debris clean-up events such as the International Coastal Clean-up (FDEP CAMA April 2006).


Fig. 3.16: Beach clean-up (Crane n.d.)

Stakeholder Involvement and Public Participation:

There were no specific opportunities for public involvement in the establishment of the existing aquatic preserves since they were established by legislative process. However, the Florida Aquatic Preserve Act of 1975 directed that should the Governor and Cabinet, acting as the Board of Trustees of the Internal Improvement Trust Fund, wish to create a new aquatic preserve, public notice must be given and a public hearing must be held in the county or counties in which the preserve would be located.

Volunteer programs are a common way for the public to be involved with preserve management. While there are several well-established volunteer programs in some of the aquatic preserves, the programs are not as well defined in the six preserves within the coral reef system. Many of these preserves partner with other organizations, such as the Biscayne Bay Alliance, to coordinate volunteer activities. There is also a citizen's support organization, The Stewards for the Southeast Florida Aquatic Preserves, Inc., which organizes volunteers for restoration and monitoring projects. One program that has a significant amount of volunteer support is the Spoil Island Enhancement Program in Indian River Lagoon, which includes the Jensen Beach to Jupiter Inlet Aquatic Preserve and the North Fork, St Lucie Aquatic Preserve. Volunteers have removed exotic species for shoreline stabilization projects, planted mangroves, removed debris, and created campsites (Spoil Island Working Group n.d.).

In 2005, the public had an opportunity to be involved with preserve management by attending public meetings for the Program Overview development process. FDEP conducted a series of nine workshops throughout the state in order to include public input in the process. The meetings focused on explaining the existing aquatic preserve program, describing the process for creating a statewide overview and for updating the site-specific aquatic preserve management plans, and soliciting public input on the management challenges, threats, and solutions (FDEP CAMA March 2006). During the meetings, FDEP collected input from the community about the range of values they held for the aquatic preserves. These efforts will continue over the next five years as CAMA works to update all of their site management plans throughout the state.

CHALLENGES TO MPA EFFECTIVENESS

Florida faces numerous challenges to effective management of the MPAs in the coral reef system. Like so many MPAs throughout the world, a lack of adequate funding is often an issue. A lack of adequate funding can contribute to other management challenges, such as capacity, enforcement, and monitoring. Capacity is a significant issue in the state parks, mainly in terms of staffing. While some parks note the need for more biologists and scientific expertise, the primary need is for more park rangers. Some of the aquatic preserves struggle with a different capacity issue – insufficient staffing levels to handle permit reviews. The need for more park rangers in the state parks highlights another important issue in many MPAs, which is the ability to enforce the regulations. More than half of the state parks and aquatic preserves in the coral reef system identify enforcement as a management challenge. Another common challenge to effective management is monitoring, especially among the aquatic preserves. More effective management could be achieved with additional, or enhanced monitoring.

Overall, there is strong public support for MPAs in Florida, with numerous citizen support organizations for the state parks and aquatic preserves. Even so, several aquatic preserves note public support as a challenge as they are still working to build broader public support. The state parks, on the other hand, are well established and public support is not a challenge to effective management. However, two parks in the coral

reef system acknowledge that they could use more public support. Interestingly, one park suggests that heightened public awareness is actually a challenge because people are more observant and critical of park management activities without understanding the reasons behind them. Similarly, public awareness of MPAs can lead to increased use of the areas, which contributes to the challenge of balancing use and protection.

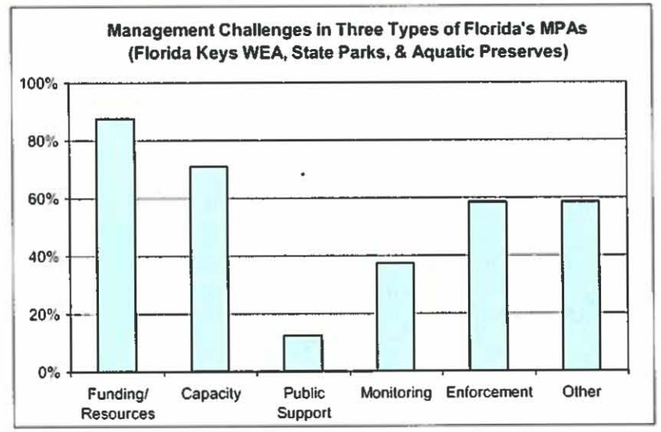

Fig. 3.17: Percent of MPAs (out of 24 total responses) that identified each issue as a challenge to effective MPA management. Data reported for the Florida Keys Wildlife and Environmental Area, state parks, and aquatic preserves. See text for discussion of "other" challenges.

Individual state parks and aquatic preserves in the coral reef system face several challenges that are site-specific. In the state parks, some of the challenges include invasive species, development or encroachment near park boundaries, convoluted boundaries, interagency cooperation, and derelict vessels. Individual aquatic preserves identify other challenges, which include boat groundings and seagrass scars, insufficient communication between researchers and the preserve, inadequate mapping and GIS products and capacity, and the fact that many agencies are responsible for managing the same area.

WORKING TOWARDS A NETWORK

Florida has a diversity of MPAs, with varying purposes, protections, and management programs. This diversity has allowed the state to establish the most appropriate type of MPA for addressing the particular needs and concerns in an area. However, this diversity also means that there are a variety of entities responsible for the designation and management of these areas. With management responsibility split between agencies, and between divisions and offices within agencies, it would be difficult to establish a comprehensive, statewide network of MPAs. Instead, efforts to establish and manage MPAs as part of a network or system have occurred at the division and office level. Efforts to increase coordination across agencies or across divisions are expected to continue as well.

The state park system is a statewide system of protected areas managed by FDEP's Division of Recreation and Parks. Planning for the establishment and management of state parks occurs at the system level. The system philosophy and policies are then applied to each state park through the individual management plans. The division also identifies, evaluates, and establishes priority projects for acquisition at the system level (FDEP Division of Recreation and Parks 2006).

As was mentioned in the section on aquatic preserves, FDEP's Office of Coastal and Aquatic Managed Areas (CAMA), which oversees the preserves, the national estuarine research reserves (NERRs), the Coral Reef Conservation Program (which manages the Southeast Florida Coral Reef Initiative), and the state's co-management responsibilities in the Florida Keys National Marine Sanctuary, is embarking on a new program and management framework. Over the next five years, CAMA will produce three to six new management plans for individual sites each year. The purpose of developing the new plans as a part of one concentrated effort is to be able to consider the values, issues, and threats to specific areas of the state's coastal waters while considering the statewide perspective. In addition to this new initiative, CAMA carries out several on-going comprehensive management efforts. CAMA manages the aquatic preserves with a focus on the unique resource management requirements of each unit while ensuring that the actions are consistent with the principles of ecosystem-based management. CAMA also supports several initiatives that will produce bioregional maps for the Florida coast and beyond into other state and federal jurisdictions.


Fig. 3.18: Gray angelfish and coral reef (FKNMS n.d.)

NEXT STEPS/ RECOMMENDATIONS

Florida is a large state with expansive coastal areas and it will take a collaborative effort to properly conserve its resources for future generations. As this chapter reveals, MPA establishment, management, and enforcement responsibilities are shared between several entities. Thus, many MPAs rely on partnerships to manage the resources effectively. Some of the government agencies that have established partnerships or undertaken other collaborative efforts include multiple local governments, Monroe, Miami-Dade, Broward, Palm Beach, and Martin Counties, the Water Management Districts, and the following state and federal agencies: the Florida Department of Environmental Projection; Florida Fish and Wildlife Conservation Commission; Florida Department of Agriculture and Consumer Services; Florida Department of Health; Florida Department of State; Florida Department of Transportation; National Oceanic and Atmospheric Administration; U.S. Army Corps of Engineers; U.S. Coast Guard; U.S. Environmental Protection Agency; and the U.S. Fish and Wildlife Service. In addition to government agencies, many concerned citizens, groups, and NGOs have joined in the efforts to adequately preserve and protect Florida's coastal ecosystems, and specifically the coral reef ecosystems. Continued collaboration among all of these entities is needed to ensure that Florida's coastal resources are effectively managed and protected.

Table 3.9: National Classification System for Florida's 82 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Biscayne Bay-Card Sound Spiny Lobster Sanctuary	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Biscayne National Park, Sponge Harvest Prohibited Area	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Biscayne National Park, Tropical Ornamental Marine Species Harvest Prohibited Area	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Biscayne Canal No Entry Zone	Natural Heritage	No Access	Permanent	Seasonal	Focal resource	No
Black Creek Canal No Entry Zone	Natural Heritage	No Access	Permanent	Year-round	Focal resource	No
Coral Gables Canal No Entry Zone	Natural Heritage	No Access	Permanent	Seasonal	Focal resource	No
Fisher Island Motorboats Prohibited Zone	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
FPL Riviera Beach Power Plant Motorboats Prohibited Zone	Natural Heritage	Uniform Multiple-Use	Permanent	Seasonal	Focal resource	No
Lauderdale Power Plant No Entry Zone	Natural Heritage	No Access	Permanent	Year-round	Focal resource	No
Little River No Entry Zone	Natural Heritage	No Access	Permanent	Seasonal	Focal resource	No
Port Everglades Power Plant No Entry Zone	Natural Heritage	No Access	Permanent	Year-round	Focal resource	No
Virginia Key No Entry Zone	Natural Heritage	No Access	Permanent	Year-round	Focal resource	No
Manatee Speed Zones*	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round & Seasonal	Focal resource	No
Bill Sadowski CWA	Natural Heritage	No Access	Permanent	Year-round	Focal resource	No

* The Manatee Speed Zones include an assortment of Idle Speed Zones, Slow Speed Zones, and Maximum Speed Zones. The total number of these zones within the Florida reef tract has not yet been determined.

Table 3.9 (cont.): National Classification System for Florida's 82 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Pelican Shoal CWA	Natural Heritage	No Access	Permanent	Seasonal	Focal resource	No
Bahia Honda State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Bill Baggs Cape Florida State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Biscayne Bay Aquatic Preserve OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Biscayne National Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Coupon Bight Aquatic Preserve OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Coupon Bight OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Crocodile Lake National Wildlife Refuge OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Curry Hammock OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Dry Tortugas National Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
East Everglades OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Everglades National Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Florida Keys OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Fort Zachary Taylor State Historic Site OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Great White Heron National Wildlife Refuge OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Hobe Sound National Wildlife Refuge OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Hugh Taylor Birch State Recreation Area OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Indian Key State Historic Site OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Jensen Beach to Jupiter Inlet Aquatic Preserve OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
John D. MacArthur Beach State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
John Pennekamp Coral Reef State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
John U. Lloyd Beach State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Jonathan Dickinson State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No

Table 3.9 (cont.): National Classification System for Florida's 82 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Key Largo Hammock State Botanical Site OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Key Largo National Marine Sanctuary OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Key West National Wildlife Refuge OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Lignumvitae Key Aquatic Preserve OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Lignumvitae Key Botanical State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Long Key State Recreation Area OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Looe Key National Marine Sanctuary OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Loxahatchee River-Lake Worth Creek Aquatic Preserve OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Martin County Tracts OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
National Key Deer National Wildlife Refuge OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
North Beach OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
North Fork, St. Lucie Aquatic Preserve OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
North Key Largo Hammock OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Oleta River State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
San Pedro State Underwater Archeological Preserve OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Seabranch OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
St. Lucie Inlet Preserve State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Westlake OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Windley Key Fossil Reef Geological State Park OFW	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Biscayne Bay SWIM Area	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Florida Keys WEA	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Bahia Honda State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Bill Baggs Cape Florida State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes

Table 3.9 (cont.): National Classification System for Florida's 82 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Curry Hammock State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Fort Zachary Taylor State Historic Site	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Hugh Taylor Birch State Recreation Area	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Indian Key State Historic Site	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
John D. MacArthur Beach State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
John Pennekamp Coral Reef State Park	Natural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	Yes
John U. Lloyd Beach State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Jonathan Dickinson State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Key Largo Hammock State Botanical Site	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Lignumvitae Key Botanical State Park	Natural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Long Key State Recreation Area	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Oleta River State Park	Natural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	Yes
San Pedro Underwater Archaeological Preserve State Park	Natural & Cultural Heritage	No-Take	Permanent	Year-round	Ecosystem	Yes
Seabranch Preserve State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
St. Lucie Inlet Preserve State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
The Barnacle Historic State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Windley Key Fossil Reef Geological State Park	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Biscayne Bay Aquatic Preserve	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Coupon Bight Aquatic Preserve	Natural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Jensen Beach to Jupiter Inlet Aquatic Preserve	Natural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Lignumvitae Key Aquatic Preserve	Natural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Loxahatchee River - Lake Worth Creek Aquatic Preserve	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes
North Fork, St. Lucie Aquatic Preserve	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	Yes

SUCCESS STORY

The St. Lucie Inlet Preserve State Park contains a 4.7 mile stretch of reef that is managed by the Florida Department of Environmental Protection's (FDEP) Division of Recreation and Parks. However, the Parks department is working cooperatively with FDEP's Office of Coastal and Aquatic Managed Areas (CAMA) Southeast Aquatic Preserve Office and Coral Reef Conservation Program (CRCP), the Florida Fish and Wildlife Conservation Commission's (FWC) newly created Division of Habitat and Species Conservation, the local commercial fishing community, and an environmentally-minded nonprofit organization in what may be an unprecedented partnership for the protection of this thriving reef community.

In 2004, diver accounts of newly found debris within the state-protected area lead to a public meeting where individuals voiced increased concern for reef health. This meeting prompted cleanup events where divers set out to locate and remove debris, including recreational and commercial fishing nets, monofilament line, and anchors. That year, they collected 120 gallons of marine debris within a few hours. This effort and its amazing results lead to the organization of subsequent events. Support for cleanup efforts to date have included a variety of governmental agencies (FDEP Division of Recreation and Parks, FDEP CAMA, and FWC), nonprofit organizations (Florida Oceanographic Society and Port Solerno Commercial Fishing Dock Authority), and concerned citizens.

In 2005, the Florida Oceanographic Society's Martin County Reef Research Dive Team received a grant through the Mote Marine Laboratory "Protect our Reefs" License Plate Trust Fund to further support this community-based marine debris removal project. The grant funds are being used to: 1) locate and map marine debris using ArcGIS, 2) remove located debris, 3) use maps to identify marine debris hotspots in an effort to set up a long-term debris monitoring program, 4) set up a debris hotline that allows people to anonymously report lost debris, and 5) create and distribute educational brochures that outline the park boundary, list rules that should be obeyed within the state park boundary, and provide information on how to anonymously report lost debris.

The guidance from the fishermen, who routinely fish these waters between November and April, reduces the amount of effort necessary to locate debris from the commercial (and possibly recreational) fishing communities. The technical expertise among Florida Oceanographic Society's Reef Research Dive Team is crucial to the proper and safe removal of marine debris from the sensitive reef environment. State agency involvement provides the project with support from the managing entity, professional biological expertise, and a platform for efficient information sharing. This project is a unique partnership between the commercial fishing community, an environmentally-minded nonprofit organization, and state agencies for the protection of the reef community and is a model of success for all of our state agencies and partners.

CITATIONS

Andrews, Katherine, Larry Nall, Chris Jeffrey, and Simon Pittman. 2005. The State of Coral Reef Ecosystems of Florida. pp. 150-200. In: J. Waddell (ed.), *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005.* NOAA Technical Memorandum NOS NCCOS 11. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. 522 pp.

Ault, J.S., J.A. Bohnsack and G. Meester. 1998. A retrospective (1979-1995) multispecies assessment of coral reef fish stocks in the Florida Keys. *Fishery Bulletin* 96 (3): 395-414.

Ault, J.S., S.G. Smith, J.A. Bohnsack, J. Luo, D.E. Harper, and D.B. McClellan. 2006. Building sustainable fisheries in Florida's coral reef ecosystem: positive signs in the Dry Tortugas. *Bulletin of Marine Science* 78(3): 633-654.

Boyer, Joseph N. and Henry O. Briceño. 2005. *Executive Summary, FY2005 Annual Report of the Water Quality Monitoring Project.* Southeast Environmental Research Center. Miami, FL. Available online at: http://serc.fiu.edu/wqmnetwork/FKNMS-CD/index.htm.

Collier, Chantal. 2006. Fig. 3.13. SEFCRI.

Constitution of the State of Florida, Article 4, Section 9.

Crane, Marella. n.d. Fig. 3.16. SEFCRI.

Florida Administrative Code (F.A.C.). Chapters 18, 62, and 68.

Florida Department of Environmental Protection (FDEP) Coral Reef Conservation Program (CRCP). December 2004. *Southeast Florida Coral Reef Initiative: A Local Action Strategy.* 29pp. Available online at: http://www.dep.state.fl.us/coastal/programs/coral/.

Florida Department of Environmental Protection (FDEP) Division of Recreation and Parks. n.d.(a). Fig. 3.10. *Florida Online Parks Guide.* FDEP. http://www.floridastateparks.org/images/Default.cfm?Region=Southeast.

———. n.d.(b). Visitor Carrying Capacity Guidelines. FDEP. http://www.dep.state.fl.us/parks/planning/default.htm.

———. February 3, 2000. *Jonathan Dickinson State Park Management Plan.* Tallahassee, FL: FDEP. Available online at: http://www.dep.state.fl.us/parks/planning/plans.htm.

———. March 15, 2001. *Bill Baggs Cape Florida State Park Management Plan.* Tallahassee, FL: FDEP. Available online at: http://www.dep.state.fl.us/parks/planning/plans.htm.

———. September 1, 2004. *John Pennekamp Coral Reef State Park Management Plan.* Tallahassee, FL: FDEP. Available online at: http://www.dep.state.fl.us/parks/planning/ plans.htm.

———. 2005a. Fig. 3.11. John Pennekamp State Park Photos. *Florida Online Parks Guide.* FDEP. http://www.floridastateparks.org/pennekamp/Photos-Park.cfm.

———. 2005b. Fig. 3.12. Curry Hammock State Park Photos. *Florida Online Parks Guide.* FDEP. http://www.floridastateparks.org/curryhammock/Photos-Park.cfm.

———. 2005c. Volunteer at a Florida State Park. *Florida Online Parks Guide.* FDEP. http://www.floridastateparks.org/volunteers/default.cfm.

———. February 11, 2005. *Curry Hammock State Park Management Plan.* Tallahassee, FL: FDEP. Available online at: http://www.dep.state.fl.us/parks/planning/plans.htm.

———. April 22, 2005. *John D. MacArthur Beach State Park Management Plan.* Tallahassee, FL: FDEP. Available online at: http://www.dep.state.fl.us/parks/planning/plans.htm.

———. August 1, 2006. The Office of Park Planning. FDEP. http://www.dep.state.fl.us/parks/planning/default.htm.

Florida Department of Environmental (FDEP) Office of Coastal and Aquatic Managed Areas (CAMA). 1992. *Coupon Bight Aquatic Preserve Management Plan.* Tallahassee, FL: FDEP. Available online at: http://www.dep.state.fl.us/coastal/downloads/management_plans/aquatic/.

———. October 28, 2005. Living Waters: Aquatic Preserves of Florida. FDEP. http://www.dep.state.fl.us/coastal/livingwaters.htm.

———. March 14, 2006. Public Workshop Information. FDEP. http://www.dep.state.fl.us/coastal/workshop_schedule.htm.

———. April 24, 2006. Aquatic Preserves at a Glance. FDEP. http://www.dep.state.fl.us/coastal/downloads/glance/.

———. June 2006. *Florida Aquatic Preserves: A Program Overview.* Tallahassee, FL: FDEP. Available online at: http://www.dep.state.fl.us/coastal/.

———. October 2006. Fig. 3.14. CAMA Map. Tallahassee, FL: FDEP CAMA.

———. November 2006. Fig. 3.1. CAMA Map. Tallahassee, FL: FDEP CAMA.

Florida Department of Environmental Protection (FDEP) Water Quality Standards and Special Projects Program. June 30, 2006a. Outstanding Florida Waters – Questions and Answers. FDEP. http://www.dep.state.fl.us/water/wqssp/ofwqa.htm.

———. June 30, 2006b. Surface Water Quality Classifications. FDEP. http://www.dep.state.fl.us/water/wqssp/classes.htm.

Florida Fish and Wildlife Conservation Commission (FWC). n.d.(a). *Florida Endangered and Threatened Species Management and Conservation Plan – FY 2004-2005 Progress Report.* Tallahassee, FL: FWC. Available online at: http://myfwc.com/imperiledspecies/pdf/Endangered-Threatened-Species-Mgmt-Plan-FY-2004-2005.pdf.

———. n.d.(b). Fig. 3.8. Florida Keys Wildlife and Environmental Area. *Recreation on Florida's Wildlife Management Lands.* FWC. http://myfwc.com/recreation/florida_keys/visitorinfo.asp.

———. 1999-2005. What are WMAs. *Recreation on Florida's Wildlife Management Lands.* FWC. http://myfwc.com/recreation/WhatAreWMAs.html.

———. January 2004. *Florida Keys Wildlife and Environmental Area Conceptual Management Plan 2004-2014.* Tallahassee, FL: FWC. Available online at: http://www.myfwc.com/wma-planning/default.htm.

Florida Fish and Wildlife Conservation Commission (FWC) Fish and Wildlife Research Institute. n.d. Features. DataGlyphics, Inc. http://research.myfwc.com/features/.

Florida Fish and Wildlife Conservation Commission (FWC) Manatee Program. 1999-2005. Manatee Signs. FWC. http://myfwc.com/manatee/signs/.
———. n.d. Fig. 3.3. Manatee Photo Gallery. FWC. http://www.myfwc.com/manatee/photogallery/manateephotos5.htm.

Florida Keys National Marine Sanctuary (FKNMS). n.d. Figs. 3.7, 3.15, and 3.18. FKNMS.

Florida State Statutes. Chapters 258, 370, 372, 373, and 403.

Gilliam, Dave. n.d. Fig. 3.2. SEFCRI.

Hood, Sharyn. August 17, 2006. Fig. 3.5. News Release: "If we build it, the will come" – a seabird success story. FWC. http://myfwc.com/whatsnew/06/statewide/tern-photos.html.

Johns, Grace, M., Vernon R. Leeworthy, Frederick W. Bell, and Mark A. Bonn. 2001. *Socioeconomic study of reefs in southeast Florida: Final Report.* Hollywood, FL: Hazen and Sawyer P.C., in association with Florida State University and National Oceanic and Atmospheric Administration.

Kautz, Randy. n.d. Fig. 3.9. FWC. http://myfwc.com/recreation/florida_keys/nc_coastal.asp

Porche, C.E., A.M. Eklund and G.P. Scott. 2003. *An assessment of rebuilding times for goliath grouper.* SEDAR6-RW-3. 25 pp.

Rohmann, SO, Hayes, JJ, Newhall, RC, Monaco, ME, Grigg, RW. In press. The area of potential shallow-water tropical and subtropical coral ecosystems in the United States. *Coral Reefs.*

Reef Environmental Education Foundation (REEF). August 2001. Tropical Western Atlantic/Northwestern Atlantic Data. REEF. http://www.reef.org/data/twa/index.htm

South Florida Water Management District (SFWMD). November 1995. *Biscayne Bay Surface Water Improvement and Management (SWIM) Plan.* West Palm Beach, FL: SWFMD. Available online at: https://my.sfwmd.gov/portal/page?_pageid=2294,5174095,2294_5174096&_dad=portal&_schema=PORTAL&project=1301&ou=440.

Spoil Island Working Group. n.d. *Spoil Island Project.* Treasure Coast Web Design. http://www.spoilislandproject.org/.

U.S. DOC (Department of Commerce). 1996. *Strategy for Stewardship: Florida Keys National Marine Sanctuary Final Management Plan/Environmental Impact Statement.* Silver Spring, MD: National Oceanic and Atmospheric Administration. Available online at: http://floridakeys.noaa.gov/regs.

Chapter 4: Guam Coral Reef MPA Summary

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INTRODUCTION

The U.S Territory of Guam is the southernmost island of the Mariana Archipelago, and the largest and most populated island in Micronesia. Guam is surrounded by offshore banks, and fringing, patch, submerged, and barrier reefs. The coral reef and lagoon area encompass approximately 69 square kilometers (km^2) in nearshore waters between zero and three nautical miles (Hunter 1995).

Traditionally, fishing on coral reefs has been an important part of local Chamorro culture, and fish were valued as an important food source. Today, Guam's reefs also support the island's tourism industry, which accounts for an estimated 60 percent of the government's revenues (Porter, et al. 2005). While dependence on the fishery has decreased, these resources remain economically and culturally important today.

Guam's reefs are threatened by several natural and anthropogenic impacts, including typhoons, crown of thorns starfish outbreaks, land based pollution, recreational impacts, fishing pressure, and coral disease and bleaching. Geology, human population, level of coastal development, types of marine uses, circulation patterns, and frequency of natural disturbances contribute to the high variability of reef health around the island. Overall, the health of Guam's reefs has declined over the past 40 years (Porter, et al. 2005). Efforts to address some of these threats are on-going.

For more than 12 years, Guam has been working towards the establishment of MPAs. It has been only recently, however, that these efforts have paid off and management objectives are being realized with support from the public. Guam's first attempt to create an MPA was the establishment of a territorial seashore park in 1978. This park is still in existence today, and, although it was legally established and a master plan was written to support it, there has been no management action in the park, and no agencies claim responsibility for its management.

Since then, the Guam Department of Agriculture, Division of Aquatic and Wildlife Resources (DAWR) has established a network of marine preserves surrounding the island to regulate the take of aquatic life to protect coral reef habitat and the related fauna. The network was established after the results of 12 years of fisheries data collection revealed a 70 percent decrease in catch per unit effort values (Gutierrez 2003). In other words, nearshore fish stocks were greatly depleted and DAWR decided it was time to take action.

With overfishing and poor land use practices seen as major threats to the integrity of Guam's marine ecosystems, DAWR investigated sites around the island that could be set aside as marine preserves. Site selection for the preserves in this network was based on a set of criteria that included habitat diversity, protection of spawning stocks, species richness, usage, enforceability, cultural practices, and local economic benefit (Sherwood 1989). From the nine sites initially proposed, five permanent sites were selected for conservation. The process to develop the network of marine preserves took more than 12 years but the establishment of these protected areas has demonstrated improved resource health and increased public support (Gutierrez 2003).

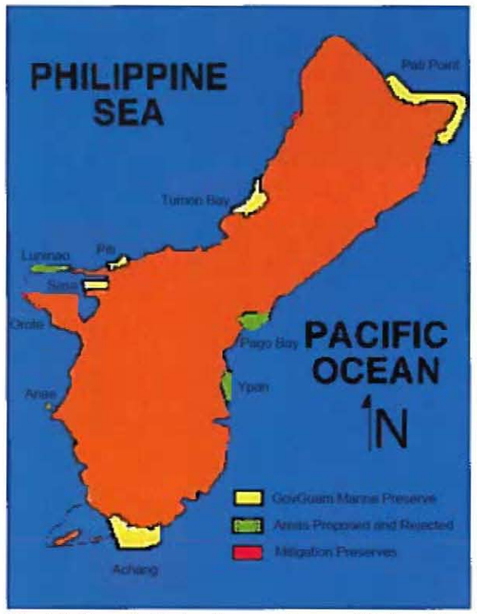

Fig. 4.1: Guam's Marine Preserve System (Davis n.d.)

MPA TYPES

Marine Preserves

National Classification: Zoned Multiple-Use and No-Take, Sustainable Production MPAs

Enabling Legislation and Responsible Agency:

The five marine preserves were legally established in 1997 through Guam Public Law 24-21, An Act to Establish Rules and Regulations for the Control of Fisheries by the Department of Agriculture. This legislation covers a broad array of modifications to Guam's approach to fisheries management, the most significant being a new section on marine preserves. On April 14, 2006, Public Law 28-107 was passed to further strengthen the protection of the marine preserves by prohibiting non-fishing activities, such as development, construction, drilling, and trenching.

DAWR is the agency responsible for managing and enforcing the regulations for the marine preserves.

Goals, Objectives, Policies, and Protections:

The goal of the marine preserves, as defined in Public Law (P.L.) 28-107, is to protect, preserve, manage, and conserve aquatic life, habitat, and marine communities and ecosystems, and to ensure the health, welfare, and integrity of marine resources for current and future generations.

One way this goal is being accomplished is through the protection of important fisheries habitat, including spawning, mating, and nursery grounds, and/or by providing refugia for species that have been exploited as by-catch. To achieve this goal, fishing and other activities are limited within the boundaries of the marine preserves.

Given that the preserves were initially established to recover food fish stocks, most preserve regulations currently revolve around fisheries management. Trolling seaward of the reef margin is allowed in all the preserves and bottom-fishing from the 100 foot depth seaward is allowed within the Tumon Bay Preserve. Certain cultural fishing practices that do not threaten the restoration goals of the preserve system are allowed within the boundaries of the Tumon Bay, Pati Point, Piti Bomb Holes, and Achang Bay Marine Preserves to sustain local cultural traditions. All other fishing activities are prohibited within the marine preserves.

DAWR is working to develop an eco-permit system (P.L. 27-87) that will regulate recreational and other non-fishing activities in all MPAs, but several activities are already regulated through other means. Permits are required from DAWR for development activities within the preserves. The use of jet skis within the preserves is limited to waters beyond the fore reef slope to prevent reef damage in shallow waters, except in Tumon Bay Marine Preserve, where they are allowed to traverse the channel at no-wake speed (9 GCA §70.25). Other non-extractive activities, including other recreational uses, educational uses, and non-extractive research, are permitted within the boundaries of the preserves. Local mangers are interested in conducting carrying capacity studies for some of the marine preserves that are heavily used by the recreational diving industry. These studies would provide managers with the necessary information to adequately manage the intensity of recreational use within the preserve system.

Table 4.1: Priority Coral Reef Resources and Habitats Found in the Five Marine Preserves

Marine Preserves	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Mud Flats	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Piti Bomb Holes	x		x				x	x	x	x	x	x	
Achang Reef Flat	x	x	x	x	x	x	x	x	x	x	x		
Pati Point	x						x	x	x	x	x		
Sasa Bay	x	x		x	x	x	x	x	x	x	x		x
Tumon Bay	x						x	x	x	x	x	x	

Management Activities:

Guam's focus has been on the development of strong fisheries and coral reef laws and regulations to support the goals of its marine preserve system. Therefore, the preserves are subject to specific regulations that have been incorporated into the territorial fishing regulations.

On-going management activities have been thus far successful in addressing the goal of the preserves to restore food fish populations. DAWR's current management programs include monitoring, enforcement, public awareness, permitting, and scientific research. Additional program support, including a public awareness campaign is provided by the Guam Coral Reef Initiative Coordinating Committee (GCRICC), which is made up of several agencies that work to collaboratively promote coral reef conservation and awareness.

Research and Monitoring:

Fig. 4.2: Fish surveys (Davis n.d.)

Guam was fortunate to have 12 years worth of detailed baseline information on annual fish extraction before the preserves were put into effect. This data indicated a reduction in fish stocks and major shifts in methods of harvest, suggesting the need for management actions that resulted in the establishment of the marine preserves (Pitlik 1997). A monitoring program was launched in 1999 to determine the effect of the new regulations on fish biomass and diversity. This information is collected through on-going fish transect counts and timed swim counts. These activities will be included in the comprehensive monitoring program being developed by the Coral Reef Monitoring Group. Research activities within preserves have been conducted by the University of Guam and include studies on larval tracking and dispersal, algal abundance, seagrass, and recreational impacts to coral reefs.

Education and Outreach:

In addition to public involvement during the establishment of the preserves, several public awareness programs have been implemented to increase public understanding and to encourage continued and increased support from local communities. These programs include radio, television, and newspaper announcements about the purpose of the marine preserve network and the regulations pertaining to each site. School programs and an educational road show to the villages have also been conducted to educate the public about the definition, purpose, and rules and regulations of the sites. Signage posted at each of the marine preserves defines the boundaries and describes the regulations for the sites.

Fig. 4.3: Kika, Guam's coral reef mascot (Galide Group 2002)

As previously mentioned, the GCRICC has developed a public outreach campaign on coral reefs, which seeks to increase public support for MPAs as a tool to protect local marine resources. The campaign includes an official mascot and several public events to promote reef-friendly behavior. At these events, Guam residents can learn more about the marine preserve network. The campaign has also aired television ads in several languages to include the diverse cultural backgrounds present in Guam's resident and visiting populations.

Enforcement:

DAWR enforcement officers, known as conservation officers, are primarily responsible for fish and wildlife enforcement, which includes the application of specific regulations at each of the preserves. Conservation officers conduct random site visits to observe activities and enforce the laws and regulations in the preserves, and respond to reports from the public about illegal activities occurring within the sites. Other enforcement officers, such as police officers, may also enforce the marine preserve laws and regulations.

Fig. 4.4: Preserve enforcement (Davis n.d.)

Permitting:

DAWR established a permitting program specific to the preserves to regulate commercial uses and the collection of species for research purposes within the preserve system. Development of an eco-permit system to regulate recreational and other non-fishing activities within the preserves is underway. Finally, a Seashore Clearance Permit Program is administered by the Department of Land Management (21 GCA §63). A Seashore Reserve Plan and regulations for the permit program, which are currently being drafted, will provide guidance to the Seashore Protection Commission on regulating development activities around Guam while protecting the environment.

Stakeholder Involvement and Public Participation:

DAWR utilized an extensive public participation process to obtain public support for the network of marine preserves. The establishment document was created in 1985, but it took six years for all of the involved local agencies to refine and approve the document for public release. The original proposal included nine marine preserve sites located around the island, with five permanent sites and four rotational sites. The four rotating preserves were intended to serve as an educational tool to inform local fishermen and the public about how marine preserves function and the impacts of fishing. In 1993, a series of public hearings was held to respond to stakeholder concerns about the proposed system. Hundreds of community members from various districts attended the meetings. The public response to the proposed marine reserves was largely negative, with the strongest objections coming from a local fishing group. In response to this opposition, DAWR made a concerted effort to understand and address the concerns of almost all of the leaders and members of the local fishing groups and associations.

Through these discussions, fishers began to understand the results of the fisheries data and the purpose of marine preserves. To alleviate the remaining major concerns, several revisions were made to the original proposal, including the removal of fishery licensing requirements and regulations regarding reporting fishery catch, and reduction of the number of preserves from the original nine sites to five permanent sites. It was decided that the four educational rotating sites were no longer necessary since local management support was attained for the five permanent sites. The revised proposal was presented in a second round of public hearings and encountered little resistance. Additionally, one community requested that a proposed rotating preserve in Merizo be made permanent. This preserve is now the Achang Bay Marine Preserve.

The comments from the second round of public hearings were incorporated into the proposal for the marine preserve network and submitted to the Guam Legislature for additional edits. The legislature removed one permanent preserve from the proposal, and five permanent preserves were eventually established. The entire public process took seven years and the proposal was finally adopted as Guam Public Law 24-21, An Act to Establish Rules and Regulations for the Control of Fisheries by the Department of Agriculture, in January 1997.

CHALLENGES TO MPA EFFECTIVENESS

The greatest challenges in effectively managing the marine preserves, as identified by local managers, are a lack of human management capacity and a lack of enforcement. One of the major problems in hiring additional staff is the lengthy and cumbersome territorial government hiring process. For this reason, a number of essential staff positions are vacant. Specifically, qualified staff is needed to conduct research and monitoring programs. It has been very difficult for DAWR to locate individuals with adequate research expertise to accomplish necessary management activities.

The human capacity shortage also affects Guam's ability to enforce regulations within and around the marine preserves. While more enforcement personnel could help to address some enforcement issues, several enforcement challenges are not related to staffing. The location of some sites does not facilitate enforcement because they are located in areas that are difficult to access by boat or within military bases. Another enforcement limitation is the difficulty to observe the entire coastline from shore. Enforcement is also a challenge because violations of preserve regulations are rarely prosecuted and therefore there is little legal incentive for resource users to comply with the regulations. Lack of enforcement results in continued poaching and other illegal fishing practices, ultimately reducing management effectiveness by decreasing public support for MPA efforts. The decrease in public support happens when use restrictions are applied to the area, but inadequate enforcement of the sites allows for poaching by a few "dishonest" fishers while limiting public use. In response to these concerns, the Guam Department of Agriculture has hired a natural resource prosecutor, and is currently working to develop a citation system (P.L. 26-25) and a volunteer conservation program (P.L. 28-30).

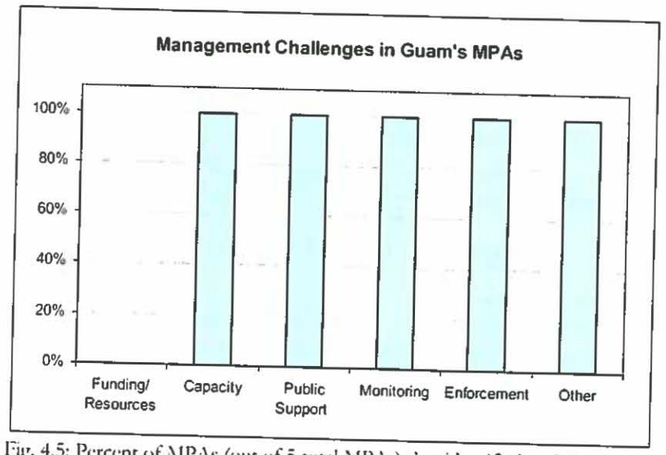

Fig. 4.5: Percent of MPAs (out of 5 total MPAs) that identified each issue as a management challenge to MPA effectiveness. "Other" challenges included the need for the development of a citation system to determine penalties for illegal activities.

Fig. 4.6: Tumon Bay Marine Preserve (Davis n.d.)

Finally, the coral reef habitat in some of Guam's marine preserves is threatened by intense levels of recreational use and land-based sources of pollution from adjacent watersheds. To address recreational use issues, Guam is working to establish an eco-permit system to regulate recreational uses other than fishing. There are also efforts to reduce the land-based sources of pollution affecting the preserve sites, such as using a watershed approach to management. All of the island's watersheds have been identified and prioritized, based on importance and data, by the Guam Watershed Planning Committee. This local group consists of representatives from various natural resource and public health agencies. Although some of the marine preserves lie adjacent to watersheds with high sediment and pollutant levels, other watersheds that pose a more direct threat to human health have been given a higher priority.

WORKING TOWARDS A NETWORK

Despite these challenges, Guam designed and implemented the marine preserves as part of a formal network with the intention of protecting 10 percent of Guam's shoreline and 20 percent of the adjacent reef. According to the 2002 *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States* report, the marine preserves "represent approximately 12% of the coastline and 28% of the coral reefs" (Richmond and Davis 2002). On-going monitoring of the MPAs is taking place to determine the effectiveness at restoring fish populations.

NEXT STEPS/ RECOMMENDATIONS

Guam has achieved initial success in the establishment of its marine preserve system. To build off these accomplishments and further improve MPA management effectiveness, the following actions are recommended:

Watershed Management:
The Guam Watershed Planning Committee should consider the development of a two-pronged approach to watershed management priority setting that takes both human health and environmental threats into consideration when identifying priority sites for funding support and management action. Funding that is intended to reduce the environmental effects of land-based pollution should be directed at watershed areas that pose the greatest threat to Guam's natural resources. While it is imperative to attend to public health issues, other sources of funding should be sought to address them. Currently, Tumon Bay is the only watershed that has been identified as a priority for management funding. However, land-based management actions that reduce sediment could also significantly improve coral reef ecosystems in Piti Bomb Holes and Achang Bay. Additionally, addressing the land-based pollution issues in these sites could improve support by local fishers who are often the sole targets of management action while sources of other human impacts to marine ecosystems go unregulated. To further protect the preserves from development threats, they should be listed as selected sensitive areas within the Seashore Reserve Plan.

Community Watch Program:
It is recommended that Guam build a strong community support program for its MPAs to improve enforcement capabilities. While community members may not be able to legally enforce specific regulations, they can provide needed assistance in surveillance, monitoring, and outreach at preserves sites adjacent to their communities. There are some excellent examples of effective community watch programs in the Pacific Islands region that empowered communities to take an active role in managing local resources. Successful community watch programs have been developed in Palau, Pohnpei, and Hawaii. It may be feasible to do exchange visits between these sites to learn about the development and implementation of these programs. At a minimum, a part-time staff person would be required to develop and run this program, and to work directly with communities adjacent to MPA sites.

Table 4.2: National Classification System for Guam's Five MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Achang Reef Flat Marine Preserve	Sustainable Production	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	No
Pati Point Marine Preserve	Sustainable Production	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	No
Piti Bomb Holes Marine Preserve	Sustainable Production	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	No
Sasa Bay Marine Preserve	Sustainable Production	No-Take	Permanent	Year-round	Ecosystem	No
Tumon Bay Marine Preserve	Sustainable Production	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	No

SUCCESS STORY

One of the main purposes of creating Guam's network of marine preserves was to restore declining fish stocks. After only five years of enforcement, the preserves show signs of improvement. Studies have confirmed that limiting fishing in these areas has had a considerable effect on species density and diversity. Research conducted by DAWR showed that after only two years of enforcement, the number of fish along transects in the Piti Bomb Holes and the Achang Reef Flat Marine Preserves increased by over 100 percent (Gutierrez 2003). In Piti Bomb Holes, the number of species increased by 14 percent and the diversity of fish species increased by 38 percent (Gutierrez 2003). Data collected by the University of Guam Marine Lab supports these findings, indicating that the mean densities of four focal species, *Mulloidichthys flavolineatus, Chlorurus sordidus, Naso lituratus,* and *Naso unicornis,* were at least 20 percent higher (in many cases, much higher) in the preserves versus control sites. In addition to increased density, the data documented a shift in the population structure towards larger individuals in the preserve populations of *C. sordidus* and *M. flavolineatus*, suggesting that the preserves are indeed working as an egg bank, with higher levels of reproductive potential than nearby control sites. Furthermore, the data indicated that the orangespine surgeonfish (*Naso lituratus*) showed a net outflow of biomass from the preserves, with 26 percent of all tagged biomass emigrating from MPAs. This data suggests that MPAs have the potential to provide herbivore biomass to adjacent areas that may be suffering from algal overgrowth (Tupper in preparation).

As a result of healthier reefs, and an increased number and size of fish, residents and visitors have recognized the benefits of marine preserves. The Guam Visitor's Bureau (GVB) partnered with the Guam Coastal Management Program to promote Tumon Bay Marine Preserve as a Sea Life Park during the summer months of 2005. This program included guided snorkel tours for tourists, the production of identification cards for common species found in the preserve, and a full color brochure illustrating the bay. The preserve also has three kiosks that remind visitors to safely enjoy the beauty of this unique bay. In addition to growing interest from the tourism industry, the Guam Legislature and DAWR continue to support the preserves. Realizing that it may become necessary to limit recreational uses within the preserves, the legislature passed Public Law 27-87, which authorized the Department of Agriculture to regulate non-fishing activities within the five marine preserves. Through the development of an eco-permitting program, DAWR will be able to keep recreational uses within limits that are compatible with the goal of fisheries restoration. The regulations are currently awaiting final approval.

CITATIONS

Davis, Gerry. n.d. Figs. 4.1, 4.2, 4.4, and 4.6. NOAA Fisheries Office of Habitat Conservation.

Government of Guam, Department of Agriculture, Division of Aquatic and Wildlife Resources.

Galide Group. 2002. Fig. 4.3.

Guam Code Annotated (GCA). 9 GCA §70.25. Jet Ski Operation, Tumon Bay.

Guam Code Annotated (GCA). 21 GCA §63. Guam Territorial Seashore Protection Act of 1974.

Guam Public Law 24-21. An Act to Establish Rules and Regulations for the Control of Fisheries by the Department of Agriculture.

Guam Public Law 26-85. An Act to Authorize the Department of Agriculture to Issue Citations for Fishing and Wildlife Violations.

Guam Public Law 27-87. An Act to Create a Marine Preserve Eco-Permitting System.

Guam Public Law 28-30. An Act to Create a Civilian Volunteer Conservation Officer Reserve Program.

Guam Public Law 28-107. An Act to Expand the Protection of Guam's Marine Preserves.

Gutierrez, J.T. 2003. *Two-year Report on the Effects of Guam's Marine Preserves.* Government of Guam, Department of Agriculture, Division of Aquatic and Wildlife Resources.

Hunter, C.L. 1995. *Review of coral reefs around American flag Pacific islands and assessment of need, value, and feasibility of establishing a coral reef fishery management plan for the western Pacific region.* Honolulu, Hawaii : Western Pacific Regional Fishery Management Council.

Pitlik, Todd J. 1997. *Inshore Creel Survey Annual Report.* Guam Division of Aquatic and Wildlife Resources.

Porter, Val, Trina Leberer, Mike Gawel, Jay Gutierrez, David Burdick, Victor Torres, and Evangeline Lujan. 2005. The State of Coral Reef Ecosystems of Guam. pp. 442-487. In: J. Waddell (ed.), *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005.* NOAA Technical Memorandum NOS NCCOS 11. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. 522 pp.

Richmond, Robert H., and Gerry W. Davis. 2002. Status of the Coral Reefs of Guam. pp. 189-194. In: *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2002.* National Oceanic and Atmospheric Administration/National Ocean Service/National Centers for Coastal Ocean Science, Silver Spring, MD. 265 pp.

Sherwood, T. 1989. Establishing Permanent Marine Conservation Areas in Guam. Project Progress Report. pp. 110-118. In: *Division of Aquatic and Wildlife Resources Annual Report Fiscal Year 1989.* Government of Guam, Department of Agriculture, Division of Aquatic and Wildlife Resources.

Tupper, M. In preparation. Piti Bomb Holes Preserve, Achang Reef Flat Preserve, and Tumon Bay Marine Preserve. WCPA-Marine/WWF MPA Management Effectiveness Initiative, Draft Preliminary Report.

Chapter 5: Hawai'i Coral Reef MPA Summary

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INTRODUCTION

As one of the most isolated archipelagos on earth, Hawai'i has estimated rates of endemism of 25 percent or greater for most coral species. This unique marine life is found no where else in the world (DLNR DAR 2005). These isolated islands consist of two regions, the Main Hawaiian Islands (MHI) and the Northwestern Hawaiian Islands (NWHI). The MHI, where 99 percent of the state's 1.3 million residents reside, consists of "high volcanic islands with non-structural reef communities and fringing reefs abutting the shore" ((Friedlander, et al. 2005c). In contrast, the NWHI remains mostly uninhabited atolls, islands, and banks that span over 2,000 kilometers (km) northwest of the MHI.

Historically, coral reefs played an important role in Hawaiian culture and were recognized as the building blocks of the islands (Friedlander, et al. 2005b). To this end, native Hawaiians had intimate knowledge of their ocean resources and employed a relatively sophisticated system to manage resources that reduced waste and ensured long-term use. Some of these methods included a "kapu" system in which the chiefs would decree an area off limits to regulate fishing during certain times (e.g., spawning season); other methods reserved certain species (DLNR DAR 2005).

Over time, these practices have eroded due to cultural, political, and demographic changes that have affected water rights, land use, and land ownership. These changes have disrupted ecosystem functions and sustainable management practices over just a few generations (Friedlander 2004). Today, Hawai'i's reefs are threatened by a number of factors, including fishing pressure, land based pollution, coastal development, aquatic invasive species, and recreational overuse.

However, these reefs remain an important part of Hawai'i's way of life. In addition to providing protection from large ocean swells and providing food for sustenance, it is estimated that the state's coral reefs generate approximately $800 million annually in added value to the state's economy (Friedlander, et al. 2005b).

To address some of the threats facing coral reefs and accommodate tourism needs, the state has been establishing and managing MPAs for 40 years. The first MPA, the Hanauma Bay Marine Life Conservation District, was designated in 1967 to provide a place where people could view a variety of marine life. Many of the initial MPAs were designated for socio-economic reasons, including local community support, reducing conflicts between user groups, ease of public access, ease of establishing and marking boundaries, cultural value, and/or scenic beauty. Some secondary goals of the MPAs included fishery enhancement or habitat protection. While Hawai'i's MPA types are currently separated into several categories, each individual site has a unique set of rules, regulations, management actions, and reasons for establishment. Because of the numerous types of MPAs, and the fact that many do not have clearly articulated goals and objectives that can be used to measure their effectiveness, Hawai'i's Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR) is currently working to develop a new framework of MPAs. See "Working Towards a Network" section.

Fig. 5.1: Hanauma Bay MLCD (Komoto n.d.)

Hawai'i has established 39 MPAs that contain coral reef resources and habitats. These sites are categorized into the following types: marine life conservation district (MLCD), fishery management area (FMA), regional fishery management area with fisheries replenishment areas (FRAs), bottomfish restricted fishing area (BRFA), natural area reserve (NAR), cultural reserve, wildlife sanctuary, marine laboratory refuge, and marine refuge.

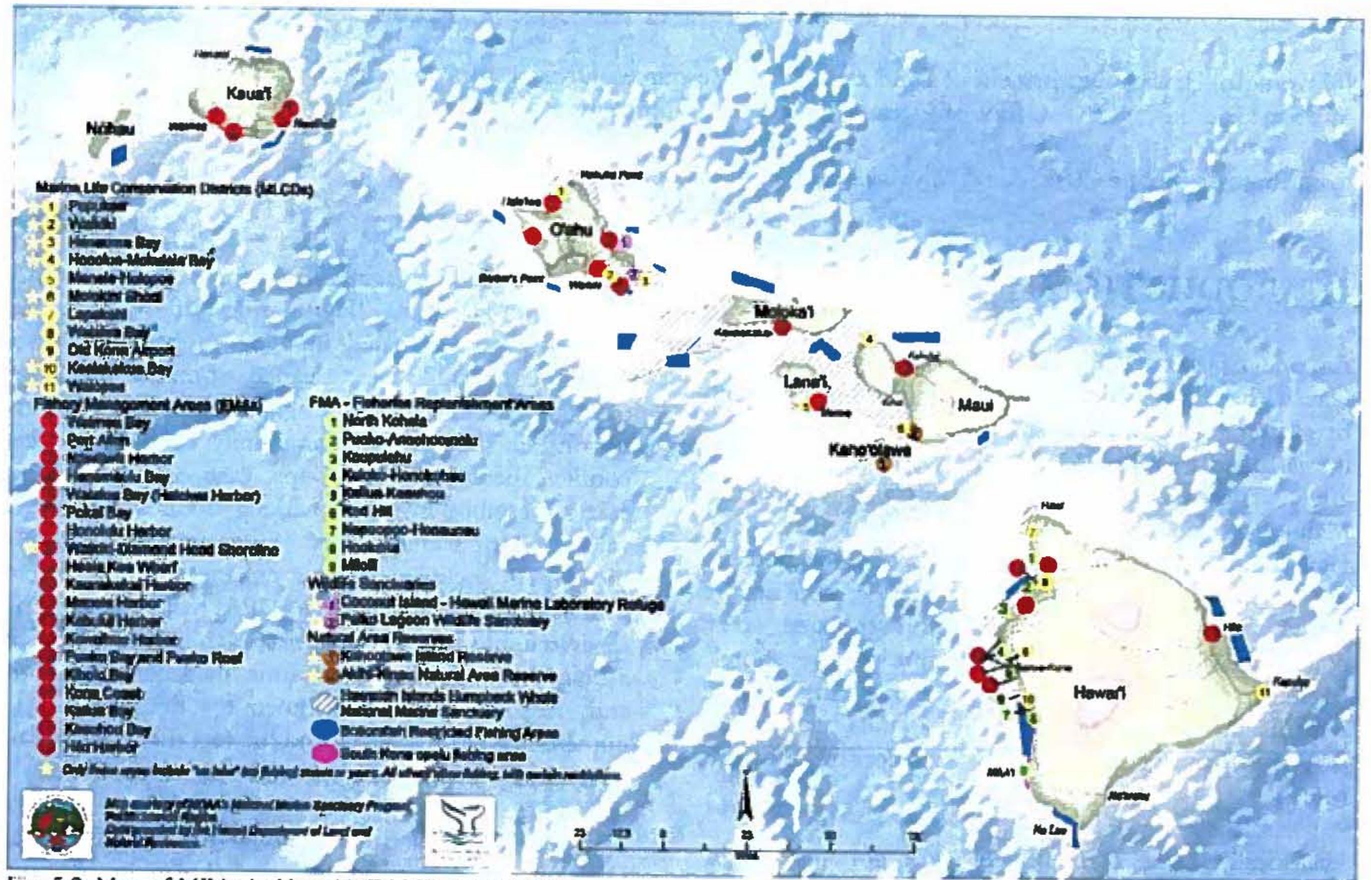

Fig. 5.2: Map of MPAs in Hawai'i (DLNR DAR 2005)

MPA TYPES

Marine Life Conservation Districts

National Classification: No-Take, Zoned Multiple-Use with No-Take Areas, Zoned Multiple-Use, and Uniform Multiple-Use, Natural Heritage MPAs

Enabling Legislation and Responsible Agency:

The Marine Life Conservation Program was established under Hawai'i Revised Statute (HRS) Chapter 190 (1995). Under this statute, all of the state's marine waters comprise a marine life conservation area, which is administered by DLNR. DLNR has the authority to establish and modify the limits of conservation districts in each county. Additionally, HRS Chapter 190 instructed DLNR to adopt rules that may "prohibit activities that may disturb, degrade, or alter the marine environment, establish open and closed seasons, designate areas in which all or any one or more of certain species of fish or marine life may not be taken, prescribe and limit the methods of fishing, including the type and mesh and other description of nets, traps, and appliances, and otherwise regulate the fishing and taking of marine life" (HRS 190-3). Under HRS Chapter 190-4, DLNR has the ability to administer, and revoke, permits for scientific, education, or other public purposes on such terms and conditions that are necessary to minimize any adverse effects within the MLCDs. This chapter also instructs DLNR to adopt rules to regulate anchoring and mooring, and it establishes penalties for violations of this statute or rule.

Goals, Objectives, Policies, and Protections:

The main criteria used to establish the MLCDs included:

- significant resources – the site supported abundant marine life, geological features that needed protection, etc;
- the site was in a relatively pristine state; and,
- there was future potential for the area to recover or flourish.

Additional criteria that were considered included:

- ease of establishing boundaries (e.g., across the mouth of an embayment); and,
- ease of access to the resources for ocean recreation activities.

Because MCLDs are designated to conserve and replenish marine resources, the taking of any marine life (fish, eggs, shells, corals, algae, etc.) and non-living habitat material (sand, rocks, coral skeletons, etc.) is

generally restricted, or prohibited entirely. Thus, the regulations may foster non-consumptive uses, such as swimming, snorkeling, and diving. Fishing may be allowed subject to certain gear restrictions, based on input received during the public meeting process. However, DAR acknowledges that, "from a conservation standpoint (and to avoid confusion about the rules), it may be desirable to prohibit all consumptive use in future MLCDs" (DLNR DAR n.d.).

Boating is also regulated within the MLCDs under HRS 190-4.5 and HRS 200, which enable DLNR to establish rules to regulate anchoring and mooring. Many sites have anchoring regulations or non-motorized boating zones to protect the marine resources from anchor damage.

When Hanauma Bay MLCD was created in 1967, regulations prohibited the taking of marine life, shells, coral, rocks, or sand. As a result of these restrictions, fish populations increased and the bay became popular for snorkeling and diving. Most MLCDs were established in the 1970s and 1980s in response to a noticeable impact on resources from overuse by recreational users (such as anchor damage), or from increasing consumptive uses that were threatening the scientific, recreational, or educational value of the natural resources at the sites. In more than half of the MLCDs, it is prohibited to fish for, catch, take, injure, kill, possess, or remove any marine life, or to take, alter, deface, destroy, possess, or remove any sand, coral, rock, or other geological feature. In addition to these protections, each MLCD has more specific regulations, such as anchoring restrictions or designated allowable fishing methods (e.g., fishing for finfish for home consumption is permitted from shore using thrownet or pole and line without reel). Some MLCDs are divided into two subzones that allow different uses (e.g., subzone A = no-take, subzone B = hook and line and thrownet for finfish allowed).

Since the late 1970s, three MLCDs have been established (Pupukea in 1983, Old Kona Airport in 1992, and Wai'Opae in 2003). Wai'Opae is the only MLCD that prohibits commercial tourism activities.

DLNR's DAR manages all of the MLCDs. However, many of these areas are accessed through county or state beach parks, requiring cooperation with other entities. The Hanauma Bay Nature Preserve is a good example of a co-managed area. The waters are managed by the state, but all access to the site is through a city and county of Honolulu nature preserve.

Management Activities:

Currently, only the Hanauma Bay MLCD has an active management plan, which was developed by the city and county of Honolulu. Wai'Opae Tidepools MLCD has a draft management plan, but it has not yet been

Table 5.1: Priority Coral Reef Resources and Habitats Found in the 11 Marine Life Conservation Districts (MLCDs)

Marine Life Conservation Districts (MLCDs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Hanauma Bay	x					x				x		
Honolua-Mokule'ia Bay	x					x				x		
Kealakekua Bay	x					x	x	x	x	x	x	
Lapakahi	x						x	x	x	x		
Manele-Hulopo'e	x					x		x	x		x	
Molokini Shoal	x		x					x	x	x	x	
Old Kona Airport	x					x	x	x	x	x	x	
Pupukea-Waimea	x						x	x	x	x	x	
Waialea Bay	x		x					x		x	x	
Waikiki	x						x	x	x	x		
Wai'Opae Tidepools	x							x				

approved by DAR. At a recent Coral Reef Alliance workshop, attendees highly recommended the development of a management plan for both the Honolua-Mokule'ia Bay and Molokini Shoal MLCDs.

Research and Monitoring:
DAR has been collecting fish and habitat data in all of the MLCDs since the 1970s. These data sets were incorporated into the Coral Reef Monitoring and Assessment Program (CRAMP), which provides over 30 years of data in some locations. In addition to the data sets included in CRAMP, there is an MHI monitoring program that has been monitoring sites continuously in West Hawai'i and Maui for many years. The program is also beginning to do comparative monitoring in protected and adjacent sites on O'ahu. A report from this work showed that abundance and distribution of species and assemblages was strongly tied to habitat type. To date, all of the regularly monitored MLCDs have higher fish biomass than adjacent sites, and have higher values for most other fish assemblages (e.g., diversity, size, and species richness) (Friedlander, et al. 2005b). Apex predators and other target species were more also abundant and larger in the MLCDs than in adjacent sites (Friedlander, et al. 2005a).

Education and Outreach:
Outreach and education programs vary by site. At a minimum, signs are located at each MLCD to indicate boundaries and describe regulations for the area. Some MLCDs have more active outreach programs (e.g., Hanauma Bay, Wai'Opae Tidepools, Pupukea-Waimea, and Honolua-Mokule'ia Bay), which range from community outreach programs that utilize volunteers to distribute information to users, to a formal education center equipped with educational videos, interactive displays, on-going events, and outreach staff.

Enforcement:
All MLCDs are enforced by DLNR's Division of Conservation and Resources Enforcement (DOCARE). DOCARE officers have full police powers, and enforce all state laws and rules involving state lands, state parks, historical sites, forest reserves, aquatic life and wildlife areas, coastal zones, conservation districts, state shores, boating and ocean recreation activities, and small boat harbors. Therefore, DOCARE is responsible for enforcing both land and marine activities. This task is tremendous, considering that Hawai'i has the fourth largest coastline in the nation, including 23,000 acres of inland surface waters, three million acres of state ocean waters, and 410,000 acres of coral reef around the MHI. There are currently 103 assigned officers to carry out these functions. Officers are not divided into marine/land officers, but are responsible for enforcing all regulations. Much of their responsibilities include outreach and education (DLNR DOCARE n.d.).

Stakeholder Involvement and Public Participation:

The Hawai'i Legislature and the public can suggest an area for establishment as an MLCD. DAR may also recommend sites for establishment based on data gathered from regular surveys of marine ecosystems throughout the state, and where areas demonstrate unique characteristics in need of protection. Once an area is recommended for designation as an MLCD, it is evaluated by DAR with regard to the following criteria:

- public accessibility,
- marine life and future potential values,
- safety from a public usage standpoint,
- compatibility with adjoining area usage, and
- minimal environmental or ecological changes from the undisturbed natural state.
- The area should have clearly defined boundaries so that it is easily recognizable for compliance and enforcement.
- The area must also be of suitable size. In other words, it must be large enough so that fish populations can be restored even with on-going fishing activity outside the MLCD, but small enough so that fishermen are not denied the use of unreasonably vast fishing areas.

If the recommended area meets the above criteria, DAR conducts a thorough investigation consisting of bottom habitat and fish surveys. Input from the public, citizen groups, and governmental and private agencies is also considered, usually with the establishment of a task force of citizens representing different user groups and the affected community. The community group works with DAR to develop recommendations to manage the area, which are then presented at public meetings. Subsequently, regulations for the area are drawn up and another public hearing is held on the proposed regulations. Final approval is obtained from the Board of Land and Natural Resources (BLNR) and the governor.

Fig. 5.3: View from Diamond Head (Komoto n.d.)

Table 5.2: Priority Coral Reef Resources and Habitats Found in the 10 Fishery Management Areas (FMAs)

Fishery Management Areas (FMAs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Hilo Bay, Wailoa River, Wailuku River								x	x			
Kahului Harbor						x		x				
Kailua Bay						x	x	x		x		
Keauhou Bay						x	x	x	x	x	x	
Kiholo Bay						x		x		x	x	
Kona Coast	x						x	x			x	
Nawiliwili Harbor								x				
Puako Bay, Puako Reef	x					x		x		x	x	
South Kona (Miloli'i)	x		x				x	x	x	x	x	
Waikiki-Diamond Head	x					x	x	x	x	x		

Fishery Management Areas

National Classification: Zoned Multiple-Use and Uniform Multiple-Use, Sustainable Production MPAs

Enabling Legislation and Responsible Agency:

The authority for DLNR to designate areas as FMAs comes from HRS 188-53 and 187A-5. Under HRS 188-53, which was passed in 1985, DLNR may establish, maintain, manage, and operate marine fishing reserves, refuges, and public fishing areas, and may make, adopt, and amend rules and issue permits to manage these areas. DLNR also has the authority to adopt, amend, and repeal rules for the conservation and allocation of the natural supply of aquatic life in any area under HRS 187A-5.

DAR is the primary agency responsible for managing the FMAs. However, many of the FMAs have boundaries that overlap with ocean recreation management areas, which have rules to reduce conflicts among ocean users. These areas are managed by the Division of Boating and Ocean Recreation (DOBOR).

Goals, Objectives, Policies, and Protections:

HRS 188-53 states that fishing reserves, refuges, and public fishing areas are established for the purpose of managing, preserving, protecting, conserving, and propagating fish or marine life.

Fishery management areas (FMAs) are established to address user conflicts among various fisher groups and other user groups (e.g., recreational and commercial fishers, boaters, tour operators, and aquarium fish collectors). The 10 FMAs in this report were also established to provide increased protection to one or more resources, such as endangered species.

FMAs have zones that restrict uses by user type, or areas that are closed to certain fishing gears (e.g., net fishing) or activities (e.g., boating) to reduce conflict and avoid depletion of resources. Each FMA has detailed, site-specific rules that target the issue(s) that it was established to address.

Management Activities:

While there are no management plans for the FMAs, several programs are used to manage the sites.

Monitoring:
Most FMAs are not monitored on a consistent basis, except in the Waikiki-Diamond Head FMA and FMAs along the West Hawai'i coastline. These sites have been, or are, monitored by DAR on a continuous basis to assess their effectiveness. In some sites, such as harbors, project-related (e.g., dredging) surveys are conducted.

Education and Outreach:
Outreach and education activities are carried out by DLNR and many of its partners, especially along the West Hawai'i coastline. Numerous presentations are given to the public by DLNR, University of Hawai'i (UH) Sea Grant, and the Hawai'i Coral Reef Initiative. UH Sea Grant-West Hawai'i conducts ReefTalks and ReefWatches on a monthly basis. Some local community groups, such as the Save Kahului Harbor Coalition, or community associations bring individuals together who are interested in protecting resources in areas with FMAs.


Fig. 5.4: Community members participate in marine algae restoration project (Community Conservation Network n.d.)

Enforcement:
All FMA sites are enforced by DOCARE. See the "MLCD" section for more information on enforcement.

Stakeholder Involvement and Public Participation:

New FMAs may be suggested by the Hawai'i Legislature, the public, and DAR. After meeting with the community to determine the area and parameters for the new FMA, public meetings are held. All public input is incorporated into the new rules, which are then submitted to DLNR and the governor for approval.

West Hawai'i Regional Fisheries Management Area with Fisheries Replenishment Areas

The West Hawai'i Regional Fisheries Management Area (WHRFMA), off the Kona coast of Hawai'i, consists of a network of nine fisheries replenishment areas (FRAs) that include over 30 percent of the Kona coastline. The nine FRAs are:

- North Kohala
- Puako-Anaehoomalu
- Kaupulehu
- Kaloko-Honokohau
- Kailua-Keauhou
- Red Hill
- Napoopoo-Honaunau
- Hookena
- Miloli'i

In the early 1970s, multiple-use conflicts between collectors and recreational dive tour operators raised concerns over diminishing nearshore fish stocks. DAR suspended aquarium fish permits briefly in July 1973, but then lifted the suspension and required permittees to submit monthly aquarium catches to DAR. The documented increase in aquarium fisheries catch, and the perceived decline in numbers of fish by the public over several years, escalated into a contentious debate between the recreational dive industry and aquarium industry. The two groups met in July 1987 and reached an informal agreement whereby aquarium collectors would refrain from collecting in certain areas and the dive operators would not initiate legislation to restrict collecting.

When the agreement expired after one year, the groups agreed to permanently close the previously agreed upon areas. These areas were incorporated into the Kona Coast FMA, effective in October 1991 (Antolini 2003). The FMA worked well at reducing the user conflict for a while, but increased pressure from the dive tour sector and the aquarium fishery perpetuated the conflict over the next several years. In May 1996, the West Hawai'i Reef Fish Working Group convened to develop a management plan to regulate the collection of aquarium fish. Many of the group's recommendations were included in DAR's 1997 legislative package, but only one recommendation passed, the establishment of licenses for aquarium fish exporters. In 1999, after significant public involvement, the WHRFMA and the nine FRAs were established.

National Classification: Zoned Multiple-Use, Sustainable Production MPAs

Enabling Legislation and Responsible Agency:

In addition to the enabling legislation for all FMAs, the Hawai'i Legislature enacted Act 306, codified as HRS 188F, which established the WHRFMA in 1998. The act instructed DLNR to establish the WHRFMA to improve the management of consumptive and non-consumptive uses of aquatic resources along the West Hawai'i coastline.

Goals, Objectives, Policies, and Protections:

HRS 188F-3 outlined the following purposes of the WHRFMA:

1) "Ensure the sustainability of the state's nearshore ocean resources;
2) Identify areas with resource and use conflicts;

3) Provide management plans as well as implementing regulations for minimizing user conflicts and resource depletion, through the designation of sections of coastal waters in the West Hawai'i regional fishery management areas as fish replenishment areas and where certain specified harvesting activities are prohibited and other areas where anchoring and ocean activities are restricted;
4) Establish a system of day-use mooring buoys;
5) Identify areas and resources of statewide significance for protection;
6) Carry out scientific research and monitoring of the nearshore resources and environment; and,
7) Provide for substantive involvement of the community" (HRS 188F-3).

In addition, HRS 188F-4 required DLNR to develop a WHRFMA plan that identifies and designates areas of the WHRFMA as follows: 1) designates a minimum of 30 percent of coastal waters as FRAs, in which aquarium fish collection is prohibited, 2) establishes a day use mooring buoy system and high-use areas where no anchoring is allowed, 3) establishes a portion of FRAs as fish reserves where no fishing of reef-dwelling fish is allowed, and 4) designates areas where the use of gill nets as set nets is prohibited. The 30 percent determination was deemed necessary based on MPA and fisheries research that stated that 20 percent of fisheries habitat needed to be placed in reserves while the remaining 80 percent be managed using other traditional fisheries management tools. However, since adequate fisheries management measures were not believed to be in place for the open areas, a higher percentage (35.2 percent) was considered appropriate for the Kona Coast (Walsh 1999).

The resulting regulations for the WHFMA were established through Hawai'i Administrative Rule (HAR) 13-60.3. The rule also identifies the boundaries of the FRAs, and penalties for violations. Within the nine FRAs, it is prohibited to take aquatic life for aquarium purposes, or to engage in or attempt to engage in fish feeding (HAR 13-60.3-3). Other restrictions may apply to specific FRAs. For example, in some areas, gill nets are regulated or banned. It is also important to note that the WHRFMA does not provide additional protection to the waters between the nine FRA sites. However, other state MPAs (e.g., MLCDs and FMAs) are situated within the WHRFMA and provide increased protection to the waters between some of the FRAs.

Fig. 5.5: Regulatory signs posted at an FRA (Bos n.d.)

Management Activities:

While the WHFMA has defined purposes and supporting regulations, it does not have a management plan.

Research and Monitoring:
When the West Hawai'i Reef Fish Working Group convened in 1996, DAR and UH began a joint research project called the West Hawai'i Aquarium Project (WHAP). This project is monitoring sites to evaluate the effectiveness of FRAs as they apply to the management of aquarium fish collecting impacts in West Hawai'i. The surveys for the project were developed to capture population data before and after closures, and to compare closed sites and open access areas along the 100 km west coastline of the island of Hawai'i.

HRS 188F-5 mandates that DAR, in cooperation with UH, review the effectiveness of the WHRFMA every five years. To meet this mandate, the Hawai'i Coral Reef Initiative Research Program (HCRI-RP) and DAR

Table 5.3: Priority Coral Reef Resources and Habitats Found in the West Hawai'i Regional Fishery Management Area (RFMA)

Regional Fishery Management Area (RFMA)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
West Hawai'i	x						x	x		x	x	

used annual NOAA coral reef grants to fund a monitoring program to determine the effectiveness of the FRAs in significantly improving fish stocks.

After five years, the monitoring data show significant increases in the overall abundance of fish targeted by collectors. These results demonstrate that MPAs can effectively aid in the recovery of exploited fish stocks in Hawai'i. The studies also show that there were no significant changes in aquarium fish species outside of the FRAs, indicating that the abundance of fish outside of MPAs will not necessarily decline due to increased fishing pressure in open areas. In addition to the increase in overall abundance within the FRAs, there has been a decrease in the fishing effort outside the FRAs. Since the FRAs went into effect, fishermen are able to catch more fish in less time for a higher value (DLNR DAR 2004).

Fig. 5.6: Young community members learning about species identification and biological monitoring in Miloli'i FRA (Philibotte n.d.)

Education and Outreach:
An outreach liaison for local advisory committees (LACs) has been hired with grant funding to do outreach work with communities within the WHRFMA. These committees voice the concerns and management goals of the local community to the West Hawai'i Fisheries Council (WHFC) (Herkes 2006). See the "FMA" section for information about other efforts.

Enforcement:
All FRA sites are enforced by DOCARE. See the "MLCD" section for more information on enforcement.

Stakeholder Involvement and Public Participation:

There has been strong public participation since the designation of these sites. While their establishment was initiated by user conflicts, the underlying reason was that the public perceived a decline in the resource and was motivated to do something about it.

One of the purposes of the WHRFMA, as identified in HRS 188F-3, is to provide for substantive stakeholder involvement in decision making from local residents and resource users. DLNR worked with UH Sea Grant to develop a process to ensure significant community input into the development and designation of FRAs. The WHFC was established as the basis of this community input process, and it was set up to include 24 voting members, as well as non-voting members, ex-officio members, and resource members representing a wide variety of stakeholders in the area. While DAR is the agency responsible for managing and monitoring the FRAs, the WHFC serves as a primary source for developing and recommending West Hawai'i management actions to DLNR. In 1998, WHFC proposed the location and size of the nine FRAs in the WHRFMA and developed a management plan, which was presented at a public hearing April 1999. The public hearing was one of the largest ever held in Hawai'i on a natural resource issue, and there was overwhelming public support for FRAs. The nine FRAs were closed to aquarium fish collecting on December 31, 1999.

The council has also recommended amendments to the rules to extend the regulations to other fishing activities besides the aquarium fishery. Some of these rules include setting aside certain areas for cultural practices, establishing mooring areas, banning gear specific fishing activities such as SCUBA spearfishing, and banning commercial netting activities while providing for subsistence netting.

Bottomfish Restricted Fishing Areas

According to statistics on commercial landings of fish kept by DAR since 1948, catch rates of onaga and ehu (highly valued fish species) have declined steadily since the early 1950s, with an even steeper drop in the last 10 to 15 years. Additionally, the proportion of mature fish in the landings has decreased. In 2000, approximately 84 percent of the commercial landings of onaga from the MHI were cited as immature, meaning they had not yet spawned. This data may indicate that the large, mature fish are being depleted from the population around the MHI. Based on this information and the dynamic spawning potential ratio (SPR), NOAA Fisheries scientists reported that the bottomfish fishery was in a state of overfishing and had probably been so since at least 1989. The SPR uses catch rates and size-frequencies to calculate a number that compares the estimated spawning biomass of the current year's fish population to an estimate of the virgin spawning biomass (DLNR DAR 2002).

Bottomfish restricted fishing areas (BRFAs) were developed to address the above issues, and to conserve the spawning populations of bottomfish.

National Classification: Uniform Multiple-Use, Sustainable Production MPAs

Table 5.4: Priority Coral Reef Resources and Habitats Found in the 12 Bottomfish Restricted Fishing Areas (BRFAs)

Bottomfish Restricted Fishing Areas (BRFAs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Site A							x	x				
Site B							x	x				
Site C							x	x			x	
Site D							x	x			x	
Site E	x						x	x			x	
Site F							x	x				
Site G							x	x			x	
Site H							x	x				
Site J							x	x			x	
Site K							x	x			x	
Site L							x	x				
Site M							x	x				

NOTE: Recent amendments to the sites include areas that have shown indications of presence by adult and juvenile fish. However, further research is needed to confirm that these sites are, in fact, spawning areas.

Enabling Legislation and Responsible Agency:

The authority for DLNR to designate areas as bottomfish restricted fishing areas (BRFAs) was established through HRS 187A-5 (1993), which allows DLNR to adopt, amend, and repeal rules for the conservation and allocation of the natural supply of aquatic life in any area. More specifically, under HAR 13-94, effective in 1998, DLNR "will restrict fishing in certain areas to conserve the spawning populations of bottomfish" (HAR 13-94-8).

DAR manages all BRFAs. The sites are enforced by DOCARE.

Goals, Objectives, Policies, and Protections:

BRFAs were established throughout the MHI based on several factors. DLNR considered the location of good bottomfish habitat areas and the most effective distribution of the areas, recognizing the potential benefits and limiting negative impacts. Consideration was also given to suggestions from bottomfish fishers. In an effort to develop a comprehensive management program to protect these deep water species, 20 percent of bottomfish spawning areas were included in BRFAs. Lastly, to improve compliance and enforcement, the inshore boundary for BRFAs was set at the 100 fathoms contour (based on NOAA benthic habitat maps).

To conserve the spawning populations of bottomfish, BRFAs prohibit fishing for the following species: Ula'ula koa'e or onaga (red snapper); Ula'ula or ehu (ruby snapper); Kalekale; Opakapaka; Ukikiki or gindai; Hapu'u; and Lehi. Specifically, HAR 13-94 states that "it is unlawful for any person to take or possess bottomfish while in a vessel that is drifting or anchoring within any BRFA, except in times of emergencies or as may be otherwise authorized by law" (HAR 13-94-8(b)). Most bottom-fishing is prohibited in BRFAs, except for consumptive recreational and subsistence fishing, which are allowed with restrictions or permits. It is unlawful for any person, without a current commercial marine license issued pursuant to HAR 13-74-20, to take or possess more than five onaga, five ehu, or a combined total of five of both. Fishing for species other than bottomfish is allowed.

DAR and the National Marine Fisheries Service (NMFS) have reviewed the location of the BRFAs to evaluate their effectiveness. NMFS recently determined that bottom-fishing effort in the MHI needed to be reduced by an additional 15 percent to ensure that the stocks were not placed in an overfished state. To address this issue, DAR worked with the University of

Hawai'i to map areas with bottomfish resources, including identifying bottomfish habitat areas where there were indications of presence by adult and juvenile fish. This information was used in conjunction with commercial fish landings and fishermen interviews to determine the effectiveness of the original 19 BRFAs and to make recommendations for revising those areas. The recent amendments reduce the number of areas from 19 sites to 12, while increasing the total area designated as BRFAs. Many of the 12 new sites consist of old sites that were expanded or slightly modified. However, the amendments also completely eliminate some old sites and create some entirely new areas.

The recent amendments are meant to address "the requirements to achieve the mandated 15% reduction in fishing mortality and other considerations, such as areas likely to do the most good with respect to larval export, protecting probable breeding habitat and areas utilized by juveniles" (DLNR 2006). DLNR and NOAA's Pacific Islands Fisheries Science Center are preparing to conduct an assessment of the proposed sites before they are closed to determine what specific resources are within the sites and to provide a baseline for future evaluation of their effectiveness at meeting their objectives.

Management Activities:

There are no management plans for the BRFAs and management activities are limited within the areas.

Research and Monitoring:
The NOAA Pacific Island Fisheries Science Center conducts research on the life history, ecology, and stock status of bottomfish in the Pacific Islands region. Research funded by DAR has enabled the UH Undersea Research Laboratory to use the Pisces' submersibles to visit 22 different sites since 1998, and to record the difference between the bottom characteristics of locations where bottomfish existed and did not exist. Scientists from UH and federal and state agencies collaborated to study the onaga (Ula'ula koa'e, *Etelis coruscans*) and ehu (Ula'ula, *E. carbunculus*), including identifying critical habitat, performing genetic analyses, developing methods to maintain live fish in captivity, and learning about their interactions with introduced ta'ape.

As previously mentioned, DAR has been keeping statistics on commercial landings since 1948. Reports indicate that the catch rates of onaga and ehu have declined steadily since the early 1950s, and have dropped even more steeply in the last 10 to 15 years. DAR is currently reviewing the BRFAs with bottomfish data obtained from the UH Undersea Research Laboratory, including essential habitat and nursery areas, species distribution, and abundance. In addition to this data, the review is incorporating current catch statistics, impact on fishers, and enforcement aspects.

Education and Outreach:
To inform the public about the bottomfish rules, DAR distributed 30,000 brochures with a foldout map of the BRFAs and a summary of the regulations. Flyers for bottomfish vessel registration were disseminated through DAR offices and fishing supply stores statewide. The proposed BFRA site maps were also mailed to all fishermen who expressed interest in the new sites. A bottomfish management webpage was developed, and local newspapers published numerous articles about the new regulations. DAR staff gave several talks to fishing clubs, DOCARE officers, the Western Pacific Regional Fishery Management Council, and others. DAR staff also gave television and radio interviews, participated in live television shows, and presented at international workshops on the new BRFAs.

Fig. 5.7: Onaga and other fish species observed at a bait station during a UH Undersea Research Laboratory dive (Moffitt 2004)

Enforcement:
All BRFA sites are enforced by DOCARE. See the "MLCD" section for more information on enforcement.

Stakeholder Involvement and Public Participation:

In 1995, to address the overfishing conditions, DLNR established an ad hoc advisory panel of recreational and commercial fishermen from all over the state, representatives from the fishing industry, and fishery managers, scientists, and enforcement personnel from other government agencies. The purpose of this panel was to develop a comprehensive management plan for MHI bottomfish (i.e., onaga and ehu). Throughout 1995, DAR and the advisory panel developed a set of management proposals, which were presented to select groups of fishermen in statewide roundtable discussions. Using the input from these discussions, DAR turned the proposals into a draft administrative rule.

The rule was presented at statewide public informational meetings with fishermen, and in formal public hearings. In all, more than 42 meetings were held to incorporate input and recommendations from fisherman and the public, many of which were utilized by the department prior to the establishment of the BRFAs in 1998.

DAR has also encouraged public participation in the current effort to revise the BRFAs to improve their effectiveness. In early 2006, DAR held informational meetings to share and discuss the boundaries of the newly proposed sites. This information was used by the agency to help modify the boundaries of the BRFA sites.

Natural Area Reserves

Natural area reserves (NARs) aim to protect complex ecosystems that support native plants and animals, many of which are threatened with extinction. There is one natural area reserve with a marine component, the Ahihi Kina'u Natural Area Reserve, which is also the first reserve established under the 1973 natural area reserves system (NARS) statute. The reserve includes submerged lands extending beyond Cape Kina'u, which contain unique geological features and a diverse marine community associated with lava flows. Communities protected by the reserve include anchialine ponds, subterranean lava tubes, and aeolian systems on the surface of the flows that are host to many rare native plants and animals.

National Classification: No Impact, Natural Heritage MPA

Enabling Legislation and Responsible Agency:

The NARS was established under HRS 195, which defines the powers and duties of DLNR, authorizes the department to make, amend, and repeal rules, establishes a natural areas reserves system commission, a natural area reserve fund, and requires the development of a comprehensive management plan for the NARS.

DLNR's Division of Forestry and Wildlife (DOFAW) manages the natural area reserves. DLNR's Division of Boating and Recreation (DOBOR) establishes rules for ocean use in the area, and DAR provides management and monitoring support for the marine portion.

Goals, Objectives, Policies, and Protections:

The main purpose of the NARS is to preserve and protect representative samples of unique Hawaiian biological ecosystems and geological formations that are vulnerable to loss. The reserves were also established for the enjoyment of future generations, and to provide a baseline against which other native ecosystems can be measured (HRS 195).

To support these purposes, DLNR adopted regulations for all NARs, which state that it is prohibited to remove, injure, kill, or introduce any form of plant and animal life, or to remove, damage, or disturb any geological or paleontological feature or substance (HAR 13-209-4). Additionally, HAR 13-244-32 prohibits the operation of any motorized water vehicle on or in the waters of Ahihi Kina'u Natural Area Reserve.

The following objectives have been established for 'Ahihi-Kina'u Natural Area Reserve (DLNR DOFAW 2006):

A. Preservation – The NAR will ensure that all user activities and management changes are consistent with NARS rules and regulations.
B. User Levels - The number of people utilizing the NAR is reasonable and controlled to minimize impacts to the resources and to provide a safe and enjoyable experience.
C. Education - Meaningful educational and interpretive opportunities are provided in the areas of conservation, history, rules and regulations, and safety.
D. Maintenance - Maintenance of infrastructure (e.g., portable toilets, roads, and trails) is provided in a cost-effective manner to minimize impacts to the NAR's resources and to ensure the health and safety of its users.
E. Safety - Safety rules and regulations, signs, and safety services are available to ensure safety for all users.

Table 5.5: Priority Coral Reef Resources and Habitats Found in the Ahihi Kina'u Natural Area Reserve (NAR)

Natural Area Reserve (NAR)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Ahihi Kina'u	x					x				x	x	

Management Activities:

A draft management plan was completed in 2003, but it has not yet been adopted by BLNR. Another plan has been presented to the NARS Commission; it is still undergoing revisions as of August 2006.

Research and Monitoring:
A volunteer group conducts human use surveys. Surveys have also been done to document the presence of invasive species, such as crown-of-thorns starfish. DAR has been conducting coral reef surveys since 1999 to characterize the nearshore fish and invertebrate community, and coral cover. In 1985, the Marine Option Program at UH completed a baseline survey of the Ahihi Bay area. The survey identified ten species of coral, with 16.4 percent coral cover, and 66 species of fish (University of Hawai'i Marine Option Program 1985).

Education and Outreach:
As part of the Makai Watch Program (see "Working Towards a Network" section), volunteers with a nonprofit organization are trained to provide outreach to visitors at a key entry station during high use times. The outreach includes coral reef etiquette, and information about the NAR's cultural elements and biological resources. In addition, two DOFAW rangers walk around the reserve to assist stranded hikers, provide education about the reserve, and patrol the area for potential violations of the rules.

Fig. 5.8: Rangers at the NAR observe recreational users and conduct outreach (Ramsey n.d.)

Enforcement:
All NARS sites are enforced by DOCARE. See the "MLCD" section for more information on enforcement.

Stakeholder Involvement and Public Participation:

A NARS site can be nominated by commission members, DOFAW, or other scientists and individuals. Public hearings are held to receive input on the proposal and site regulations. In addition to hearings about the proposed site, informational meetings are held on the island where the site is located.

Volunteers with the Makai Watch Program continue to staff the education table and to provide visitors with information about the reserve. They also conduct human use surveys to determine the high use areas, what activities visitors are involved in, and when the high use times are.

Cultural Reserves:

In 1976, a group of 50-60 islanders challenged the federal government's occupation of the island of Kaho'olawe, intending to occupy the island to halt the bombing that had been occurring since 1941. Nine made it to shore and the grassroots group, known as the Protect Kaho'olawe Ohana (PKO), filed a federal civil suit seeking to halt the Navy's bombing activities on the island. In 1977, the court ordered the Navy to conduct an environmental impact statement and to supply an inventory of, and to protect, the historic sites on the island. In 1980, a consent decree was reached in the suit, where the Navy agreed to do the following: 1) survey and protect historic and cultural sites on the island, 2) clear surface ordnance from 10,000 acres, 3) continue soil conservation and re-vegetation programs, 4) eradicate the goats from the island, 5) limit ordnance impact training to the central third of the island, and 6) allow monthly PKO accesses to the island.

In November 1994, after more than five decades of control by the U.S. Navy, Kaho'olawe was conveyed back to the state of Hawai'i. While the Navy was responsible for the cleanup of unexploded ordnance, there still remains an imminent peril to public health and safety on the island and in the surrounding waters. Kaho'olawe is of tremendous cultural and historical significance to native Hawaiians.

National Classification: Zoned Multiple-Use, Cultural Heritage MPA

Enabling Legislation and Responsible Agency:

Kaho'olawe Island Reserve was established under HRS 6K-4 (1993), which also created the Kaho'olawe Island Reserve Commission (KIRC) within DLNR to manage the reserve and adopt, amend, and repeal rules. The reserve includes the island of Kaho'olawe and the waters extending two miles from its shoreline. The statute also provides that the reserve be held in trust as part of the public land trust and that "the State shall transfer management and control of the island and its waters to the sovereign native Hawaiian entity upon its recognition by the United States and the State of Hawai'i" (HRS 6K-9).

Table 5.6: Priority Coral Reef Resources and Habitats Found in the Kaho'olawe Island Cultural Marine Reserve

Cultural Marine Reserve	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Kaho'olawe Island Reserve	x							x		x	x	

KIRC is responsible for the policy and management oversight of Kaho'olawe Island Reserve. The commission is administratively attached to DLNR and consists of members from various stakeholder groups, including governmental agencies and non-governmental native Hawaiian groups. KIRC uses the federal funds designated for state responsibilities to carry out management activities in the reserve. The primary management activities are the administration and enforcement of policies that support the restoration of the island's natural resources for their traditional and cultural values.

Goals, Objectives, Policies, and Protections:

The reserve was established for the purposes of preservation, and practice of, native Hawaiian rights for cultural, spiritual, and subsistence purposes; preservation of the island's archaeological, historical, and environmental resources; rehabilitation, habitat restoration, and revegetation; and, education (HRS 6K-4).

Regulations for the reserve were adopted through HAR 13-261, which states that it is prohibited to enter the reserve for any purpose unless authorized to do so (HAR 13-261-10). This prohibition includes diving, surfing, swimming, snorkeling and walking in shallow waters. Entry into the reserve must be consistent with its purpose, and is allowed only by application to KIRC. The regulations also prohibit the removal or disturbance of any aquatic life, wildlife, natural or geological resource, archeological artifact, or mineral. Commercial activities and fishing are not permitted. Specifically, no person may possess "any fishing gear or device, including, but not limited to, any hook-and-line, rod, reel, spear, trap, net, crowbar, or other device, or noxious chemical that may be used for the taking or altering of any aquatic life" (HAR 13-261-14). Within one zone, trolling is permitted two weekends per month, which is based on the Hawaiian fishing calendar.

The vision for Kaho'olawe is "The kino of Kanaloa is restored. Forests and shrub lands of native plants and other biota clothe its slopes and valleys. Pristine ocean waters and healthy reef ecosystems are the foundation that supports and surrounds the island. Na po'e Hawai'i care for the land in a manner which recognizes the island and ocean of Kanaloa as a living spiritual entity. Kanaloa is a pu'uhonua and wahi pana where native Hawaiian cultural practices flourish. The piko of Kanaloa is the crossroads of past and future generations from which the native Hawaiian lifestyle spreads throughout the islands" (Kaho'olawe Island Reserve Commission 2004).

KIRC's four strategic priorities are leadership, stewardship, restoration, and perpetuation and education. The first priority of KIRC is the cleanup and restoration of Kaho'olawe and its surrounding waters (PBR Hawai'i 1995).

Management Activities:

The reserve has several different operational plans, including a strategic plan, use plan, environmental restoration plan, cultural resources, ocean recreation management plan, access and risk management plan, and an access policy. The use plan was developed 1994 in accordance with Section VI of the Memorandum of Understanding with the U.S. Navy. PKO has developed an Access Plan and Procedures based on 23 years experience conducting trips to the island.

Research and Monitoring:
The Coral Reef Assessment and Monitoring Program, DAR, and several research institutions conduct monitoring on the island. Numerous agencies have monitoring efforts focused the reserve's waters, including fish and algae monitoring and benthic habitat mapping. KIRC's Ocean Resource Management Program has initiated an apex fish-tagging project. This non-lethal tag and release program will assist scientists in the monitoring and understanding of fish growth rates, migratory patterns, and possible spillover effects

the reserve may have on neighboring waters. KIRC, with assistance from the UH Marine Option Program, completed an additional survey of the fish and marine life of Kaho'olawe in August of 2006.

Fig. 5.9: Underwater surveying with the UH Marine Option Program (Stanton n.d.)

Education and Outreach:
KIRC maintains staff to assist in the management of the reserve, including a volunteer and outreach coordinator. The reserve conducts restoration field trips and beach clean-ups on a regular basis, writes a newsletter about reserve activities, and creates videos about the reserve and the restoration efforts. Staff also give presentations at various conferences and public meetings around the state.

PKO is a grassroots organization whose mission is "to perpetuate Aloha 'Aina throughout our islands through cultural, educational and spiritual activities that heal and revitalize the cultural and natural resources on Kaho'olawe" (PKO 2006). This group has been conducting cultural and spiritual activities on the island since 1980, and developed the 2004 Access Plan and Procedure to guide access and appropriate conduct for the island.

Enforcement:
The reserve is enforced by DOCARE. See the "MLCD" section for more information on enforcement.

Stakeholder Involvement and Public Participation:

KIRC conducts monthly meetings that are open to the public. The public can also get involved with the restoration activities conducted by PKO, which are usually held February through November during the full moon.

Wildlife Sanctuaries

Wildlife sanctuaries include state owned or controlled lands, surface water areas, islands, islets, and rocks. The sanctuaries are where native and endangered waterbirds, as well as migratory seabirds roost, nest, or rest on their way to other areas. Some sanctuaries contain protected environments for native coastal vegetation, including naupaka and ilima. There are four wildlife sanctuaries in the state, but only the Paiko Lagoon Wildlife Sanctuary includes coastal habitat.

The Paiko Lagoon Wildlife Sanctuary is located in East O'ahu, and it includes all of the state owned land areas adjacent to Paiko Lagoon and water areas within Paiko Lagoon. Paiko Lagoon, formerly a coastal fishpond, is fed by a freshwater spring and Kuliouou Stream. The lagoon's water level varies with the tides and occasionally exposes the saline mudflats. The silt and mudflat habitat within the lagoon provides important resting, nesting, and feeding sites for native shorebirds and migratory waterbirds. The site was designated in 1974 as a bird sanctuary for the native endangered Hawaiian stilt and other native birds.

While the lagoon (a former fishpond) acts as a de facto MPA, it has never been managed as such because the benthic habitat has been significantly altered due to coastal development. The proximity of residential uses and intrusions by humans and domesticated animals may threaten the sanctuary.

National Classification: No-Take, Natural Heritage MPA

Enabling Legislation and Responsible Agency:

The Paiko Lagoon Wildlife Sanctuary was established through the HRS 183D-4 (1993), which states that DLNR may establish, maintain, manage, and operate wildlife sanctuaries for the purpose of preserving, protecting, conserving, and propagating wildlife. Under HRS 183D-3, DLNR was given the authority to adopt,

Table 5.7: Priority Coral Reef Resources and Habitats Found in the Paiko Lagoon Wildlife Sanctuary

Wildlife Sanctuary	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Paiko Lagoon						x						

amend, and repeal rules concerning the preservation, protection, regulation, extension, and utilization of, and entry into wildlife sanctuaries.

DOFAW is responsible for the management of this site.

Goals, Objectives, Policies, and Protections:

Rules for the sanctuaries were established under HRS 13-125 for the purpose of conserving, protecting, and managing indigenous wildlife. More specifically, the rules prohibit the removal, disturbance, injury, killing, possessing, or introduction of any form of plant or wildlife. It is also prohibited to enter or remain on any surface water area (HRS 13-125-4). Permits may be issued by BLNR for access related to scientific, educational, or conservation purposes.

Management Activities:

DOFAW has overall management guidelines to address the desired levels of human use activities on its managed lands. The guidelines are in draft form, but they are intended to provide administrative policy direction, and to prioritize resource management activities, with recognition of the importance and sustainability of native ecosystems. With the goal of ensuring the perpetuity of native habitats, DOFAW determined the appropriate levels of intensity within each of the vegetation classes for three activities (forest products, recreation, and game management).

Research and Monitoring:
While birds are monitored extensively by UH students and scientists, and other agencies, the marine portion of the sanctuary is not monitored on a regular basis. Some surveys of alien algae have been done by UH Botany Department students, and DAR staff. Students from the local high school are conducting alien algae surveys, water quality monitoring, and limu (native seaweed) restoration. The Bishop Museum did a survey to determine if non-indigenous species could have an impact on sport fishing in the stream and estuarine areas. The museum found that areas more marine in character, like Paiko Lagoon, had more native species (Englund, et al. 2000).

Fig. 5.10: Fishponds around Coconut Island (Kozlowski 2006)

Education and Outreach:
Signs indicate that the area is a wildlife sanctuary, with no access allowed. The Hawai'i Audubon Society conducts bird surveys and trips to the sanctuary to view the endangered birds.

Enforcement:
The sanctuary is enforced by DOCARE. See the "MLCD" section for more information on enforcement.

Stakeholder Involvement and Public Participation:

As mentioned above, the public may enter the area with the Hawai'i Audubon Society to view endangered birds. Volunteer opportunities in the sanctuary include non-native plant (e.g., mangrove) control, trash removal, predator control, and restoration.

Marine Laboratory Refuge

In 1936, Christian Holmes, heir to the Fleischmann yeast fortune, purchased Moku O Lo'e (a.k.a., Coconut Island) from the Bishop Estate and made extensive modifications that resulted in a larger island. These modifications included seawalls, rocks, lagoons, spits, piers, and fishponds, which are utilized by UH today. Significant dredging, grading, and fill created the lagoons and most of the flatter sections of the island. In 1947, the Edwin Pauley family purchased the island; in 1951, they allowed the use of one of the old Army buildings as a field station for UH's Marine Lab. After the building burned down, the family provided funding for the island's original laboratory.

Moku O Lo'e (Moku means "island" or "splitting," and Lo'e means "bend in a fish hook") is speculated to have been used as a lookout by fishermen, who had temporary residences on the island. The island is surrounded by 64 acres of coral reef, designated by the state as the Hawai'i Marine Laboratory Refuge. The island itself covers around 29 acres, with six acres enclosed in lagoons that are used for keeping organisms in captivity for study by Hawai'i Institute of Marine Biology (HIMB) faculty and students.

In the early 1950s, tuna that were being used in an experimental project were captured and transferred alive to the ponds of the Hawai'i Marine Laboratory at a substantial cost. The captive tuna were speared out of the ponds and stolen. Because fishers could come close to the ponds to fish on the reefs, it was difficult to properly patrol the area. In response, the site was established as a marine laboratory refuge in Kane'ohe Bay to create a protective area around the laboratory.

Table 5.8: Priority Coral Reef Resources and Habitats Found in the Moku O Lo'e Island (Coconut Island) Marine Laboratory Refuge

Marine Laboratory Refuge	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Moku O Lo'e Island (Coconut Island)	x							x				

National Classification: No Access, Natural Heritage MPAs

Enabling Legislation and Responsible Agency:

The Hawai'i Marine Laboratory Refuge was established through HRS 188-36 (1993), which defines the refuge as consisting of "the reefs and bay waters surrounding the island of Moku-o-loe located in Kaneohe Bay, island of Oahu, from the high water mark on the island extending outward to "twenty-five feet beyond the outer edges of the reefs""(HRS 188-36). DLNR manages the refuge and enforces its regulations.

Goals, Objectives, Policies, and Protections:

Fig. 5.11: Aerial photo of Coconut Island and surrounding reefs (Daniel n.d.)

Under HRS 188-36, it is unlawful for any unauthorized person to take any aquatic life within the refuge. Only researchers associated with HIMB are allowed to collect specimens from the refuge. Outside scientists must coordinate with an HIMB faculty member in order to conduct research at the refuge. Other visitors must have an HIMB sponsor, sign a waiver/release form, and access the island via scheduled boat service. Other access is strictly limited, although kayakers and boaters informally access the southern point (Maile Point) for picnics and rest. Conflicts occur when unauthorized visitors enter areas of active research.

Management Activities:

The Coconut Island Long Range Development Plan was developed in 2001 to address future facilities, research, access, and other related management issues.

Research and Monitoring:
CRAMP conducts monitoring of the area. A recent survey found that the refuge, along with other no-take areas, had the highest values for most fish assemblage characteristics (species richness, size, diversity). In addition to CRAMP, the staff and students at HIMB utilize the area for their research. Research topics include coral disease and bleaching, marine mammal bioacoustics, molecular ecology, gene flow of corals, spectral analysis via aircraft and satellite-based remote sensing of coral reef ecosystems, and ecology of coral reefs in relation to other geographic areas.

Education and Outreach:
HIMB staff conduct educational outreach programs, tours, and other programs for school groups. These programs provide visitors with a history of the island, its current uses and protections, and types of research occurring on the island.

Enforcement:
The site is enforced by DOCARE. See the "MLCD" section for more information on enforcement.

Stakeholder Involvement and Public Participation:

The public is allowed access to the island if they have an HIMB sponsor. Various educational programs and workshops are offered for students and the public.

Marine Refuge

In September 2006, the governor of Hawai'i created the largest single conservation area in the history of the state (either marine or terrestrial) by creating the Northwestern Hawaiian Islands (NWHI) State Marine Refuge. This marine refuge includes all state waters,

from the shoreline to three miles offshore, of all the islands and atolls in the 1,200 mile chain of islands to the northwest of Kauai and Niihau, except Midway Atoll.

On June 15, 2006, President Bush created the NWHI Marine National Monument by signing a proclamation. In so doing, he created the largest conservation area in the world. The NWHI Marine National Monument incorporated the previously established national wildlife refuges, the NWHI Coral Reef Ecosystem Reserve, and the NWHI State Marine Refuge, and called for the creation of a new form of governance whereby the U.S. Departments of the Interior, Commerce, and State would cooperatively manage the area.

Fig. 5.12: Reef fish in the NWHI State Marine Refuge (Watt n.d.)

National Classification: No Impact, Natural Heritage MPA

Enabling Legislation and Responsible Agency:

The NWHI State Marine Refuge was established through HAR 13-60.5, which states that DLNR intends to establish a marine refuge "for the long-term conservation and protection of the unique coral reef ecosystems and the related marine resources and species, to ensure their conservation and natural character for present and future generations" (HAR 13-60.5-1(1)).

The marine resources within the NWHI State Marine Refuge are managed by several agencies. DAR has specific management responsibility for all marine resources out to three nautical miles from all emergent lands, with the exception of Midway Atoll. DOFAW is a related management agency that manages Kure Atoll as a state wildlife sanctuary. The U.S. Fish and Wildlife Service manage the Hawaiian Islands National Wildlife Refuge on eight of the islands and atolls, and claims administrative boundaries to a depth of 10 or 20 fathoms around these islands. NOAA Fisheries and the National Marine Sanctuary Program manage the waters out to 50 miles offshore.

Goals, Objectives, Policies, and Protections:

The purpose of the refuge, as detailed in HAR 13-60.5-1, is to:

- manage, preserve, protect and conserve the unique resources in the marine refuge, using the best available science and a precautionary management approach to resource protection to minimize risks of possible adverse impacts to the regional ecosystem, its biodiversity or its indigenous wildlife, especially where data is limited;
- implement a permit entry program that is consistent with the management programs in the adjacent Hawaiian Islands National Wildlife Refuge and the NWHI Coral Reef Ecosystem Reserve;
- support, promote, and coordinate appropriate scientific research, assessment and monitoring of refuge resources, and the impacts of threats thereto from human and other activities;
- allow native Hawaiian cultural, subsistence, and religious practices that are consistent with the long-term conservation and protection of the resources; and,
- coordinate management among state and federal agencies in the region to provide comprehensive conservation of the resources.

To support these objectives, the regulations prohibit entry into the reserve without a permit, including setting foot on shore or any emergent land or reef. Vessel discharge and any activities that can result in damage to coral, including anchoring, are prohibited.

Table 5.9: Priority Coral Reef Resources and Habitats Found in the Northwestern Hawaiian Islands Marine Refuge

Marine Refuge	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Northwestern Hawaiian Islands	x		x			x	x	x	x	x	x	x

It is also illegal to take marine life for the purpose of sale (HAR 13-60.5-4). A person may enter the refuge only with a permit for "scientific or education purposes; non-extractive purposes undertaken to further the knowledge of resources or which provide for enhanced resources protection or benefit resource management; and subsistence, traditional and customary practices by Native Hawaiians consistent with the long-term preservation of the refuge resources" (HAR 13-60.5-5(b)).

Management Activities:

The state is working cooperatively with the U.S. Fish and Wildlife Service and the National Marine Sanctuary Program to develop a joint management plan for the newly created and designated NWHI Marine National Monument.

Research and Monitoring:
Monitoring and research are conducted by various local and federal partners by permit only.

Education and Outreach:
Outreach and education are done jointly through the U.S. Fish and Wildlife Service, the National Marine Sanctuary Program, and the state of Hawai'i.

Enforcement:
While DOCARE has primary responsibility for enforcing the NWHI Marine Refuge, enforcement of the region is also done jointly by the U.S. Fish and Wildlife Service, the NOAA Office of Law Enforcement, and the U.S. Coast Guard.

Stakeholder Involvement and Public Participation:

The rules demonstrate DLNR's responsiveness to the conservation measures requested by considerable public comment. Two rounds of public hearings held statewide over the last three-and-a-half years resulted in over 25,000 public comments received.

"The public input on these proposed rules has been outstanding," Young said. "We heard loud and clear from the public that they feel that the NWHI is a special place worthy of the highest levels of protection" (Gonser 2006).

CHALLENGES TO MPA EFFECTIVENESS

Public Support:
While there have been several successes with Hawai'i's MPAs, there remains strong opposition to the use of MPAs as a management tool. This dissent has affected the state's ability to pass regulations establishing new sites or supporting MPA networks.

Enforcement:
DOCARE has been stretched thin due to a lack of funding, drug enforcement and crime prevention duties, and tasks associated with homeland security. With officers responsible for both land and marine activities for the entire island, there are simply not enough officers to witness and catch every violator. An audit conducted by the state auditor office found that DOCARE does not have enough officers to patrol the land and waterways, and to respond to hotline calls. The audit suggested that the lack of officers contributes to the overuse and abuse of Hawai'i's resources.

The audit included recommendations to: develop a long-term strategic plan and meaningful performance measures, actively seek more federal grants, establish cross-divisional working groups, and periodically schedule field supervisors and enforcement officers to work late night and early morning shifts.

In response to the audit, DLNR has placed more rangers at selected natural area reserves and state parks,

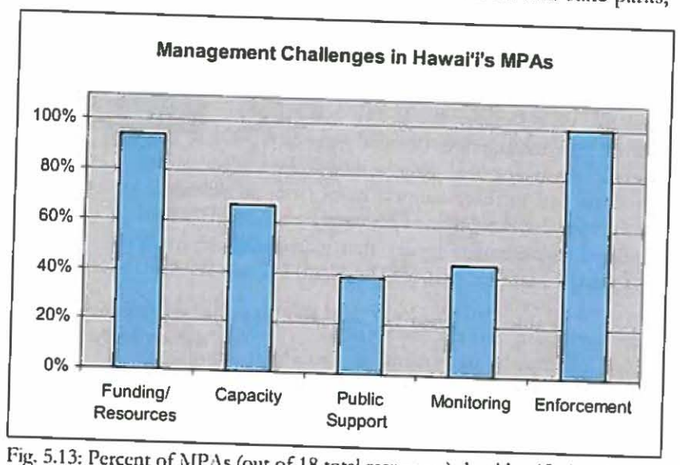

Fig. 5.13: Percent of MPAs (out of 18 total responses) that identified each issue as a challenge to effective MPA management. Data reported for the Ahihi Kina'u NAR, Kaho'olawe Island Reserve, Paiko Lagoon Wildlife Sanctuary, Moku O Lo'e Island (Coconut Island) Marine Laboratory Refuge, Northwestern Hawaiian Islands State Marine Refuge, West Hawai'i Regional FMA, 3 out of 10 FMAs, and 9 out of 11 MLCDs. No BRFAs responded to the question.

and has worked with several non-governmental organizations (NGOs) and coastal community groups to develop the Makai Watch Program. Communities participating in the Makai Watch Program work closely with local DOCARE officers to provide outreach and education to users in the area and report violations, thereby making DOCARE efforts more effective.

MPA Management Capacity:
While there are numerous MPAs in Hawai'i, there is limited implementation of management programs or activities in these areas. Few MPAs have on-site managers and many of the DAR staff responsible for MPA management have other duties. DAR only has one staff member working on the comprehensive review of MPAs as a part of the new MPA framework process, and this position is a temporary contract position. Monitoring occurs regularly at some sites, but other sites are only visited occasionally, as staff and resources are available. Most of the MPAs have undergone rule changes over the years as new issues have been raised, and DAR has attempted to integrate adaptive management into the overall management of these sites. However, no management plans or system site assessments have been done.

Funding:
Many of the challenges identified above are linked to a lack of adequate funding and staffing. Again, the Makai Watch Program is improving this situation by encouraging community support for management efforts. NGOs in Hawai'i have been particularly active in raising funds for this program to complement the state's limited funds and partnering with the state to support MPA management. Many MPA management activities in the state have also been funded through the NOAA Coral Reef Conservation Program.

Despite these challenges, it is important to note that Hawai'i has been using MPAs as a management tool for several decades. One of the greatest challenges comes with the fact that existing sites were mainly established to provide the public and Hawai'i's visitors with unique places to see marine resources in a natural state (specifically the no-take MLCDs). In this light, the state has been very successful in achieving the goals of the sites. However, as our understanding of MPAs as a management tool to improve natural resource health has increased, these sites have been held to a different standard of effectiveness than what they were established to achieve. In many ways, the success of the MPAs in achieving the goal of providing recreational benefits has been an obstacle to gaining further support for existing and future sites. Hawai'i's fishermen view the establishment of new sites, or new regulations in existing sites, as an effort to take the sites away from them for tourist use.

Fig. 5.14: Honolua Bay MLCD (Komoto n.d.)

WORKING TOWARDS A NETWORK

West Hawai'i Regional Fisheries Management Area (WHRFMA):
The WHRMA is a network of MPAs that was established after several years of user conflicts and noted depletion to aquarium fish resources on the Big Island of Hawai'i. While there was initially extensive opposition to the establishment of the WHRFMA, years of community and stakeholder meetings and negotiations eventually resulted in support for the network.

The WHRFMA was established through Act 306 in 1998, which called for DLNR to improve the management of consumptive and non-consumptive uses of aquatic resources along the West Hawai'i coastline by placing a minimum of 30 percent of the Kona Coast in fish replenishment areas (FRAs). The nine FRAs were designated after reviewing existing protected areas on the West Hawai'i coast to determine what additional sites were needed to address the mandates of Act 306. Factors used to select the sites included the location of use conflict areas, enforceability, and known biological research. However, several key pieces of information were not available during the site selection, such as recruitment and current patterns. Therefore, it was anticipated that spreading the sites over a large area would account for some of the scientific uncertainty and allow for further monitoring to better understand fish populations along the coast and the effectiveness of the sites. More information about this network can be found on pp. 82-84 and in the "Success Story" on p. 99.

Other MPA Efforts:
In recent years, legislation calling for the implementation of a network of sites has been proposed, but has note been passed because of strong public dissent, mainly from local fishermen. The

current efforts described below have focused on improving the effectiveness of existing sites, and garnering stronger public support for MPAs as a tool for marine resource management.

Makai Watch Program:
To engage the public in management, 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 a DOCARE 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. DAR recently published a new community stewardship guide, *Getting Involved in Carrying 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.


Fig. 5.15: Coral Reef Awareness Day (Komoto n.d.)

Development of a New Framework:
DLNR is currently working on a new framework for MPAs in Hawai'i that will establish categories that group together areas with similar management goals and objectives, and biological and socio-economic criteria. The draft framework was presented to 13 small focus groups in different communities around the state to obtain their input. Most comments focused on increased and improved outreach and education, enforcement, and preservation of traditional methods. A revised draft is currently being circulated around DLNR, and a final draft will be presented to BLNR for approval.

Fisheries Outreach:
DAR is working with NOAA and NGO partners to develop a full-time fisheries outreach liaison. Recognizing that fishermen feel under-represented in management processes, and perceive themselves as being targeted as the cause of marine resource degradation, a position is being developed to improve communication between fishers and managers. This full-time position will work in the fishing community to engage fishers in discussions, listen to their concerns, and exchange information between the state and the community. Through this position, DAR is making an effort to incorporate fishers more directly into management decisions and to address their needs.

NEXT STEPS/ RECOMMENDATIONS

MPA Capacity:
With so many different marine resource users in Hawai'i, the state is faced with the challenge of balancing resource protection and sustainable use. To support MPA management among various user groups, the state should, at a minimum, establish a permanent MPA coordinator position and increase staff capacity for MPA management. Specifically, management plans need to be developed in conjunction with a stakeholder participatory process to ensure support for the goals and objectives, and to allow for more involvement in MPA management by local users. The process would also lead to the development of effectiveness measures that are appropriate, can be shared with the public, and foster adaptive changes. It is also important for the state to look to the future and develop more focused goals and objectives to support conservation of marine resources, and to determine how MPAs can be utilized to achieve those goals based on the best available science.

Sustainable Financing:
Because of the wide range of users of marine resources, and high revenue of tourism based on marine activities, the state should work with the tourism authority and other agencies to develop a sustainable financing mechanism to support marine conservation. Securing long-term funding should be a priority because inadequate resources have severely limited the amount of effort put towards protecting the MHI nearshore resources, and therefore limiting the effectiveness of those efforts. Several islands with tourism based economies can provide useful examples of sustainable financing tools that may be applicable to Hawai'i.

Agency Collaboration:
Like many jurisdictions, Hawai'i would benefit from improved collaboration between agencies to address MPA issues. It is important to prioritize upland management efforts adjacent to MPAs so that there is

an integrated approach to marine management. This approach would also facilitate better support from fishermen. Fishermen often feel that they are the only ones who are restricted from certain sites while the impacts of land-based pollution from development and recreational users remain relatively less managed near those sites. Current efforts through the local action strategy (LAS) initiative are beginning to address this issue, but the state may benefit from an MPA working group and potentially an MPA LAS that focus on employing an integrated coastal zone management approach to improve the effectiveness of existing MPA management. This approach should focus on short and long-term strategies for improving MPA effectiveness, and should prioritize projects that address all impacts to marine resources and management effectiveness.

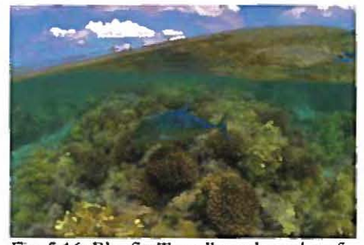
Fig. 5.16: Bluefin Trevally and coral reef in the NWHI (Watt n.d.)

Education and Outreach:
While outreach and education efforts are improving in Hawai'i, MPAs are relatively misunderstood by the public, especially their regulations. It is widely believed that all MPAs are no-take areas, and there are many myths regarding current site protections. To address this issue, DAR is working to make more information available about MPAs, including posting additional information on its web site. DAR recently created an MPA insert for the local newspaper that was distributed to over 150,000 households statewide and was put in hundreds of classrooms for students and teachers. A small four-color brochure explaining MPAs was also developed by DAR.

MPA outreach is also improving through community based programs such as the Makai Watch Program. However, a larger campaign may be necessary to improve the public's understanding of current sites and to improve support and compliance with existing site regulations. Therefore, more public outreach is recommended to continue to address these issues.

Table 5.10: National Classification System for Hawai'i's 39 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Hanauma Bay MLCD	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Honolua-Mokule'ia Bay MLCD	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Kealakekua Bay MLCD	Natural Heritage	Zoned Multiple-Use With No-Take Areas	Permanent	Year-round	Ecosystem	No
Lapakahi MLCD	Natural Heritage	Zoned Multiple-Use With No-Take Areas	Permanent	Year-round	Ecosystem	No
Manele-Hulopo'e MLCD	Natural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	No
Molokini Shoal MLCD	Natural Heritage	Zoned Multiple-Use With No-Take Areas	Permanent	Year-round	Ecosystem	No
Old Kona Airport MLCD	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Pupukea-Waimea MLCD	Natural Heritage	Zoned Multiple-Use With No-Take Areas	Permanent	Year-round	Ecosystem	No

Table 5.10 (cont.): National Classification System for Hawai'i's 39 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Waialea Bay MLCD	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Waikiki MLCD	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Wai'Opae Tidepools MLCD	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Hilo Bay, Wailoa River, Wailuku River FMA	Sustainable Production	Uniform Multiple-Use	Permanent	Seasonal	Focal resource	No
Kahului Harbor FMA	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Kailua Bay FMA	Sustainable Production	Zoned Multiple-Use	Permanent	Year-round	Focal resource	No
Keauhou Bay FMA	Sustainable Production	Zoned Multiple-Use	Permanent	Year-round	Focal resource	No
Kiholo Bay FMA	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Kona Coast FMA	Sustainable Production	Zoned Multiple-Use	Permanent	Year-round	Focal resource	No
Nawiliwili Harbor FMA	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Puako Bay, Puako Reef FMA	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
South Kona (Miloli'i) FMA	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Waikiki-Diamond Head FMA	Sustainable Production	Zoned Multiple-Use	Permanent	Seasonal	Ecosystem	No
West Hawai'i Regional FMA (includes a series of FRAs)	Sustainable Production	Zoned Multiple-Use	Permanent	Year-round	Focal resource	Yes
Site A	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site B	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site C	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site D	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site E	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site F	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site G	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site H	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site J	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No

Table 5.10 (cont.): National Classification System for Hawai'i's 39 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Site K	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site L	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Site M	Sustainable Production	Uniform Multiple-Use	Conditional	Year-round	Focal resource	No
Ahihi Kina'u NAR	Natural Heritage	No Impact	Permanent	Year-round	Ecosystem	No
Kaho'olawe Island Reserve	Cultural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	Yes
Paiko Lagoon Wildlife Sanctuary	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	Yes
Moku O Lo'e Island (Coconut Island) Marine Laboratory Refuge	Natural Heritage	No Access	Permanent	Year-round	Ecosystem	No
Northwestern Hawaiian Islands State Marine Refuge	Natural Heritage	No Impact	Permanent	Year-round	Ecosystem	No

SUCCESS STORY

After several years of public concern over declining fish stocks, and heated debate among recreational users and aquarium fishers about the decline, Act 306 was passed in 1998 to establish the West Hawai'i Regional Fisheries Management Area (WHRFMA). The act sought to improve fisheries resources by placing 35.2 percent of West Hawai'i's coastline into a network of fisheries replenishment areas (FRAs). Some of the act's goals include: 1) development of a management plan to improve resources for consumptive and non-consumptive use, 2) establishment of a monitoring protocol to determine the effectiveness of the regulations, 3) reduction of user conflicts, and 4) incorporation of substantial public input in the process. While DAR is the agency responsible for managing the FRAs, the West Hawai'i Fisheries Management Council also provides management support. The council, which is made up of 24 voting members representing various stakeholders in the area, provides on-going guidance in the development, management, and monitoring of the sites.

The Hawai'i Coral Reef Initiative Research Program funded a monitoring program, the West Hawai'i Aquarium Project, to determine the effectiveness of the network of FRAs at significantly improving fish stocks. The project included the collection of population data before and after closures, and a comparison of closed sites and open access areas. Results from the project's five-year monitoring studies have recently been published.

Results show that seven of the ten most heavily collected species (representing 94 percent of all collected fish) have increased in overall density, and that the number one most collected species (yellow tang) increased by 49 percent relative to control sites. Overall, the results also showed positive effectiveness in reaching FRA goals in seven of nine sites. Additionally, the impact on the aquarium fishery has been positive. There has been an increase in the average number of fishers, the catch per unit effort is higher in West Hawai'i than it is in any other area of the state, and collectors receive a higher price per fish for yellow tangs. These changes have led to economic benefits and an increasing economic value of the West Hawai'i aquarium fishery. Finally, while some user conflicts remain, there is a much higher level of compliance by collectors, and overall less contention between user groups.

CITATIONS

Antolini, Denise. April 30, 2003. *Hawai'i Marine Protected Areas Governance Study.* Prepared for the Division of Aquatic Resources, State of Hawai'i Department of Land and Natural Resources.

Bos, Melissa. n.d Fig. 5.5. Alliance for Coastal Technologies.

Community Conservation Network. n.d. Fig. 5.4.

Daniel, Brain. n.d. Fig. 5.11.

Englund, R.A., K. Arakaki, D.J. Preston, S.L. Coles and L.G. Eldredge. February 2000. *Nonindigenous freshwater and estuarine species introductions and their potential to affect sportfishing in the lower stream and estuarine regions of the south and west shores of O'ahu, Hawai'i.* Final report prepared for the Hawai'i Department of Land and Natural Resources, Division of Aquatic Resources, Bishop Museum Technical Report # 17. Honolulu, HI: Bishop Museum, The State Museum of Natural and Cultural History.

Friedlander, Alan M. 2004. *Status of Hawai'i's coastal fisheries in the new millennium.: proceedings of the 2001 Fisheries Symposium.* Honolulu, HI: American Fisheries Society, Hawaii Chapter.

Friedlander, A., E. Brown, M.A. Monaco, and A. Clark. 2005a. *Fish Habitat Utilization Patterns and Evaluation of the Efficacy of Marine Protected Areas in Hawai'i: Integration and Evaluation of NOAA Digital Benthic Habitats Mapping and Coral Reef Ecological Studies.* NOAA Technical Memorandum NOS NCCOS 23. 210p.

Friedlander, Alan, Greta Aeby, Eric Brown, Athline Clark, Steve Coles, Steve Dollar, Cindy Hunter, Paul Jokiel, Jennifer Smith, Bill Walsh, Ivor Williams, and Wendy Wiltse. 2005b. *The State of Coral Reef Ecosystems of the Main Hawaiian Islands.* pp. 222-269. In: J. Waddell (ed.), The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005. NOAA Technical Memorandum NOS NCCOS 11. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. 522 pp.

Friedlander, Alan, Greta Aeby, Russell Brainard, Athline Clark, Edward DeMartini, Scott Godwin, Jean Kenyon, Randy Kosaki, Jim Maragos, and Peter Vroom. 2005c. The State of Coral Reef Ecosystems of the Northwestern Hawaiian Islands. pp. 270-311. In: J. Waddell (ed.), *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005.* NOAA Technical Memorandum NOS NCCOS 11. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. 522 pp.

Gonser, James. 2006. Refuge status sought for northwest islands. *Honolulu Advertiser,* May 6, 2006. Available online at http://the.honoluluadvertiser.com/article/2005/May/06/ln/ln14p.html.

Hawai'i Administrative Rule (HAR) 13-60.3. West Hawaii Regional Fisheries Management Area.

Hawai'i Administrative Rule (HAR) 13-60.5. Northwestern Hawaiian Islands Marine Refuge.

Hawai'i Administrative Rule (HAR) 13-94. Bottomfish Management.

Hawai'i Administrative Rule (HAR) 13-125. Rules Regulating Wildlife Sanctuaries.

Hawai'i Administrative Rule (HAR) 13-209. Rules Regulating Activities within Natural Area Reserves.

Hawai'i Administrative Rule (HAR) 13-244-32. Ahihi Kina'u Ocean Waters.

Hawai'i Administrative Rule (HAR) 13-261. Kaho'olawe Island Reserve.

Hawai'i Department of Land and Natural Resources (DLNR). 2006. *Hawai'i's Bottomfish Fishery.* Land Board Briefing Paper, December 8, 2006. Honolulu, HI: DLNR. Available online at http://www.hawaii.gov/dlnr/dar/pubs/DLNR_Bottomfish.pdf.

Hawai'i Department of Land and Natural Resources (DLNR) Division of Aquatic Resources (DAR). n.d. Marine Life Conservation Districts. DAR. http://www.hawaii.gov/dlnr/dar/mlcd/index.htm.

———. 2002. Bottomfish. DAR. http://www.hawaii.gov/dlnr/dar/bottomfish/index.htm.

———. 2004. *A Report on the Findings and Recommendations of Effectiveness of the West Hawai'i Regional Fisheries Management Area.* Report to the Twenty-Third Legislature Regular Session of 2005. Available online at http://www.hawaii.gov/ dlnr/dar/pubs/ar_hrs188F5.pdf.

———. 2005. *Marine Protected Areas in Hawai'i.* Custom Publishing Group of the Honolulu Advertiser, March 9, 2005. Available online at http://www.hawaii.gov/dlnr/dar/ library/index.htm.

Hawai'i Department of Land and Natural Resources (DLNR) Division of Conservation and Resources Enforcement (DOCARE). n.d. DLNR. http://www.hawaii.gov/dlnr/ dcre/dcre.html.

Hawai'i Department of Land and Natural Resources (DLNR) Hawai'i Division of Forestry and Wildlife (DOFAW). August 2006. *Ahihi Kina'u Draft Management Plan.* Honolulu, HI: DOFAW.

Hawai'i Revised Statute (HRS) 6K-4. Kaho'olawe Island Reserve.

Hawai'i Revised Statute (HRS) 183D. Wildlife.

Hawai'i Revised Statute (HRS) 188F. West Hawaii Regional Fisheries Management Area.

Hawai'i Revised Statute (HRS) 188-53. Fishing Rights and Regulations. Fishing reserves, refuges, and public fishing areas.

Hawai'i Revised Statute (HRS) 187A-5. Aquatic Resources. Rules.

Hawai'i Revised Statute (HRS) 188-36. Hawaii marine laboratory refuge.

Hawai'i Revised Statute (HRS) Chapter 190. Marine Life Conservation Program.

Hawai'i Revised Statute (HRS) 195. Natural Area Reserves System.

Hawai'i Revised Statute (HRS) 200. Ocean Recreation and Coastal Areas Programs.

Herkes, Marni. 2006. Personal communication. West Hawai'i Fisheries Council.

Kaho'olawe Island Reserve Commission (KIRC). 2004. *Kaho'olawe Island Reserve Strategic Plan 2004 - 2008.* Kaho'olawe Island Reserve Commission, Wailuku, HI. Available online at http://kahoolawe.hawaii.gov/stratplan/FE10-StrategicPlan2.pdf.

Komoto, Jill. n.d. Figs. 5.1, 5.3, 5.8, 5.14, and 5.15. Hawai'i Division of Aquatic Resources.

Kozlowski., Jennifer 2006. Fig. 5.10. NOAA Office of Ocean and Coastal Resource Management.

Moffitt, Bob. 2004. Fig. 5.7. NOAA Fisheries.

PBR Hawai'i. 1995. *Kaho'olawe Use Plan.* Kaho'olawe Island Reserve Commission, Wailuku, HI. Available online at http://kahoolawe.hawaii.gov/plans/use.htm.

Philibotte, Jason. n.d. Fig. 5.6. NOAA Fisheries Office of Habitat Conservation.

Protect Kaho'olawe Ohana (PKO). 2006. Protect Kaho'olawe Ohana. http://www.kahoolawe.org/.

Ramsey, Matt. n.d. Figure #. Department of Land and Nature Resources, Division of Fish and Wildlife.

Stanton, F. n.d. Fig. 5.9. UH Marine Option Program.

University of Hawai'i Marine Option Program. 1985. *A Baseline Survey of Ahihi Bay.* Available online at http://www.dofaw.net/nars/files/MOPBaselineSurvey1985.pdf.

Walsh, W.J. 1999. Community based management of a Hawai'i aquarium fishery. *Proceedings of the Marine Ornamentals '99.* Waikoloa, Hawaii. Pp. 83-87.

Watt, James. n.d. Figs. 5.12 and 5.16. Northwestern Hawaiian Islands Marine National Monument. http://www.hawaiireef.noaa.gov/imagery/photos.html.

Chapter 6: Puerto Rico Coral Reef MPA Summary

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INTRODUCTION

The commonwealth of Puerto Rico is part of a volcanic island platform that includes Puerto Rico and the Virgin Islands. To the east of the main island of Puerto Rico are the smaller island municipalities of Culebra and Vieques. Three uninhabited oceanic islands, Mona, Monito, and Desecheo, are located off the west coast. South of the main island lies Caja de Muertos Island and several keys and mangrove islets.

Puerto Rico's 620 kilometer (km) coastline is surrounded by over 5,000 km² of easily accessible (less than 20 meters depth) coral reef ecosystems (CSCOR 2005). Although there are coral communities throughout the entire insular shelf, they are most developed along the southwestern and northeastern shelves. Ninety-three species of coral taxa, including octocorals and hydrocorals, have been identified. While fringing reefs are the most common reef structure found in Puerto Rico, barrier, patch, and shelf-edge formations can also be found. Reefs with the highest live coral cover are generally found at the offshore islands (e.g. Desecheo, Mona, Vieques, and Culebra), the mainland shelf edge in the south, and the southwest and west coasts of the main island (García-Sais, et al. 2005). Puerto Rico also has extensive sea grass beds, mangrove forests, and colonized hardgrounds.

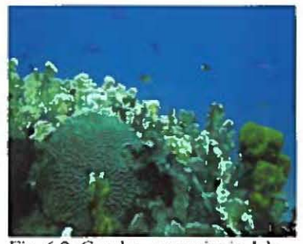


Fig. 6.2: Coral community in Isla Desecheo Marine Reserve (Soto 2005)

Puerto Rico has a population of approximately 3.8 million people. The high population density (more than 1,000 people per square mile) and a shift of population to coastal areas have increased land-based pollution and runoff associated with coastal development, placing significant pressure on coral reef ecosystems. During the past 50 years, more than 50 percent of living coral in Puerto Rico has been lost, and the rate of loss of reef areas has accelerated during the past 20 years (Morelock, et al. 2001). The commercial and recreational fisheries and the collection of ornamentals have put reef fish populations under intense pressure. Between 2001 and 2003, 82 percent of the entire commercial harvest was represented by reef-associated fisheries (García-Sais, et al. 2005).

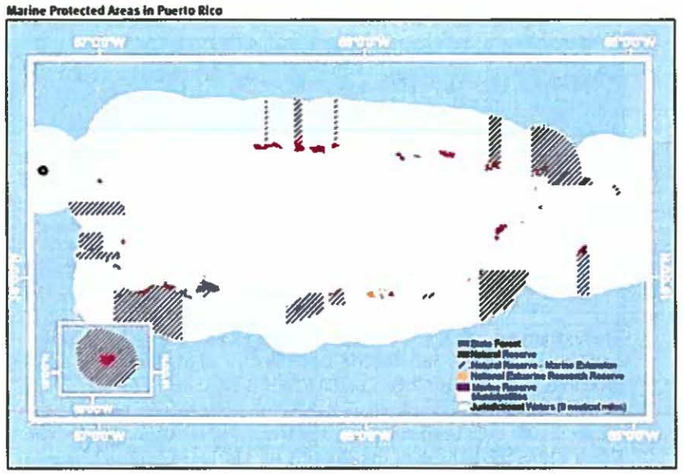


Fig. 6.1: Map of Puerto Rico showing the location of the MPAs (Álvarez 2006a)

Dramatic decreases in catch per unit of effort have also been documented in the recreational fishing industry, with a 40 percent drop between 2000 and 2002 (Lilyestrom and Hoffmaster 2002). Export of marine organisms for the aquarium trade has occurred in Puerto Rico for over three decades and the export of over 100 species has been documented (Mote Environmental Services Inc. 2002). Vessel groundings, land-based sources of pollution, recreational overuse impacts, coral diseases, bleaching due to increasing sea temperatures, and invasive species have all contributed to the decline in the health of Puerto Rico's coral reef ecosystems.

In 2004, 1,600 km² of Puerto Rico's jurisdictional waters were included in a NOAA initiative to map benthic habitats in the U.S. Caribbean (Kendall 2004). It is estimated that twenty-five percent (25%) of this area falls within the borders of Puerto Rico's MPAs (DNER-CZMP 2005, unpublished data). The government of Puerto Rico has established 35 MPAs that fall within three categories: natural reserves, marine reserves, and state forests (Fig. 6.1). There are 32 natural reserves, 27 of which the Department of Natural and Environmental Resources (DNER) administers. The Conservation Trust of Puerto Rico, a local non-governmental organization, administers four natural reserves, and the National Parks Company administers one. DNER also manages two marine reserves and a coastal state forest. In addition to the 35 sites under Puerto Rico's jurisdiction, there are four MPAs that the Puerto Rico government jointly manages with the federal government. These MPAs are the Jobos Bay National Estuarine Research Reserve (JOBANERR), jointly managed with NOAA; and, three seasonal closure areas for spawning aggregations of red hind grouper (*Epinephelus guttatus*): Tourmaline Bank, Bajo de Cico, and Abrir La Sierra. The closure areas are located off the west coast of Puerto Rico and were established in conjunction with the Caribbean Fisheries Management Council. All fishing is prohibited within federal waters in these areas from December 1st through February 28th on an annual basis. The regulations do not apply to the territorial waters in these areas. Since these four MPAs are managed in conjunction with the federal government, they are not included in this analysis of state and territory MPAs.

MPA TYPES

Natural Reserves:

National Classification:

The 32 sites in this system fall into six different national classification categories:

- Uniform Multiple-Use, Natural Heritage
- Uniform Multiple-Use, Cultural Heritage
- Uniform Multiple-Use, Sustainable Production
- Zoned Multiple-Use, Natural Heritage
- No-Take, Natural Heritage, and
- Zoned Multiple-Use with No-Take Areas, Natural Heritage

Enabling Legislation and Responsible Agency:

Twenty-seven natural reserves (NRs) were proposed by DNER and designated by the Puerto Rico Planning Board through Law No. 75, which gives the board the authority to establish these sites, and by Puerto Rico Planning Board Resolution PU-002, which includes the official declaration for each site. Five additional NRs have been designated by the Puerto Rico Legislature, providing specific recognition to their high ecological value and importance: Cayo Ratones and adjacent waters, Ecosystems adjacent to the Laguna Joyuda, Manglar Punta Tuna, Ciénaga Las Cucharillas, and Seven Seas. The latter was legally established through the enactment of Law No. 228 of August 12, 1999 known as "Law of the Seven Seas Natural Reserve"; Cayo Ratones and adjacent waters NR was legally established by Law No. 36 of April 17, 1979, and Ecosystems adjacent to the Laguna Joyuda NR was established by Law No. 201 of August 25, 2001. Manglar Punta Tuna NR was established through Joint Legislative Resolution 449 of August 21, 2000, and Ciénaga Cucharillas was established through Executive Order OE – 2004-49 of August 25, 2004.

Of the 32 sites in the NR system, 27 are administered by DNER, which is the primary natural resource management authority in the commonwealth and includes the Puerto Rico Coastal Zone Management Program (PRCZMP) and the Coral Reef Initiative Program. There are two divisions within DNER that oversee the management of these sites: the Natural Reserves and Wildlife Refuges Division and the Forest Management Division.

Table 6.1: Proportion of Benthic Habitats in Puerto Pico's MPAs (DNER-CZMP 2005; Kendall, et al. 2004)

Mapped Benthic Habitat Types	Proportion found within MPAs (%)
Jurisdictional waters of Puerto Rico	25.15%
Coral Reefs	50.19%
Seagrass Beds	33.33%
Macroalgae	47.31%
Submerged Aquatic Vegetation	35.20%

These data were calculated using the benthic habitat maps of Puerto Rico developed by NOAA and the GIS shapefiles for all of Puerto Rico's MPAs produced by the Puerto Rico Coastal Zone Management Program. An overlay analysis was completed with these two data sources revealing the proportion of each benthic habitat type from the NOAA maps which are found within the borders of the 35 MPA sites included in this chapter.

Table 6.2: Priority Coral Reef Resources and Habitats Found in the 32 Natural Reserves *

Natural Reserves (NRs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds	Bioluminescent Bays
Arrecifes de Guayama	x	x	x			x	x	x	x	x	x	x	
Arrecifes de la Cordillera	x	x	x	x		x	x	x	x	x	x	x	
Arrecifes de Tourmaline	x		x			x	x	x	x	x	x		
Bahías Bioluminiscentes de Vieques	x	x	x	x	x	x	x	x	x	x	x	x	x
Boquerón State Forest	x	x	x	x	x	x	x	x	x	x	x	x	x
Cabezas de San Juan	x	x	x	x	x	x	x	x	x	x	x	x	x
Caja de Muertos	x	x	x	x		x	x	x	x	x	x	x	
Canal Luis Peña	x		x			x	x	x	x	x	x	x	
Caño La Boquilla		x	x	x	x	x	x	x	x	x	x	x	
Caño Martín Peña		x		x	x	x	x	x				x	
Caño Tiburones		x		x	x		x	x	x			x	
Cayo Ratones	x	x	x			x	x	x	x				
Ceiba State Forest		x	x	x	x	x	x	x	x	x	x	x	
Ciénaga Las Cucharillas		x		x	x	x	x	x				x	
Cueva del Indio	x		x		x	x	x	x	x	x	x	x	
Ecosystems adjacent to the Laguna Joyuda	x		x	x	x	x	x	x	x	x	x	x	
El Pantano, Bosque de *Pterocarpus*, Lagunas Mandry y Santa Teresa		x		x	x	x		x	x	x		x	
Finca Belvedere	x	x	x	x		x	x	x	x	x	x	x	
Guanica State Forest NR and Biosphere Reserve	x	x	x	x	x	x	x	x	x	x	x	x	
Hacienda La Esperanza		x	x	x		x		x	x			x	
Islas de Mona y Monito	x	x	x	x		x	x	x	x	x	x	x	
La Parguera	x	x	x	x	x	x	x	x	x	x	x	x	x
Laguna Joyuda		x	x	x	x	x	x	x	x			x	x
Laguna Tortuguero				x	x	x	x	x		x	x	x	
Manglar Punta Petrona	x	x	x	x	x	x	x	x	x	x	x	x	
Manglar Punta Tuna	x	x	x	x		x	x	x	x	x	x	x	
Pantano Cibuco	x	x		x	x	x	x	x	x			x	
Piñones State Forest	x	x	x	x	x	x	x	x	x	x	x	x	x
Punta Guaniquilla	x	x	x	x	x	x	x	x	x	x	x	x	
Punta Yeguas		x					x	x		x	x		
Río Espíritu Santo	x	x	x	x	x	x	x	x	x	x	x	x	
Seven Seas	x	x	x	x	x	x	x	x	x	x	x	x	x

* Resource information was extracted from National MMA Inventory and Ventosa-Febles, et al. 2005.

There are five state forests with marine components. Four of these forests are classified within the NR system: Piñones State Forest NR, Boquerón State Forest NR, Ceiba State Forest NR, and Guanica State Forest NR, which is also a Biosphere Reserve designated under the United Nations Man and Biosphere Program. The remaining coastal state forest is Aguirre State Forest, which is administered by DNER's Forest Management Division and is further discussed in the State Forest section below.

Four sites (Cabezas de San Juan NR, Hacienda La Esperanza NR, Punta Yeguas NR, and Punta Guaniquilla NR) are administered by the Conservation Trust of Puerto Rico, a non-profit institution working to protect Puerto Rico's natural resources (Conservation Trust of Puerto Rico 2006). The Puerto Rico National Parks Company has primary management responsibility for the Seven Seas NR. The National Parks Company is a commonwealth government agency with the responsibility of managing public parks, beaches, and other recreational areas for public enjoyment as well as providing education and outreach services to increase public awareness of environmental issues (Compañia de Parques Nacionales n.d.).

Goals, Objectives, Policies and Protections:

The goals and management objectives of the NR system are abundant and diverse and include the conservation, preservation, and restoration of the physical, ecological, geographic, social, and environmental value of the natural resources found in the reserves. Specific keys and islands have been designated as NRs to protect critical habitat for coastal and marine species; targeted habitats such as coral reefs, seagrass meadows, mangroves, wetlands, bioluminescent bays, and nesting and foraging habitat for seabirds, sea turtles, and the West Indian manatee; reef fish spawning aggregations; and endangered, threatened, rare, and endemic species and their habitats. Other significant objectives include the protection of cultural and archeological sites used by the Taíno Indians who inhabited the Greater Antilles during pre-Columbian times; the promotion of educational activities and ecotourism in the area; the improvement of community participation in natural resource management; aquifer conservation; and the protection of the largest hawksbill sea turtle rookery in the Caribbean Basin, which is located on Mona Island.

Two NRs contain no-take areas in which all commercial and recreational fishing activity is prohibited. The waters of the Canal Luis Peña NR at Culebra Island are completely no-take (Fig. 6.3). This NR, designated in 1999, became the first no-take area in Puerto Rico in December 2003 when an Administrative Order 2003-14 was passed by the Secretary of DNER. In 2004, Puerto Rico Fishing Regulations No. 6768 established a no-take zone in the Isla de Mona NR that includes an area of 0.5 nautical miles from the shoreline of the majority of the coast surrounding the main island of Mona and the smaller island of Monito. There is one area on the northwest side of Mona, Playa Sardinera, in which hook and line recreational fishing is permitted. In all of the NRs, fishing is prohibited in areas that have been designated as swimming areas by the Puerto Rico Planning Board. There are no other fisheries restrictions in the remaining reserve sites beyond those provided by the fisheries regulations, Puerto Rico Fishing Regulations No. 6768, which apply to all of Puerto Rico's waters.

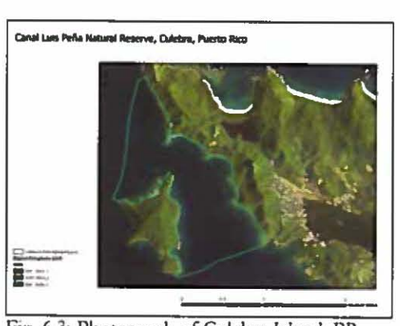


Fig. 6.3: Photograph of Culebra Island, PR and delineation of the boundaries of the Canal Luis Peña Natural Reserve (Álvarez 2006b)

Other activities that are regulated within individual NRs include mangrove cutting, dredging, waste discharge and disposal, camping, vehicle transit, boat transit, commercial sales, anchoring, recreational boating, hunting, education, and research. Fishery regulations include restrictions on the harvest of berried female lobsters, seasonal shellfish closures, and seasonal reef fish closures. Regulation of these activities is specific to each NR site. Collection of terrestrial flora and fauna is prohibited in all of the reserves, including the harvest of land crabs, *Cardisoma guanhumi,* which are a popular Puerto Rican dish.

Management Activities:

Over the past few years, DNER has worked to prioritize sites in the NR system for the development of comprehensive management plans. The management planning process in Puerto Rico is complicated and entails coordinated plan development between DNER and Puerto Rico's Environmental Quality Board, a series of public hearings and public comment periods, and final approval by the Planning Board and adoption as part of the Island-wide Land Use Plan.

Two sites (Bahías Bioluminiscentes de Vieques NR and Seven Seas NR) have management plans awaiting approval from the Planning Board. There are on-going

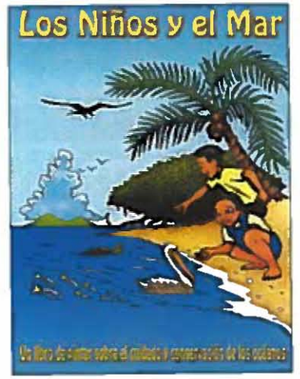
efforts to develop draft plans in several other natural reserve sites, including Canal Luis Peña NR, Caño Tiburones NR, Isla de Mona y Monito NR, and Arrecifes de la Cordillera NR, which has a preliminary plan that is being updated.

Some of the priority NRs that have been identified for near-term management plan development are La Parguera NR, Guanica State Forest NR, Arrecifes de Guayama NR, Río Espíritu Santo NR, and Caja de Muertos NR. The latter has a draft management plan that has been used by DNER as an operational plan for reserve management. Three NRs, La Parguera, Laguna Tortuguero, and Piñones State Forest, are part of larger special planning areas (coastal areas subject to conflicting uses that require special management attention) that have approved management plans. However, more specific management plans are needed for these NRs.

In summary, none of the 32 sites discussed in this section has an approved management plan. However, there is a significant amount of management activity occurring on the ground. Many sites have management officials assigned to them who serve as reserve managers and oversee day-to-day management activities, and who are often physically located in the vicinity of the reserves. Management officials also develop and implement operational plans for their reserves. DNER leadership in San Juan, PR in the Natural Reserves and Wildlife Refuges Division and the Forest Management Division is actively involved with all of the sites and spends a lot of time in the field addressing both site-specific and systemic management issues. Other efforts aim to zone the reserves by identifying important benthic habitats and the locations of different marine oriented activities. Eleven NRs have field officers and managers, and all the state forests in the NR system have field officers and forest managers.

Research:

Most research on MPAs is conducted by the University of Puerto Rico and DNER. DNER's Natural Resources Administration has several units that conduct research and coordinate research activities with public and private universities, federal agencies, and individual investigators. Research projects related to endangered species, such as sea turtles and Mona Island's iguanas, are led by DNER and funded by the U.S. Fish and Wildlife Service. NOAA has also funded research on acroporid corals and sea turtle nesting, foraging, and population dynamics on Mona, Desecheo, and Culebra. DNER's Fisheries Laboratory maintains an information system and database for fisheries and marine stranding. Through professors, consultants, and graduate students, the University of Puerto Rico and DNER conduct coral reef characterizations and monitoring activities. NOAA's Biogeography Program has been instrumental in mapping Puerto Rico's coral reefs, submerged aquatic vegetation, seagrass beds, and benthic habitats.



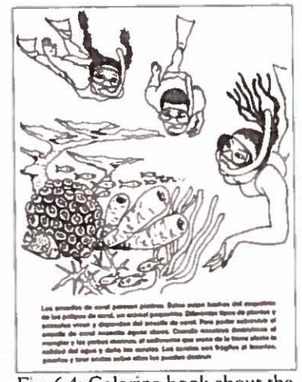


Fig. 6.4: Coloring book about the protection and conservation of the ocean (Green-Cáceres 2005)

Monitoring:

DNER' s Puerto Rico Coral Reef Monitoring Program has on-going monitoring programs in six NRs, including monitoring of environmental indicators such as coral reef coverage, fisheries abundance/diversity, and water quality, and socioeconomic indicators such as public use of reserve areas. The University of Puerto Rico, Mayagüez Campus hosts the Caribbean Coral Reef Institute (CCRI), which was established in cooperation with NOAA to promote scientific research and to monitor and improve knowledge about coral reefs and associated ecosystems. The CCRI, other University of Puerto Rico investigators, and DNER carry out most of the monitoring and research activities in the reserves.

Education and Outreach:

The PRCZMP supports an environmental education and outreach task that includes salaries for four educators, and funding for equipment, supplies, and outreach material. While this task includes a broad array of activities, the PRCZMP specifically targets the NRs as a key component of its education and outreach strategy. The strategy also supports Coral Reef Initiative outreach activities, most of which are part of the local action strategy (LAS) initiative. Some of the outreach and education activities include a public awareness media campaign focused on tourists traveling to Puerto Rico, development of a series of DVDs with coral reef awareness messages and images for television and internet broadcasts, and production and placement of visual media near areas of intense use in NRs. Outreach publications are distributed island-wide at conferences, fairs, public libraries, and visits to K-12 schools,

and are available online. Management officers also give talks in the NRs and at schools and other places about the NR resources and management and conservation of the protected areas.

DNER, through the Coral Reef Conservation and Management Program, provides capacity building opportunities on diverse themes related to coral reef conservation, such as watershed protection workshops and coral and fish species identification trainings for enforcement officers in NRs. NOAA also supports outreach and education activities implemented by the National Parks Company and the Conversation Trust of Puerto Rico.

Enforcement:

DNER has a Maritime Ranger Unit of approximately 195 rangers that enforce local coral reef, navigation, and fisheries regulations as well as the regulations that are specific to individual NRs. Within this unit, there is an eight-member Coral Reef Ranger Task Force and nine-member NOAA Fisheries Task Force. The NOAA Fisheries Task Force is deputized to enforce federal fisheries regulations and local regulations. A Joint Enforcement Agreement was signed between NOAA and DNER that increases the number of rangers in the Fisheries Task Force and provides more funds to implement the regulations. The Coral Reef Ranger Task Force members are responsible for special projects such as ship groundings and coral reef restoration work. All of the rangers are assigned to regions, and most are assigned to large areas that can include several NRs.

DNER has installed marker buoys to delineate the NRs and to indicate fishing prohibitions in the NRs that have such designations (Fig. 6.5). It has also installed mooring buoys in several sites, and will continue to install more buoys in priority coral reef areas and areas of intense boating activity.

Stakeholder Involvement and Public Participation:

DNER has worked to involve local communities in the management plan development process for two NRs, the Canal Luis Peña NR and Arrecifes de la Cordillera NR. Local non-governmental organization (NGO) partners are leading the charge and have been meeting with stakeholders in the surrounding communities to develop the plans and ensure that the communities' concerns are addressed. In the Canal Luis Peña NR on the island of Culebra, the federal government (NOAA and the U.S. Fish and Wildlife Service), the commonwealth government (DNER), and the local government of Culebra are working with the local fishers' association, NGOs, and researchers in a unique, collaborative effort to develop a plan for the site. This initiative started in 2003 and it has been a long, slow process, but significant progress has been made in identifying priority threats to the natural resources in the NR and developing targeted management actions to address those threats. The development of opportunities for stakeholder and community participation in the implementation of these plans once they are approved is also being explored.

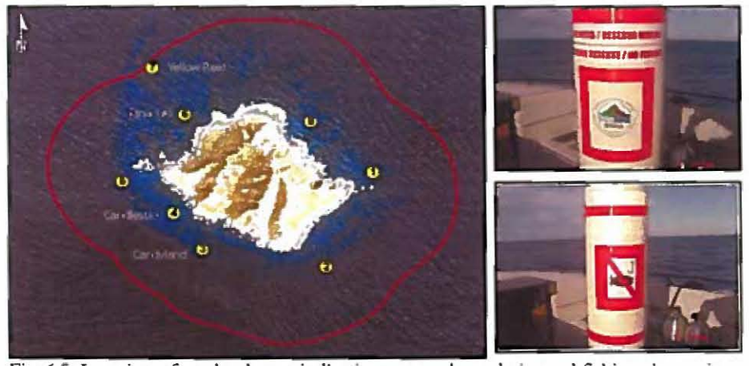


Fig. 6.5: Location of marker buoys indicating reserve boundaries and fishing closure in Isla Desecheo Marine Reserve (DNER - Reserves and Refuges Division 2006)

Marine Reserves

Puerto Rico has two MPAs that are locally classified as marine reserves (MRs). The Tres Palmas MR is located in the municipality of Rincón, at the northwest corner of the main island of Puerto Rico. The Isla de Desecheo MR comprises 0.5 nautical miles around the Desecheo Island, which is an oceanic island located off the northwest coast of Puerto Rico. The island itself is a national wildlife refuge of the U.S. Fish and Wildlife Service.

National Classification: Uniform Multiple-Use and No-Take, Natural Heritage MPAs

Enabling Legislation and Responsible Agency:

In March of 2000, the Puerto Rico Legislature passed Law No. 57, which declared the waters surrounding Desecheo Island, one-half of a nautical mile from the coastline, as a marine reserve. DNER subsequently passed Administrative Order number 2003-22 in

Table 6.3: Priority Coral Reef Resources and Habitats Found in the Two Marine Reserves

Marine Reserves (MRs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds	Bioluminescent Bays
Isla de Desecheo	x		x			x	x	x	x	x	x	x	
Tres Palmas	x		x	x		x	x	x	x	x			

October of 2003 and Puerto Rico Fishing Regulations No. 6768 in February 2004, which established the entire reserve as a no-take area.

In January of 2004, the Puerto Rico Legislature passed Law No.17, which designated the Tres Palmas reef as a marine reserve. In contrast to Desecheo Island, Tres Palmas is not a no-take marine reserve. An administrative order of the secretary of DNER or an amendment to Puerto Rico Fishing Regulations No. 6768 declaring a no-take zone within the reserve would need to be passed in order to provide that level of protection.

In addition to legally establishing the reserves, both Law No. 57 of 2000 and Law No. 17 of 2004 order the secretary of DNER to develop management plans and regulations to guide the administration and conservation of the areas. DNER's Reserves and Wildlife Refuges Division is the responsible management authority for both reserves.

Goals, Objectives, Policies and Protections:

The Isla de Desecheo MR was established to protect the coral reefs, fishes, and associated habitats of Desecheo Island. The island's coral reef communities are considered to be the highest quality reefs found in all of Puerto Rico's waters (Law No. 57, March 2000) (Fig. 6.2). According to DNER Administrative Order 2003-22, the reserve was also established with the goal of "protecting all of the species of fish, crustaceans and mollusks during their growth and reproduction, and to enable the restoration of these populations as well as all of the marine life in this protected area" (Puerto Rico DNER 2003). Tres Palmas MR was designated to protect a priority focal species, the elkhorn coral (*Acropora palmata)*, which dominates the shallow marine component of the reserve. This coral reef species, along with the staghorn coral (*Acropora cervicornis)*, was listed as threatened under the federal Endangered Species Act on May 9, 2006.

The Isla de Desecheo MR is a no-take area. Any type of fishing or other extractive activities are completely prohibited throughout the reserve. The implementation of a no-take designation is currently being explored for the Tres Palmas MR. Puerto Rico Fishing Regulations No. 6768 prevents the use of spear guns in both marine reserve sites.

Management Activities:

DNER is currently in the process of developing a management plan for Tres Palmas in conjunction with the Surfrider Foundation, a national NGO that is very active in the Rincón area of Puerto Rico, known for its popular surf break during the winter months. An intense outreach and education campaign has been a key component of the Tres Palmas MR establishment process (Fig. 6.6). The Isla de Desecheo MR has been selected by DNER as a priority area for management plan development and a preliminary first draft of the management plan has been completed.

Fig. 6.6: Tres Palmas Marine Reserve informational and educational poster (Surfrider Foundation 2005)

Stakeholder Involvement and Public Participation:

The local community of Rincón, with support from the Surfrider Foundation, has been very involved in the process to establish the Tres Palmas MR and to develop a management plan for the site. The process has been led by a steering committee representing different interests, and a complete draft plan for the site is in review.

State Forests

Of the five state forests with marine components, Aguirre State Forest is the only site that is administered by DNER's Forest Management Division. The other four sites are managed under the natural reserve system as described above.

Table 6.4: Priority Coral Reef Resources and Habitats Found in the Aguirre State Forest

State Forest	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds	Bioluminescent Bays
Aguirre	x	x	x	x	x	x	x	x	x	x	x	x	x

National Classification: Uniform Multiple-Use, Natural Heritage MPA

Enabling Legislation and Responsible Agency:

State forests are established by Gubernatorial Proclamation. This authority is established in the Forestry Law of Puerto Rico, Law No. 133 of July 1, 1975. Aguirre State Forest is the oldest MPA in Puerto Rico as it was inherited from the Spanish Crown Authority and legally established in May of 1918. All state coastal forests are administered by DNER.

Goals, Objectives, Policies and Protections:

The main goals of the Aguirre State Forest are to preserve the coastal wetlands, mangroves, and keys found within its boundaries. This site is also significant because it abuts the Jobos Bay National Estuarine Research Reserve. Activities that are regulated within this site include mangrove cutting, dredging, waste discharge and disposal, camping, vehicle transit, boat transit, commercial sales, anchoring, recreational boating, hunting, education, and research. There are also seasonal shellfish closures within the site.

Management Activities:

The Aguirre State Forest does not have an approved management plan and no management activities are reported for this area. All of the four state forests within the NR system have management officers assigned to their areas.

Stakeholder Involvement and Public Participation:

There is no reported stakeholder involvement in the management of the Aguirre State Forest.

CHALLENGES TO MPA EFFECTIVENESS

The chart depicts the number of MPAs for which the issues of funding/resources, capacity, public support, monitoring, and enforcement were identified as challenges to MPA effectiveness in the National MMA Inventory (Fig. 6.7). Among the 35 sites that responded to the question, funding/resources and enforcement were identified as the greatest challenges to MPA effectiveness. Addressing the lack of funds should be a top priority, as there is an imperative need to designate management officials for the MPAs. These officials would serve as facilitators between the communities and the government and help to establish possible collaborative management strategies for the protected areas.

Staff's capacity and monitoring were also identified as common challenges, with public support identified as the least prevalent challenge to MPA effectiveness. "Other" challenges include poor land management and land-based pollution, lack of existing infrastructure and facilities to support existing staff, lack of support from

local governments, lack of coordination between government agencies, lack of public awareness, and conflicts with private land owners.

Additional issues identified as threats to MPA success include poaching in no-take areas, direct fishing effects, recreational use impacts, vessel based sources of pollution, and coral damage (Schärer and Almodóvar-Ramírez 2005).

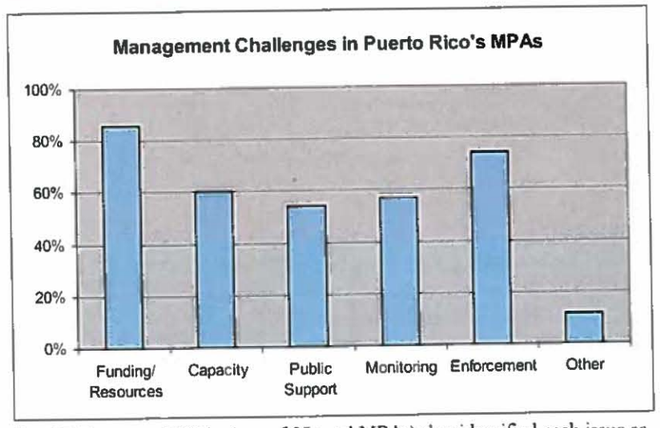


Fig. 6.7: Percent of MPAs (out of 35 total MPAs) that identified each issue as a challenge to effective MPA management.

WORKING TOWARDS A NETWORK

The PRCZMP established a natural reserves network in 1978, which consisted of existing and proposed coastal and marine sites that needed to be protected. New NR designations and the designation of special protection areas as buffer zones for the NRs are geared towards increasing the ability of the sites to achieve preservation, conservation, and restoration management objectives. New areas being evaluated for designation as NRs include Faro de los Morillos in the municipality of Arecibo, *Pterocarpus* Forest in the municipality of Dorado, and Espinar Swamp in the municipality of Aguadilla. Other agencies and quasi-public organizations, such as the U.S. Fish and Wildlife Service and the Conservation Trust of Puerto Rico, manage important coastal and marine protected areas on the main island of Puerto Rico and the islands of Culebra, Vieques, and Desecheo. At present, there is strong coordination between these organizations and DNER to effectively manage the MPAs as a network.

Recognizing that there is an intrinsic relationship between land-based activities and coastal and marine resources, especially coral reefs and associated ecosystems, DNER, the Conservation Trust of Puerto Rico, and the U.S. Fish and Wildlife Service have joined the U.S. Department of Agriculture's International Institute of Tropical Forestry in the Biodiversity Conservation Initiative. This initiative aims to improve data and information sharing between key biodiversity conservation organizations, and offers opportunities for academia, researchers, and NGOs to collaborate in the decision making process regarding MPA management and biodiversity conservation.

NEXT STEPS/ RECOMMENDATIONS

As Puerto Rico works to complete and approve management plans for the MPAs discussed in this chapter, implementation of the plans must be simultaneously addressed. This effort entails the assignment of management officials and other key personnel that are essential to the effective implementation of the plans. DNER also needs to strengthen its enforcement efforts by building the capacity of DNER's rangers to enforce regulations within the MPAs, and by assigning specific rangers to each site that are not personally connected with local resource users so as to avoid conflicts of interest. Targeted outreach initiatives for these MPAs will help to increase local awareness of, and support for, Puerto Rico's MPA systems.

Fig. 6.8: Management plan development training for Puerto Rico's MPAs (Parks 2005)

Table 6.5: National Classification System for Puerto Rico's 35 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Arrecifes de Guayama NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Arrecifes de la Cordillera NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	In development[1]
Arrecifes de Tourmaline NR	Natural Heritage	Zoned Multiple-Use with No-Take Areas	Permanent	Year-round	Ecosystem	No
Bahías Bioluminiscentes de Vieques NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	In development[2]
Boquerón State Forest NR	Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Cabezas de San Juan NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Caja de Muertos NR	Natural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	No
Canal Luis Peña NR	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	In development[1]
Caño La Boquilla NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Caño Martín Peña NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Caño Tiburones NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	In development[1]
Cayo Ratones NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Ceiba State Forest NR	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Ciénaga Las Cucharillas NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Cueva del Indio NR	Cultural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Ecosystems adyacent to the Laguna Joyuda NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
El Pantano, Bosque de *Pterocarpus,* Lagunas Mandry y Santa Teresa	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Focal Resource	No
Finca Belvedere NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Guánica State Forest NR and Biosphere Reserve	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Hacienda La Esperanza NR	Cultural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No

Table 6.5 (cont.): National Classification System for Puerto Rico's 35 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Islas de Mona y Monito NR	Natural Heritage	Zoned Multiple-Use	Permanent	Year-round	Ecosystem	In development[1]
La Parguera NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Laguna Joyuda NR	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Laguna Tortuguero NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Manglar Punta Petrona NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Manglar Punta Tuna NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Focal Resource	No
Pantano Cibuco NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Piñones State Forest NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Punta Guaniquilla NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Focal Resource	No
Punta Yeguas NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Focal resource	No
Río Espiritu Santo NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Seven Seas NR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	In development[2]
Isla de Desecheo MR	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Tres Palmas MR	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Focal resource	In development[1]
Aguirre State Forest	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No

[1] Management plan in preparation
[2] Management plan final document awaiting approval from the Puerto Rico Planning Board

SUCCESS STORY

The fishing community on the small island of Culebra, well aware of the imminent threats that their reefs were facing, began promoting the establishment of an MPA around the island in the 1980s. In 1999, the Asociación de Pescadores de Culebra (Culebra Fisherman's Association), with the support of the community, academia, scientists, and NGOs, finally succeeded in their conservation efforts. In that year, the Puerto Rico Planning Board, following the recommendation of the Department of Natural and Environmental Resources (DNER), designated the ecologically important area that comprises the Luis Peña Channel as a natural reserve (NR). This reserve was the first marine NR that was originally petitioned by a fishing community in Puerto Rico, and it subsequently became the first NR with a no-take zone by virtue of the Puerto Rico Fishing Regulations (Article 8 (i)). The initial involvement of the fishermen and other stakeholders in the community has continued, with management plan development and implementation being driven by a bottom-up process (Hernández-Delgado 2003).

Culebra's efforts, and others simultaneously occurring throughout the world, motivated a small community in the municipality of Rincón to take action to protect the Tres Palmas reef. This reef has one of the few remaining large populations of healthy elkhorn coral (*Acropora palmata*) in the Caribbean. Several groups began lobbying for the designation of Tres Palmas as a marine reserve in 2001, and the leading group of stakeholders joined to form the Coalición Pro-Calidad de Vida de Rincón in 2002. Through an effective and efficient outreach and education campaign focused on the local community, the group was able to obtain public and government support for the marine reserve. The Puerto Rico Legislature approved the designation of the Tres Palmas Marine Reserve by passing Law No. 17 of January 8, 2004. This law also ordered DNER to develop a co-management plan (Article 5) and to establish coordination and management agreements (Article 6). Following the path taken by the community of Culebra, including the creation of steering and technical advisory committees, the Tres Palmas group is developing a well-organized management plan based on collaborative management between the community, DNER, and other groups. They are also promoting stakeholder participation in every stage of management plan development and implementation. In the interim, steps are being taken to designate the Tres Palmas Marine Reserve as a no-take area.

In 2002, the Culebra and Rincón efforts were recognized by the Coral Reef Task Force with awards. The community of Tres Palmas is applying the "lessons learned" from Culebra to the development of management plans for other MPAs. These examples will serve as models for collaborative management in Puerto Rico.

CITATIONS

Álvarez, N. 2006a. Fig. 6.1. Natural Protected Areas GIS layer from the Coastal Zone Division, DNER.

———. 2006b. Fig. 6.3.

Center for Sponsored Coastal Ocean Research (CSCOR). 2005. Caribbean Coral Reef Institute. NOAA/NOS/NCCOS/CSCOR. www.cop.noaa.gov/ecosystems/coralreefs/current/ccri-factsheet-cr.html.

Compañia de Parques Nacionales. n.d. Información General. www.parquesnacionalespr.com.

Conservation Trust of Puerto Rico. 2006. Mission. www.fideicomiso.org.

Department of Environmental and Natural Resources – Coastal Zone Management Program (DNER – CZMP). 2005. Alvarez, N. and E. Díaz. Estadísticas sobre los Arrecifes de Coral y Ecosistemas Bénticos Asociados de Puerto Rico, Draft.

Department of Environmental and Natural Resources (DNER) – Reserves and Refuges Division. 2006. Fig. 6.5.

Executive Order OE-2004-49 of August 25, 2004. Ciénaga Cucharillas Natural Reserve.

García-Sais, J.R., Appeldorn,R., Bruckner, A., Caldow, C., Christensen, J.D., Lilyestrom, C., Monaco, M.E., Sabater, J., Williams, E. and E. Díaz. 2005. *The State of Coral Reef Ecosystems of the Commonwealth of Puerto Rico.* In: J. Waddell (ed.), The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005. NOAA Technical Memorandum NOS NCCOS 11. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. 522 pp.

Green-Cáceres, Astrid J. 2005. Fig. 6.4. DNER. Adaptation of publication by the University of the Virgin Islands sponsored by the University of the Virgin Islands and the Sea Grant Program.

Kendall, M.S., Kruer, C.R., Buja, K.R., Christensen, J.D., Diaz, E., Warner, R.A. and M.E. Monaco. 2004. A characterization of the shallow-water coral reefs and associated habitats of Puerto Rico. *Gulf and Caribbean Research* Vol. 16 (2): 172-184.

Hernández-Delgado, E.A. 2003. Suplemento técnico al plan de manejo para la Reserva Natural del Canal Luis Peña, Culebra, Puerto Rico. Departamento de Recursos Naturales, San Juan, PR and National Oceanic and Atmospheric Administration.

Joint Legislative Resolution 449 of August 21, 2000. Manglar Punta Tuna.

Law No. 17 of January 8, 2004. Tres Palmas Marine Reserve Law.

Law No. 36 of April 17, 1979. Cayo Ratones and Adjacent Waters Law.

Law No. 57 of March 10, 2000. Law to designate as a Marine Reserve one half mile of the territorial waters around Desecheo Island.

Law No. 75 of June 24, 1975. Organic Law for the Planning Board of Puerto Rico as amended.

Law No. 133 of July 1, 1975. State Forests Law of Puerto Rico as amended.

Law No. 201 of August 25, 2000. Ecosystems adjacent to the Laguna Joyuda Law.

Law No. 228 of August 12, 1999. Law of Seven Seas Natural Reserve.

Lilyestrom, C.G. and E. Hoffmaster. 2002. *Recreational fishery statistics of coral reef fisheries in Puerto Rico.* In: Proceedings, Coral Reef Fisheries, Caribbean Regional Workshop on Coral Reef Fisheries Management: Collaboration on Successful Management, Enforcement and Education Methods.

Matos, Robert. 2006. Fig. 6.5. DNER – Reserves and Refuges.

Morelock, Jack, Wilson R. Ramírez, Andy W. Bruckner, and Milton Carlo. 2001. Status of Coral Reefs in Southwest Puerto Rico. Caribbean Journal of Science, Special Online Publication. Available online at http://www.uprm.edu/biology/cjs/reefstatuspdf.pdf.

Mote Environmental Services Inc. 2002. A description of the export industry for marine ornamental fish and invertebrates in Puerto Rico. Unpublished report to Puerto Rico Department of Natural and Environmental Resources' Coral Reef Advisory Committee. 85pp.

Parks, John. 2005. Fig. 6.8. NOAA Office of Ocean and Coastal Resource Management.

Puerto Rico Department of Natural and Environmental Resources (DNER). 2003. Administrative Order 2003-22.

Puerto Rico Fishing Regulations No. 6768. February 10, 2004.

Puerto Rico Planning Board Resolution PU-002 and extensions.

Schärer, M. and M. Almodóvar-Ramírez. 2005. Marine Managed Areas Inventory of Puerto Rico: A comprehensive database of coastal resources. COSTAS.

Soto, Elliot. 2005. Fig. 6.2. DNER – Enforcement Division.

Surfrider Foundation. 2005. Fig. 6.6. http://www.surfrider.org/.

U.S. National Oceanic and Atmospheric Administration. National Ocean Service, National Centers for Coastal Ocean Science Biogeography Program. 2001. Benthic Habitats of Puerto Rico and the U.S. Virgin Islands. CD-ROM. Silver Spring, MD: National Oceanic and Atmospheric Administration.

Ventosa-Febles, E.A., Camacho-Rodríguez, M., Chabert-Llompart, J.L., Sustache-Sustache, J. and Dávila-Casanova, D. 2005. Puerto Rico Critical Wildlife Areas. Commonwealth of Puerto Rico, Department of Natural and Environmental Resources, Bureau of Fish and Wildlife, Territorial Resources Division. 392pp.

Chapter 7: U.S. Virgin Islands Coral Reef MPA Summary

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INTRODUCTION

The U. S. Virgin Islands (USVI) is comprised of the three main islands of St. Croix, St. John, and St. Thomas, and 54 small islands and keys. Several types of coral reefs, including patch, bank, barrier, and fringing reefs can be found in the waters surrounding this island system. Spur and groove formations dominate many forereefs. Other prevalent components of the USVI's coral reef ecosystem that provide habitat for many different coral reef species include non–coralline hardbottom, mangrove systems represented by four different mangrove species, salt ponds created by the growth of coral reefs across the mouths of enclosed bays, large algal plains, and extensive seagrass beds. Over 350 species of fish have been observed among the coral reefs and in surrounding waters of the USVI (Drayton 2004).

Human activities, natural storm events, the impact of disease on corals, and the 1980's mass mortality of the black-spined sea urchin have significantly reduced the health and diversity of coral reef ecosystems in the USVI. Concentrated tourism pressure from the cruise ship industry; improper construction and wastewater management practices associated with the prolific development of private homes, hotels, and large resorts on the steep terrain of the three main islands; and increased fishing and marine recreation activity have had a severe impact on the coral reefs of the Virgin Islands.

Fig. 7.1: Threatened elkhorn coral in St. Croix (Weatherall 2005)

Coral reef ecosystem monitoring efforts of the federal government (NOAA, the U.S. Environmental Protection Agency, and the U.S. Department of the Interior), the territorial government (the USVI Department of Planning and Natural Resources), and the University of the Virgin Islands have revealed major declines in coral reef coverage, health, species diversity, and fish population abundance in the USVI. Over the past 25 years, living coral coverage has declined on some reefs from over 40 percent to under 20 percent, and small colonies outnumber major reef building species (Drayton 2004). Monitoring assessments in and around the federal protected areas of the Virgin Islands National Park and Coral Reef Monument on St. John and the Buck Island Reef National Monument off of St. Croix have revealed similar decreases in live coral cover over a four-year period from 1997 to 2001 (Jeffrey, et al. 2005). Observations of *Acropora palmata,* an important reef building species, in the official 2005 report on the State of Coral Reef Ecosystems of the US Virgin Islands, have revealed continued loss of this species due to disease and physical breakage (Jeffrey, et al. 2005). Over the past 12 years, the National Park Service has also documented significant declines in reef fish abundance, including key reef species like gray angelfish (*Pomacanthus arcuatus),* queen angelfish (*Holacanthus ciliarus),* red hind (*Epinephelus guttatus)*, and Nassau grouper *(Epinephelus striatus)* (Beets and Friedlander 2003). Intense fishing pressure, habitat loss and degradation, and tropical storm events have resulted in the demise of the large grouper and snapper species in the USVI (Olsen and LaPlace 1978; Beets and Friedlander 1992; and Rogers and Beets 2001).

The U.S. federal government and the territorial government of the USVI have recognized that measures must be taken to protect remaining coral reef resources in the islands, and for almost 50 years they have made efforts to conserve coral reef ecosystems through the establishment of MPAs. In 1959, the Virgin Islands government joined forces with the U.S. Department of the Interior to support a survey of recreational needs, sites, and services in the USVI. This study was done specifically to encourage the development of a territorial park system, and many of the existing MPAs in the USVI were first identified by this survey (Island Resources Foundation 2002).

The government of the USVI has established 24 MPAs on St. Croix, St. John and St. Thomas that contain coral reef resources and habitats. These sites represent three types of MPAs in the USVI: territorial marine parks, areas of particular concern (APCs), and marine reserve

and wildlife sanctuaries (MRWSs). There is also a fisheries spawning area closure in the USVI, the St. Croix Mutton Snapper Closure Area, which is jointly managed by the federal and territorial government. As described in the report's introduction, this report is an accounting of areas that are managed by state and territory governments; therefore, this fisheries closure is not further discussed in this chapter.

MPA TYPES

Territorial Marine Parks:

Although the USVI has expressed a goal of establishing a system of territorial marine parks, the St. Croix East End Marine Park is the only park currently in this MPA category.

National Classification: Zoned Multiple-Use with No-Take Areas, Natural Heritage MPA

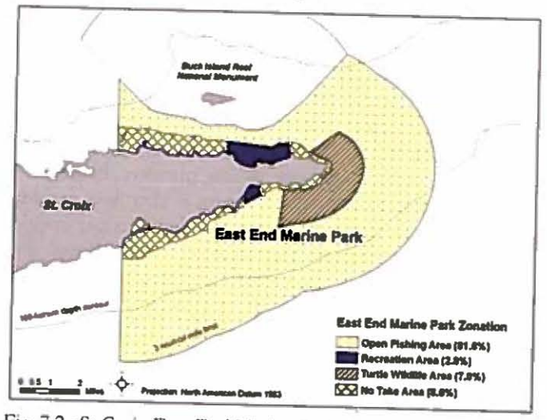

Fig. 7.2 : St.Croix East End Marine Park zonation map (USVI Department of Planning and Natural Resources 2006b)

Enabling Legislation and Responsible Agency:

The USVI Department of Planning and Natural Resources (DPNR), Division of Coastal Zone Management (CZM) has management authority over the St. Croix East End Marine Park (STXEEMP), which was established by the 24th Legislature of the USVI on January 15, 2003 through the creation of Act No. 6572 of the Virgin Islands Code Title 12, Chapter 1, Sections 97 and 98. This act also gave DPNR the authority to establish other territorial marine parks.

Goals, Objectives, Policies and Protections:

According to the official mission statement, the STXEEMP was "established for the purpose of managing the resources within the boundaries of the park. These natural and cultural resources provide environmental, economic and social benefits to residents and visitors. Increased demand for recreational, educational, and commercial uses require the resources be managed in a manner that guarantees the benefits are available for present and future generations" (STXEEMP 2005-06a). The legislative authority establishing the park states that the park's goal is "to protect territorially significant marine resources, promote sustainability of marine ecosystems, including coral reefs, seagrass beds, wildlife habitats and other resources, and to conserve and preserve significant natural areas for the use and benefit of future generations…" (Virgin Islands Code, Title 12, Ch. 1, § 97-98).

Official rules and regulations for the park were adopted by the VI CZM Commission on April 4, 2006. Once the governor of the USVI signs the rules and regulations, they will be legally enforceable. The commission may revise the rules and regulations at any time, but the changes must be adopted by the commission and signed by the USVI governor.

Within the boundaries of the STXEEMP, there are four types of managed areas, or zones, including recreational management areas, a turtle wildlife preserve area, no-take areas, and open areas. Recreational management areas, which make up 2.8 percent of the park, were established to allow for the enjoyment of marine resources by local Virgin Islanders and visitors to

Table 7.1: Priority Coral Reef Resources and Habitats Found in the St. Croix East End Marine Park

Territorial Marine Park	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wet lands	Bays and Estuaries	Salt Ponds	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
St. Croix East End	x	x	x	x	x	x	x	x	x	x	x	x	x

St. Croix, while minimizing the disturbance to marine life and their habitats. These areas were designated for uses such as snorkeling, diving, catch and release fishing, cast net bait fishing, shoreline fishing, and boating. The intent of the turtle wildlife preserve area is to protect primary turtle nesting beaches as well as transit and foraging areas for green, hawksbill, and leatherback turtles. The public is permitted to use these areas for recreation, but no cars, horses, or fires are permitted on the beaches. A prohibition on gill and trammel nets for the harvest of baitfish in this area also offers protection for turtles feeding in the park waters. This zone represents 7 percent of the total STXEEMP area.

Approximately 8.6 percent of the STXEEMP is made up of no-take areas that prohibit all commercial and recreational fishing. These areas were established to protect spawning, nursery, and residence habitat for important reef species. A majority of the STXEEMP area, over 80 percent, has been designated as open area. This area prohibits the removal of coral or live rock.

The USVI government has a joint enforcement agreement with NOAA to support and enforce both local and federal regulations pertaining to the protection of important fisheries habitat and managed species.

Management Activities:

A comprehensive management plan for the park was formally adopted by the Virgin Islands Legislature in 2002. The plan was developed by the Virgin Islands chapter of The Nature Conservancy (TNC) and was based on a participatory process involving many different stakeholders on St. Croix. TNC used their site conservation planning framework for the development of this plan, which resulted in a series of management strategies and action plans to achieve the identified goals and objectives of the park.

The STXEEMP currently has an administrative assistant, a chief of interpretive rangers, and a marine resource ecologist. Efforts are underway to fill additional positions for the park including a marine park coordinator, outreach and education coordinator, and interpretive rangers. These staff positions answer to the director of the VI CZM Program and are responsible for the day-to-day management of the park, including the implementation of all park programs and management activities. Upon signature of the rules and regulations by the governor of the USVI, environmental enforcement officers from DPNR's Division of Environmental Enforcement will be able to enforce the

Table 7.2: STXEEMP Zone Regulations (USVI Department of Planning and Natural Resources 2006a)

Park Wide Regulations	Wildlife Preserve Zone (Turtle Area)	No-Take Zone	Recreational Zone	Open Fishing Area
Removal, injury, or possession of any coral or live rock not allowed Alteration or construction on the sea bed not allowed Discharge or deposit of materials such as oil or trash not allowed Use of a vessel in a manner that damages marine habitats not allowed All vessels must be anchored or moored in accordance with marine park regulations Diving without a flag not allowed Damage or removal of markers not allowed Commercial activity, scientific research, or other activity that involves extraction, alteration, or addition requires a permit	Gill and trammel nets not allowed Additional regulations may be implemented at a future date	Vessels longer than 150 feet. not allowed Fishing not allowed Removal of, or injury to, any living marine resource not allowed Personal watercraft, airboats, and waterskiing not allowed	Recreational activities such as, but not limited to, swimming, snorkeling, diving, kite boarding, windsurfing, and boating, allowed Shoreline recreational line fishing (keep catch) allowed Catch and release guide fishing allowed Cast netting to catch bait fish allowed All other traditional fishing methods not allowed	Existing territorial regulations apply Removal of coral or live rock not allowed

NOTE: The above referenced information is an extract of highlights from the draft STXEEMP Rules and Regulations. This list is not exhaustive nor inclusive of all the prohibitions cited in the rules and regulations.

adopted regulations. Listed below are some of the programs that are being implemented, or are in development.

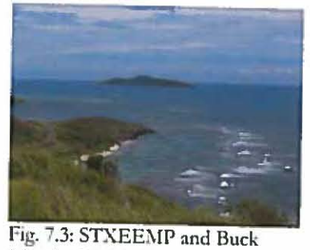
Fig. 7.3: STXEEMP and Buck Island (Wusinich-Mendez 2005)

Monitoring:
In partnership with NOAA, the National Park Service, the University of the Virgin Islands, and DPNR's Division of Fish and Wildlife (DFW), the CZM Program has been monitoring long-term trends in benthic habitat and fishery resources in the USVI, with a focus on the development of a comprehensive baseline measure of marine resources within the STXEEMP. The CZM Program and DFW are also working together to monitor populations of Caribbean spiny lobster (*Panulirus argus*) within the park.

Education and Outreach:
The STXEEMP has a strong outreach and education program that seeks to "promote a holistic view of the park ecosystem as an interrelated and interdependent system of habitats, encourage and promote a sense of user stewardship regarding the marine environment, and promote the awareness of and support for the St. Croix East End Marine Park" (STXEEMP 2005-06b). Several products and on-going programs have been developed to achieve these goals. They include snorkel clinics, summer camps, a marine park video, an outreach and information center, a mobile outreach and education van, and the on-going development of outreach products for hotels, private tour operators, and the public. DPNR is working with NOAA Fisheries and the Nature Conservancy to create an interpretive plan for the park that includes training of interpretive rangers. A STXEEMP visitor's center is currently under development. Outreach staff are also involved with the Virgin Islands Network of Environmental Educators (VINE), a network of natural resource and cultural outreach specialists working to build capacity for environmental education in the USVI. The network includes members of 26 territorial agencies and organizations dedicated to managing territorial cultural and natural resources.

Other:
As a part of the U.S. Coral Reef Task Force, the USVI is participating in an initiative to develop and implement local action strategies (LAS) that address priority threats to U.S. coral reef ecosystems. The USVI chose to focus their LAS effort completely on the STXEEMP, and has developed a series of over 60 projects to address overfishing, land-based sources of pollution, recreational overuse and misuse, and a lack of public awareness of coral reef issues, all of which are major threats to the park's coral reef resources. Twenty-four of these projects are currently being implemented.

The CZM Program has installed 45 day-use mooring buoys and is permitted to install a total of 55 throughout the park. Buoy locations were selected based on high use areas and benthic habitat surveys throughout the STXEEMP, and were installed to protect seagrass beds and coral reefs in areas with heavy recreational use.

Federal funds have also been obtained by the CZM Program for the installation of navigational aids, boundary markers, and park signage; an economic valuation of coral reef resources with the STXEEMP, a user survey, and a vessel assessment; and, development of standard operating procedures for the day-to-day management of the park.

Stakeholder Involvement and Public Participation:

The USVI has recognized the importance of involving local stakeholders in the development and management of the STXEEMP. In the initial stages of developing the park boundaries and identifying different use zones, DPNR and TNC worked with local fishermen in community workshops. The fishermen identified the proposed no-take areas for the park as light commercial fishing areas and agreed that they would be appropriate for no-take areas because of their importance as nursery areas for recreational and commercial fisheries (TNC 2002). The management plan development process was a highly collaborative one. The management strategies and action plans that are the core of the STXEEMP Management Plan are the result of a series of community workshops held on St. Croix in 2001. The workshops were attended by representatives of DPNR's Divisions of CZM, Fish and Wildlife, Environmental Enforcement, Comprehensive and Coastal Zone Planning, and Environmental Protection, the University of the Virgin Islands, the National Park Service, The Ocean Conservancy, the Island Resources Foundation, the St. Croix Fisheries Advisory Committee, the commercial fishing industry, and local dive operators.

The STXEEMP has an official advisory committee, the Virgin Islands Marine Park Advisory Committee (VIMPAC) that was created to support effective management of the park (see success story on p. 128). The committee's work has been crucial to the successful development of the STXEEMP. Members worked with the territorial government to establish the park and develop the management plan and rules and regulations. VIMPAC has members representing territorial and federal government agencies, international, national and local non-governmental organizations (NGOs), the University of the Virgin Islands, commercial fishers, private businesses, and interested stakeholders. The committee's role has evolved and the group now provides advice and technical assistance on MPA issues in the USVI beyond the STXEEMP.

Areas of Particular Concern

The CZM Program Development Regulations, Section 305 (b)(3) and 15 CFR Part 923, provide criteria that each state or territory may use when designating or nominating areas of particular concern (APCs). Areas may be designated under a number of categories (see Table 7.3). These categories were used by the territorial government in 1979 to select the 18 APCs, and include significant natural areas (SNAs), culturally important areas, recreational areas, prime industrial and commercial areas, developed areas, hazard areas, and mineral resources. Half of the APCs are located on St. Croix, and half are split between the other two main islands, with three on St. John and six on St. Thomas. Table 7.3 lists the APCs for each island and their original categories for selection.

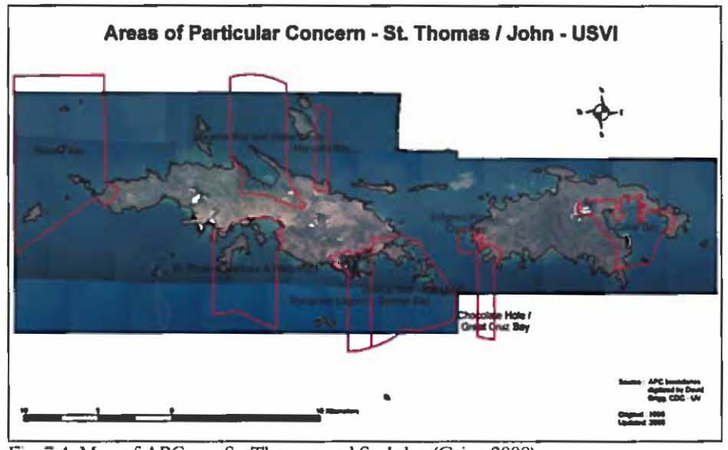

Fig. 7.4: Map of APCs on St. Thomas and St. John (Grigg 2000)

National Classification: Uniform Multiple-Use, Natural Heritage and Cultural Heritage MPAs

Enabling Legislation and Responsible Agency:

The Virgin Islands Coastal Zone Management Act of 1978 declared that certain areas of the USVI's coastal zone are of special significance, and called for an inventory and designation of APCs within the coastal zone. In 1979, the Virgin Islands Department of Conservation and Cultural Affairs conducted an inventory of sites for nomination as areas of particular concern (APCs) and areas for preservation and restoration (APRs). Based on technical review by government staff and public review and input, 18 land and water areas were designated as APCs and APRs. On June 9, 1994, the Legislature of the Virgin Islands, through Bill No. 20-0252, legally designated all 18 areas as APCs within the coastal zone. The bill designates the APCs by name and geographic boundary only. There are currently no areas designated as APRs.

The CZM Division of DPNR is responsible for the management of these 18 areas. Upon the development and approval of management plans and rules and regulations for these areas, DPNR's Division of Environmental Enforcement will be responsible for enforcement.

Goals, Objectives, Policies and Protections:

The areas included within the APC system possess an abundance of biological diversity. Almost all of the APCs include both a terrestrial and marine component, and ten include a significant marine component that extends from the shoreline to the three-mile territorial limit. These areas contain critical coral reef habitat areas, such as mangroves, seagrass beds, fish spawning areas, fish and shellfish nursery areas, wetlands, estuaries, and salt ponds.

The APCs were originally developed as a land use planning tool rather than for the purpose of managing marine resources. Therefore, there is some debate as to whether these sites actually qualify as MPAs. The APC system is included in this report for several reasons, including the fact that the APCs were included by the USVI in the National MMA Inventory and that most APCs include significant marine components that will be addressed in management plans and managed through the development of rules and regulations for the system. Specific goals and objectives for the APCs have yet to be established or adopted by the territorial government, but general guidelines and use recommendations were outlined for the system (DOC 1979). These guidelines recommend the protection of natural functions, protection of marine ecosystems and resources, wildlife conservation, habitat protection, protection of endangered species, watershed management, marine pollution management, support of recreational activities

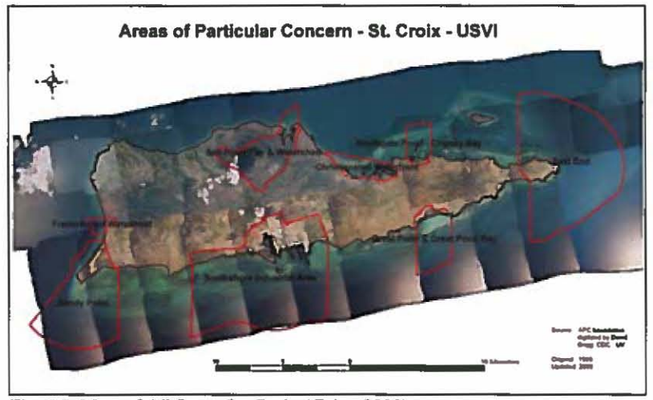

Fig. 7.5: Map of APCs on St. Croix (Grigg 2000)
NOTE: Map does not include the St. Croix Coral Reef Ecosystem APC.

and water-based commerce, protection of cultural and historic resources, and research and education. Each of the 18 APCs has at least one recommendation related to natural resource conservation.

Management Activities:

There have been numerous attempts to create management plans for the APCs. In 1981, draft management plans for various APCs were developed by the Department of Conservation and Cultural Affairs. In 1993, analytic studies for all 18 APCs were completed that provided background information for the areas. In 2001, draft management plans were produced for Coral Bay, Benner Bay, and Christiansted Waterfront APCs. These plans were deemed unacceptable by DPNR because they proposed a restructuring of the territorial government, were very general, and did not include site-specific management approaches. In 2002, portions of four APCs on St. Croix (East End, St. Croix Coral Reef Ecosystems, Great Pond, and Southgate Pond/Chenay Bay) were combined and elevated in status to become the St. Croix East End Marine Park (STXEEMP). Since the STXEEMP encompasses significant marine components of four APCs, the park's management plan could be considered a successfully adopted APC-related management plan. Apart from being an APC, the Sandy Point area of St. Croix is also a national wildlife refuge and is managed by the U.S. Fish and Wildlife Service. A portion of the Southgate Pond APC is privately owned by the St. Croix Environmental Association (SEA). SEA has prepared a conservation management plan for the pond and surrounding area that encompass their private land holdings. The Magens Bay Beach Authority manages the beach portion of the Magens Bay APC and collects user fees to maintain the beach facilities and provide lifeguards.

As far as the remaining APCs, there are no management plans or rules or regulations that prohibit or limit any activities within the areas beyond the existing territorial and federal laws and rules and regulations. To date,

Table 7.3: APC Selection Criteria (U.S. Department of Commerce 1979)

Criteria for Selection 1979 designation	St. Croix APCs	St. Thomas APCs	St. John APCs
Prime Commercial /Recreational Area	Christensted Waterfront	Vessup Bay – East End	
Commercial	Frederiksted Waterfront		Enighed Pond
Territorial Park System	East End	Botany Bay	Coral Bay-Lagoon Point
Wildlife, Educational and Natural Area	Great Pond		
Natural, Scientific, Educational, Scenic and Historic Area	Salt River Bay and Watershed		
Significant Natural Area	Sandy Point		Chocolate Hole-Great Cruz Bay
Wildlife Educational and Research Area	Southgate Pond		
Industrial Area	Southshore Industrial Area		
Underwater Park/Territorial Park System	St. Croix Coral Reef Ecosystems		
Archeological, Cultural, Educational, Recreational Area		Magens Bay and Watershed	
Wildlife and Scenic Park		Mandahl Bay	
Mangrove Protection/Restoration		Mangrove Lagoon – Benner Bay	
Industrial and Commercial Area		St. Thomas-Charlotte Amalie Harbor and Waterfront	

none of the 1981 draft management plans, 1993 analytic studies, or 2001 draft management plans have been adopted by the territorial government. In 1980, there was an attempt to incorporate the APC management recommendations outlined in the 1979 Virgin Islands Coastal Management Program and Final Environmental Impact Statement into the CZM permitting process. However, it is unclear how extensively these recommendations have been applied. In 1994, in Virgin Islands Conservation Society, Inc. v. Virgin Islands Board of Land Use Appeals and Virgin Islands Coastal Zone Management Commission et al. 857 F. Supp.1112, the U.S. District Court found that APC management plans are non-binding unless approved and adopted by the legislature.

Fig. 7.6: Coral Bay watershed and APC (Wusinich-Mendez 2005)

DPNR has recently designated a coordinator for the APC system who will work with other divisions of local government, stakeholder groups on all three islands, and involved federal partners to identify strategies and attempt to make the APC system functional. This effort may lead to the prioritization of areas for management action, including the development of management plans and regulations.

Stakeholder Involvement and Public Participation:

Due to the lack of progress in implementing the APC system, there has been little opportunity to involve local stakeholders and minimal public involvement in management, with the exception of the Coral Bay-Lagoon Point APC on St. John. The residents of Coral Bay have formed the Coral Bay Community Council to provide a forum whereby local residents can participate in planning for development. The council is involved in several activities that seek to increase general awareness

Table 7.4: Priority Coral Reef Resources and Habitats Found in the 18 Areas of Particular Concern (APCs)
(STX = St. Croix, STJ = St. John, STT = St. Thomas)

Areas of Particular Concern (APCs)	Coral Reefs	Mangroves	Seagrass and Algal Beds	Wet lands	Bays and Estuaries	Salt Ponds	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Botany Bay - STT	x	x	x			x					x	x	x
Christiansted - STX	x	x	x	x			x	x	x	x	x		x
Chocolate Hole - STJ	x	x	x	x		x	x				x		x
Coral Bay - STJ	x	x	x	x		x		x		x	x		x
East End - STX	x	x	x	x	x			x	x	x	x	x	x
Enighed Pond - STJ	x	x	x	x		x	x	x	x	x			x
Frederiksted - STX	x		x									x	x
Great Pond - STX	x	x	x	x		x		x	x	x			x
Magens Bay - STT	x		x					x	x	x		x	x
Mandahl Bay - STT	x	x		x		x	x	x	x		x	x	x
Mangrove Lagoon - STT	x	x	x	x	x	x	x	x	x	x	x	x	x
Salt River - STX	x	x	x	x	x	x		x	x	x	x	x	x
Sandy Point - STX			x			x					x		x
Southgate - STX	x	x	x	x				x	x	x	x		x
Southshore Industrial - STX	x	x	x			x	x		x	x			x
St. Croix Coral Reef - STX	x	x	x				x	x	x	x	x		
St. Thomas Harbor - STT	x	x	x	x		x	x				x	x	x
Vessup Bay - STT	x	x	x	x		x					x		x

and understanding of issues related to land use planning, watershed management, and the use and protection of ocean resources. It has developed outreach materials that provide information to developers and the public on best management practices for watershed conservation, and it is currently working on a project to inventory the marine and coastal species and habitats of Coral Bay. While not specific to the APCs, there has been stakeholder and public involvement in the development and management of the STXEEMP, which consists of portions of four APCs.

Ecological Preserve and is jointly managed with the National Park Service.

Goals, Objectives, Policies and Protections:

All of the reserves have one goal in common – the protection of valuable fishery and wildlife resources, and the habitats on which those species depend. Each reserve also has specific goals, objectives, and regulations included in the section of Virgin Islands Code Title 12, Chapter 1 that authorized their establishment. Currently, the reserves in the MRWS system have stronger regulations for the protection of marine resources than any other territorial MPA in the USVI.

Table 7.5: Priority Coral Reef Resources and Habitats Found in the Five Marine Reserve and Wildlife Sanctuaries (MRWSs) (STX = St. Croix, STJ = St. John, STT = St. Thomas)

Marine Reserves and Wildlife Sanctuaries (MRWSs)	Coral Reefs	Mangroves	Seagrass or Algal Beds	Wetlands	Bays and Estuaries	Salt Ponds	Fish Spawning Areas	Commercial Finfish	Recreational Finfish	Shellfish	Sea Turtles	Marine Mammals	Threatened or Endangered Birds
Cas Cay/Mangrove Lagoon - STT		x	x	x	x	x	x	x					
Compass Point Pond - STT		x	x	x	x	x	x						x
Frank Bay - STJ			x		x	x	x	x	x	x			
Salt River Bay - STX		x	x	x			x	x	x	x	x		x
St. James - STT	x	x	x		x	x	x	x	x	x	x		

Marine Reserves and Wildlife Sanctuaries:

Three of the reserves are located on the East End of St. Thomas, and St. Croix and St. John each have one.

National Classification: No-Take, Natural Heritage, Cultural Heritage, and Sustainable Production MPAs

Enabling Legislation and Responsible Agency:

The five reserves in this system are supported by both the Wildlife and Marine Sanctuaries Act 1980 (Act No. 5229) and the Virgin Islands Code Title 12, Chapter 1, Sections 94, 96, and 97. This legislation allows DPNR to designate wildlife sanctuaries and marine reserves, and to promulgate associated rules and regulations. While the supporting legislation was created in 1980, the five reserves were officially designated between 1992 and 2000. DPNR's Division of Fish and Wildlife (DFW) has management authority over the reserves, and DPNR's Division of Environmental Enforcement is responsible for enforcing the reserves' regulations. Salt River Bay is also a National Historical Park and

The Cas Cay/Mangrove Lagoon MRWS was established to protect essential fish habitat for juvenile reef fish, lobsters, birds, and wetland plants and animals, and to support the restoration of these wildlife populations within the reserve. It is illegal to take any living organism from the reserve, or to use firearms or any other contrivances designed to take fish, birds, or other wildlife. In the reserve, boats are not allowed to anchor for more than seven days, and vessels without functioning sewage holding tanks are prohibited from anchoring. Within an identified inner lagoon area, it is illegal to use motorized vessels. Bait fishing is allowed north and west of the shorelines of the reserve with a permit from DPNR's Division of Environmental Enforcement.

The Compass Point Pond MRWS was established to protect this important wildlife area on St. Thomas and to prevent any further degradation of the natural resources found within it. Prohibited activities within

this reserve include the use of firearms, the taking of any plant or animal, and the construction, storage, repair, and maintenance of vessels or vehicles.

The St. James, Frank Bay, and Salt River MRWSs have focused marine resource conservation goals that aim to: contribute to commercially viable fishery resources by protecting a portion of their spawning stock; to preserve coral reefs and seagrass habitats for larval, juvenile, and adult fish and invertebrates, as well as endangered sea turtles and bird species; and, finally, to provide marine viewing areas for commercial dive operators, recreational divers, students, and researchers. As in the other reserves, it is unlawful to remove any marine or other wildlife from these three reserves. In the St. James MRWS, fishing by hook and line and bait fishing using a cast net are allowed within 50 feet of the shoreline with a permit from DPNR's Division of Environmental Enforcement.

Management Activities:

Although the regulations for each reserve are comprehensive and seek to effectively protect marine and wildlife resources in the MRWS system, none of the reserves has a management plan. The existing management efforts in these reserves include the installation of signage that enables DPNR's Division of Environmental Enforcement to effectively respond when violations are reported, the distribution of brochures that explain the rules and regulations for these areas, and the opening of channels in the Cas Cay/Mangrove Lagoon MRWS to restore circulation after they had been closed off by hurricanes. DFW has worked with a number of hotels and condominium communities in the areas surrounding the reserves to make their clientele aware of the reserve regulations. In partnership with NOAA, DFW has also developed educational materials on the MRWSs of St. Thomas that were distributed through the hotels and fishing associations.

Stakeholder Involvement and Public Participation:

The reserves were established with public input. The St. Thomas Fisheries Advisory Committee recommended the establishment of the Cas Cay/Mangrove Lagoon and St. James MRWSs. The Frank Bay MRWS was developed as a result of a stakeholder initiative, and the residents of St. John are very involved in the conservation of this area.

CHALLENGES TO MPA EFFECTIVENESS

One of the greatest challenges to the effective implementation of MPAs in the USVI is a lack of resources, both human and financial, dedicated to MPA management activities. Only one MPA in the USVI, the STXEEMP, has dedicated staff. With no human resources dedicated to managing the MPAs, there is little to no management activity for these sites and only the STXEEMP has an approved management plan. Even within the STXEEMP, which has federal funds that currently support the staff positions and management activities described above, there is no identified source of long-term, sustainable funding that will support the activities that are critical to the effective management of the park. There are efforts underway to complete a sustainable financing plan for the STXEEMP that seeks to identify these long-term opportunities. The lengthy hiring processes of the territorial government is also a challenge because it is difficult to find qualified personnel that are willing to wait the one to two years that it can take to finalize a position. As a result of such hiring delays, several of the funded staff positions within the STXEEMP are currently vacant.

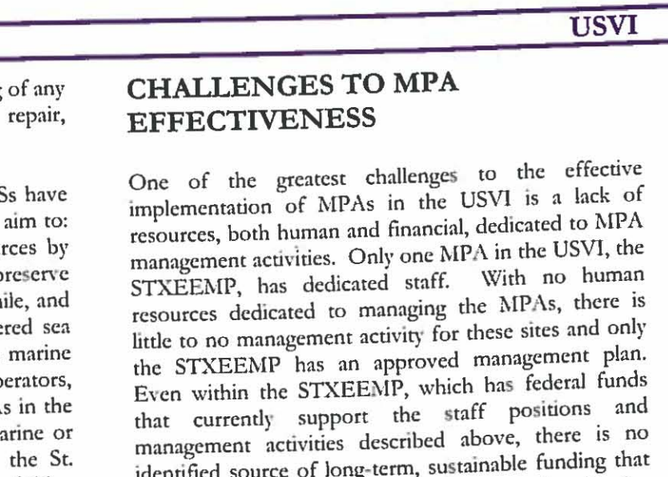

Fig. 7.7: Percent of MPAs (out of 24 total MPAs) that identified each issue as a challenge to effective MPA management.

In addition to inadequate funds to support staff, capacity of existing staff is a considerable MPA management challenge. It is extremely difficult to find qualified local residents of the USVI that are interested in coastal and marine resource management positions. The lack of qualified staff will remain an issue until marine conservation is better incorporated into local education systems and curricula.

Another obstacle to effective MPA management is a lack of enforcement of existing rules and regulations. Currently, DPNR's Division of Environmental Enforcement is responsible for upholding all environmental rules and regulations throughout the territory. There is no enforcement staff dedicated specifically to the MPAs, and with other enforcement priorities such as port security and immigration issues, protected area management falls by the wayside. The root cause of these problems may be a general lack of awareness and understanding of the threats to marine and coral reef resources in the USVI and the potential benefits of MPAs. Without a change in the level of public interest and support for marine conservation in the USVI, decision makers and government officials will not dedicate more resources and attention to coral reef conservation.

In the National MMA Inventory, all 24 MPAs identified capacity, public support, and enforcement as major management challenges. Resources and monitoring were identified as priority challenges for all MPAs except the STXEEMP, which currently has access to federal funding and has on-going coral reef and water quality monitoring programs.

WORKING TOWARDS A NETWORK

There is a need for a system of MPAs operating cooperatively and synergistically across the territory to support the ecological integrity of the coral reef resources of the USVI. In 2004, the USVI completed a *Management Framework for a System of Marine Protected Areas for the U.S. Virgin Islands* (Gardner 2004). Little has been done to further develop and implement that plan until recently. Two major non-governmental conservation organizations located in St. Croix, The Nature Conservancy and The Ocean Conservancy, are working together with DPNR to provide critical information for future network development. They are assessing existing federal and territorial MMAs throughout the USVI to determine the level of coral reef ecosystem protection within existing sites, the viability of those areas, and their contribution to a potential representative and resilient ecological network of MPAs. The organizations will also be conducting a series of workshops with fisheries and marine resource management experts, as well as representatives from various stakeholder groups, to identify priority marine conservation targets, their locations, ecological needs, and presence within and outside of existing MMAs. These workshops will be followed by an in-depth gap analysis to determine an optimal portfolio of protected areas for the conservation of coral reef ecosystems in the U.S. Virgin Islands. It is hoped that this information will then be used as the basis for the development of an expanded territorial marine park system in the USVI.

Fig. 7.8: NOAA and USVI DPNR partner to monitor coral reefs in the STXEEMP (Rothenberger 2005)

NEXT STEPS/ RECOMMENDATIONS

The following measures are recommended in support of the development and effective management of coral reef protected areas in the USVI.

Strengthen DPNR's Division of Environmental Enforcement by investing more resources, and hiring more enforcement personnel that can dedicate their time to MPA enforcement issues. A corps of MPA rangers could be created that would patrol protected areas and observe, document, and report territorial or MPA regulatory violations to DPNR's Division of Environmental Enforcement. Officers could then take enforcement actions and issue violations as they are reported by the rangers.

Create a consistent, targeted effort to educate policy makers on the importance of coastal and marine resources. An effective network of MPAs will never be realized in the USVI without addressing the issue of political will. Decision makers need to be involved in protected area processes so that they see the value of these initiatives and will support their development.

Strengthen relationships with local partners, including federal government agencies academic institutions, NGOs, and local community groups that can help the local government design and implement actions to support protected area management.

Develop scholarship and internship programs for local students to build local protected area management capacity.

Table 7.6: National Classification System for the USVI's 24 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
East End Marine Park	Natural Heritage	Zoned Multiple-Use with No-Take Areas	Permanent	Year-round	Ecosystem	Yes
Botany Bay APC	Natural & Cultural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Christiansted APC	Natural & Cultural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Chocolate Hole APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Coral Bay APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
East End APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Enighed Pond APC	Natural & Cultural Heritage & Sustainable Production	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Frederiksted APC	Natural & Cultural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Great Pond APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Magens Bay APC	Natural & Cultural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Mandahl Bay APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Mangrove Lagoon APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Salt River APC	Natural & Cultural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Sandy Point APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Southgate APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Southshore Industrial APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
St. Croix Coral Reef APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
St. Thomas Harbor APC	Cultural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No
Vessup Bay APC	Natural Heritage	Uniform Multiple-Use	Permanent	Year-round	Ecosystem	No

Table 7.6 (cont.): National Classification System for the USVI's 24 MPAs

Site Name	Conservation Focus	Level of Protection	Permanence of Protection	Constancy of Protection	Scale of Protection	Management Plan
Cas Cay – Mangrove Lagoon MSWR	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Compass Point Pond MSWR	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
Frank Bay MSWR	Natural Heritage	No-Take	Permanent	Year-round	Ecosystem	No
St. James MSWR	Natural Heritage & Sustainable Production	No-Take	Permanent	Year-round	Ecosystem	No
Salt River Bay MSWR	Natural & Cultural Heritage	No Impact	Permanent	Year-round	Ecosystem	No

SUCCESS STORY

Fig. 7.9: VIMPAC (STXEEMP 2003)

The Virgin Islands Marine Park Advisory Committee (VIMPAC) was originally established in early 2000 as a group of local experts that would help guide the establishment of the first territorial marine park in the U.S. Virgin Islands, the St. Croix East End Marine Park (STXEEMP). The committee is represented by four divisions of DPNR (Divisions of CZM, Environmental Protection, Fish and Wildlife, and Environmental Enforcement); the University of the Virgin Islands and other local academic institutions; six federal government agencies (NOAA, National Park Service, U.S. Fish and Wildlife Service, U.S. Geological Service, the U.S. Environmental Protection Agency, and the U.S. Coast Guard); the Caribbean Fisheries Management Council; local fisheries representatives; non-governmental organizations (The Nature Conservancy, the Ocean Conservancy, the St. Croix Environmental Association, and the Island Resources Foundation); and, commercial and recreational marine resource users from various sectors.

Members of the committee have remained dedicated to assisting the Virgin Islands government in developing a territorial marine park system for over five years. Working on a volunteer basis, they meet monthly to provide guidance and technical assistance for the implementation of management measures for the STXEEMP. They assisted in the development of a management plan for the STXEEMP and most recently worked to develop the rules and regulations that will legally put the management plan into effect. VIMPAC's dedication to the vision of a territorial marine park system remains an asset to DPNR. The committee has effectively acted as a broker for communication and information sharing between DPNR and stakeholder groups, and has provided a forum through which management issues and concerns can be discussed by various groups. In 2003, VIMPAC members received the Coastal America Partnership Award in recognition of the collaborative effort of the territorial government and stakeholders in developing the STXEEMP.

VIMPAC has created the by-laws by which it will be governed, and has drafted the following goals: the protection and maintenance of biological diversity throughout the USVI; the management of marine resources for sustainable use; socio-economic parity for displaced individuals or businesses due to MPA establishment processes; and, increased local knowledge of marine resources and the benefits of protecting them. The committee is also working to secure funds for the sustainable management of MPAs; to assist with the technical and operational aspects of MPA management as appropriate; and, to promote effective MPA conservation and management by demonstrating lessons learned from other protected areas.

CITATIONS

Beets, J. and A. Friedlander. 1992. Assessment and management strategies for red hind, *Epinephelus guttatus*, in the U.S. Virgin Islands. *Proceedings of the 42nd Gulf and Caribbean Fisheries Institute* 42: 226-242.

———. 2003. *Temporal analysis of monitoring data on reef fish assemblages inside the Virgin Islands National Park and around St. John, U.S. Virgin Islands, 1988-2000.* Final Report to the U.S. Geological Survey Caribbean Field Station, St. John, Virgin Islands.

Drayton, N., C. Rogers, and B. Devine. 2004. *The State of the Reefs of the U.S. Virgin Islands.* Washington, DC: The Ocean Conservancy.

Gardner, L. 2004. *Management Framework for a System of Marine Protected Areas for the U.S. Virgin Islands.* University of the Virgin Islands and Department of Planning and Natural Resources. USVI, September 24, 2002.

Grigg, David. 2000. APC Boundaries Revised. University of the Virgin Islands Conservation Data Center, USVI.

Island Resources Foundation. 2002. *Resource Description Report.* University of the Virgin Islands and Department of Planning and Natural Resources. USVI, 14 August, 2002.

Jeffrey C., U. Anlauf, J. Beets, S. Caseau, W. Coles, A. Friedlander, S. Herzlieb, Z. Hillis-Starr, M. Kendall, V. Mayor, J. Miller, R. Nemeth, C. Rogers, and W. Toller. 2005. The State of Coral Reef Ecosystems of the U.S. Virgin Islands. pp. 45-90. In: J. Waddell (ed.), *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005.* NOAA Technical Memorandum NOS NCCOS 11. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. 522 pp.

Olsen, D.A. and J.A. LaPlace. 1978. A study of a Virgin Islands grouper fishery based on a breeding aggregation. *Proceedings of the 31st Gulf and Caribbean Fisheries Institute* 31: 130-144.

Rogers, C.S. and J. Beets. 2001. Degradation of marine ecosystems and decline of fishery resources in marine protected areas in the US Virgin Islands. *Environmental Conservation* 28: 312-322.

Rothenberger, Paige. 2005. Fig. 7.8. USVI Department of Planning and Natural Resources, Division of Coastal Zone Management.

The Nature Conservancy (TNC). 2002. *St. Croix East End Marine Park Management Plan.* University of the Virgin Islands and Department of Planning and Natural Resources. U.S.V.I. July 18, 2002.

St. Croix East End Marine Park (STXEEMP). 2005-06a. Mission Statement. Department of Planning and Natural Resources, Coastal Zone Management, Government of the US Virgin Islands. http://www.stxeastendmarinepark.org/mission.htm

———. 2005-06b. Education and Outreach. Department of Planning and Natural Resources, Coastal Zone Management, Government of the US Virgin Islands. http://www.stxeastendmarinepark.org/mission.htm

———. 2003. Fig. 7.9.

U.S. Department of Commerce (DOC), National Oceanic and Atmospheric Administration, Office of Coastal Zone Management. 1979. *Virgin Islands Coastal Management Program and Final Environmental Impact Statement.* U.S. Department of Commerce, Washington, D.C.

Virgin Islands Code, Title 12, Ch. 1, § 94, 96, 97, and 98. Wildlife and Marine Sanctuaries and Game Preserves.

U.S. Virgin Islands Department of Planning and Natural Resources, Division of Coastal Zone Management. 2006a. Draft Rules and Regulations for the East End Marine Park.

U.S. Virgin Islands Department of Planning and Natural Resources, Division of Coastal Zone Management. 2006b. St. Croix East End Marine Park Zonation Map.

Virgin Islands Coastal Zone Management Act of 1978. Act No. 4828.

Weatherall, Rebecca. 2005. Fig. 7.1. The Nature Conservancy.

Wildlife and Marine Sanctuaries Act 1980. Act No. 5229.

Wusinich-Mendez, Dana. Figs. 7.3 and 7.6. NOAA Office of Ocean and Coastal Resource Management.

Appendix A

List of Acronyms

MMA	Marine Managed Area
MPA	Marine Protected Area
NOAA	National Oceanic and Atmospheric Administration
CRTF	U.S. Coral Reef Task Force

American Samoa

ASAC	American Samoa Administrative Code
ASCA	American Samoa Code Annotated
ASCC	American Samoa Community College
ASCMP	American Samoa Coastal Management Program
ASEPA	American Samoa Environmental Protection Agency
CAP	community action plan
CFMP	community-based fisheries management program
CRAG	Coral Reef Advisory Group
CRTF	U.S. Coral Reef Task Force
DMWR	Department of Marine and Wildlife Resources
DOC	Department of Commerce
DPR	Department of Parks and Recreation
FMAC	fisheries management advisory committee
FMP	fisheries management plan
NPS	National Park Service
PLA	Participatory Learning and Action
PNRS	Project Notification and Review System
RANWR	Rose Atoll National Wildlife Refuge
SMA	special management area
USFWS	U.S. Fish and Wildlife Service

CNMI

CNMI	Commonwealth of the Northern Mariana Islands
CRMO	Coastal Resources Management Office
DEQ	Division of Environmental Quality
DFW	Division of Fish and Wildlife
DLNR	Department of Lands and Natural Resources
MMCA	Mañagaha Marine Conservation Area
MMT	Marine Monitoring Team
MSP	Marine Sanctuaries Program
NGO	non-governmental organization
SBFR	Sasanhaya Bay Fish Reserve

Florida

CAMA	Office of Coastal and Aquatic Managed Areas
CRCP	Coral Reef Conservation Program (Florida program)
CREMP	Coral Reef Evaluation and Monitoring Project
CSO	citizen support organization
CWA	critical wildlife area
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FKNMS	Florida Keys National Marine Sanctuary
FWC	Florida Fish and Wildlife Conservation Commission
LAS	local action strategy
NERR	national estuarine research reserve
NGO	non-governmental organization
OFW	outstanding Florida water
REEF	Reef Environmental Education Foundation
RVC	reef fish visual census
SECREMP	Southeast Florida Coral Reef Evaluation and Monitoring Project
SEFCRI	Southeast Florida Coral Reef Initiative
SFWMD	Southwest Florida Water Management District
SOP	Seagrass Outreach Partnership
SWIM	surface water improvement and management
WEA	wildlife and environmental area
WMA	wildlife management area

Guam

DAWR	Division of Aquatic and Wildlife Resources
GCA	Guam Code Annotated
GCRICC	Guam Coral Reef Initiative Coordinating Committee
GVB	Guam Visitor's Bureau
P.L.	Public Law

Hawaii

BLNR	Board of Land and Natural Resources
BRFA	bottomfish restricted fishing area
CRAMP	Coral Reef Monitoring and Assessment Program
DAR	Division of Aquatic Resources
DLNR	Department of Land and Natural Resources
DOBOR	Division of Boating and Ocean Recreation
DOCARE	Division of Conservation and Resources Enforcement
DOFAW	Division of Forestry and Wildlife
FMA	fishery management area
FRA	fisheries replenishment areas
HAR	Hawai'i Administrative Rule
HCRI-RP	Hawai'i Coral Reef Initiative Research Program
HIMB	Hawai'i Institute of Marine Biology
HRS	Hawai'i Revised Statute
KIRC	Kaho'olawe Island Reserve Commission
LAC	local advisory committee
MHI	Main Hawaiian Islands
MLCD	marine life conservation district

NAR	natural area reserve
NARS	natural area reserves system
NGO	non-governmental organization
NWHI	Northwestern Hawaiian Islands
PKO	Protect Kaho'olawe Ohana
RFMA	Regional Fisheries Management Area
UH	University of Hawai'i
WHAP	West Hawai'i Aquarium Project
WHFC	West Hawai'i Fisheries Council
WHRFMA	West Hawai'i Regional Fisheries Management Area

Puerto Rico

CCRI	Caribbean Coral Reef Institute
DNER	Department of Natural and Environmental Resources
JOBANERR	Jobos Bay National Estuarine Research Reserve
MR	marine reserve
NGO	non-governmental organization
NR	natural reserve
PRCZMP	Puerto Rico Coastal Zone Management Program

USVI

APC	areas of particular concern
CZM	Coastal Zone Management
DFW	Division of Fish and Wildlife
DPNR	Department of Planning and Natural Resources
LAS	local action strategy
MRWS	marine reserve and wildlife sanctuary
NGO	non-governmental organization
SEA	St. Croix Environmental Association
STXEEMP	St. Croix East End Marine Park
TNC	The Nature Conservancy
USVI	U.S. Virgin Islands
VIMPAC	Virgin Islands Marine Park Advisory Committee
VINE	Virgin Islands Network of Environmental Educators

Appendix B

A Functional Classification System for Marine Protected Areas in the United States

The U.S. Classification System: An Objective Approach for Understanding the Purpose and Effects of MPAs as an Ecosystem Management Tool

Toward a Common Language for Marine Protected Areas

Faced with widespread declines in ocean health and a growing interest in place-based ecosystem management, many nations, including the United States, are establishing marine protected areas (MPAs) to conserve vital marine habitats and resources. Familiar examples of U.S. MPAs include national marine sanctuaries, national parks and wildlife refuges, many state parks and conservation areas, and a variety of fishery management closures. Over the past several decades, a variety of legal authorities and programs have been established at all levels of government resulting in a dramatic increase in the number of MPAs. More than 1,500 such federal and state/territory sites exist today.

This complex assortment of different MPA types and purposes poses many challenges to policy-makers and stakeholders alike. Chief among these is terminology. Although MPAs have long been used for decades in the U.S. as a conservation and management tool, the nation still lacks a straightforward and consistent language to accurately describe the many types of MPAs occurring in our waters and to understand their effects on ecosystems and the people that use them.

For example, the official programmatic names of many U.S. MPAs (such as sanctuaries, parks, preserves, or natural areas) rarely reflect the area's actual conservation purpose, allowable uses, or management approach. Similarly, the generic term "marine protected area" is frequently assumed in the policy arena to mean "no-take reserves," when in fact, no-take MPAs are rare in the United States. This chronic confusion over MPA terms continues to unnecessarily complicate the critically important national dialogue about whether, when, and how to use this promising ecosystem management tool.

In response, the National Marine Protected Areas Center has developed a Classification System that provides agencies and stakeholders with a straightforward means to describe MPAs in purely functional terms using five objective characteristics common to most MPAs:

- Conservation Focus
- Level of Protection
- Permanence of Protection
- Constancy of Protection
- Ecological Scale of Protection

For most MPAs in the U.S. and elsewhere, these five functional characteristics provide an accurate picture of why the site was established, what it is intended to protect, how it achieves that protection, and how it may affect local ecosystems and local human uses. Combining elements of several domestic and international MPA classification schemes, this new approach to describing U.S. MPAs is intended to augment, but not replace official programmatic names and terms. It is designed to provide a neutral, intuitive, common language with which to describe, understand, and evaluate proposed and existing MPA sites, networks and systems.

What is a Marine Protected Area?

"Marine protected area" is an umbrella term that encompasses a wide variety of approaches to U.S. place-based conservation and management. The official federal definition of an MPA in Executive Order 13158 is: "any area of the marine environment that has been reserved by federal, state, tribal, territorial, or local laws or regulations to

provide lasting protection for part or all of the natural and cultural resources therein." Specific operational criteria for several key terms within this broad definition (for example, "protection" and "lasting") have been developed by the National MPA Center based on guidance from the MPA Federal Advisory Committee, governmental agencies, and the public. The criteria were published as part of the framework for developing the national MPA system, which was released in July 2006 and available for public comment for 145 days.

In practical terms, marine protected areas are delineated areas in the oceans, estuaries, and coasts with a higher level of protection than prevails in the surrounding waters. MPAs are used extensively in the U.S. and abroad for a variety of conservation and management purposes. They span a range of habitats including areas in the open ocean, coastal areas, inter-tidal zone, estuaries, and Great Lakes waters. They vary widely in purpose, legal authorities, agencies and management approaches, level of protection, and restrictions on human uses.

Overview of the U.S. MPA Classification System

The MPA Classification System uses five key functional characteristics to describe any MPA. Taken together, these characteristics influence the site's effects on local ecosystems and human users, and thus its role in contributing to the conservation of healthy marine ecosystems. Among these five site characteristics, the first two – the site's Conservation Focus and its Level of Protection – reflect many of the issues of greatest interest to stakeholders in local, regional, and national MPA dialogues.

(a) Conservation Focus *(one or more)*
• Natural Heritage • Cultural Heritage • Sustainable Production
(b) Level of Protection Afforded *(one attribute)*
• Uniform Multiple-Use • Zoned Multiple-Use • Zoned with No-Take Area(s) • No Take • No Impact • No Access
(c) Permanence of Protection *(one attribute)*
• Permanent • Conditional • Temporary
(d) Constancy of Protection *(one attribute)*
• Year-round • Seasonal • Rotating
(e) Ecological Scale of Protection *(one atrribute)*
• Ecosystem • Focal Resource

Detailed User's Guide to the Classification System

This section describes how to interpret and use the MPA Classification System. Much of the information needed to classify and understand any specific MPA in the U.S. is publicly available through NOAA's National Inventory of Marine Managed Areas, which contains more than 1,500 individual sites and is available on www.MPA.gov. Other relevant information can be found in official programmatic documents including management plans, regulations, designation documents, and statutes. The MPA Center will use these data sources to publish a complete classification of U.S. MMAs and MPAs.

The MPA Classification System can be applied to a single MPA site, or to individual management zones established within a larger MPA site. In a zoned MPA, each zone is classified independently based on its own characteristics and attributes. The overall MPA site then reflects the aggregate characteristics of its component management zones. Four of the five classification characteristics require unique, site-specific selections for the associated attribute options. One (Conservation Focus) allows multiple attribute selections in recognition of the complexity and variety of MPA applications. MPA examples are presented here for illustrative purposes only and may not always correspond to specific local sites.

(a) Conservation Focus (select all attributes that apply to the MPA or zone)

Most MPAs have legally established goals, conservation objectives, and intended purpose(s). Common examples include MPAs created to conserve biodiversity in support of research and education; to protect benthic habitat in order to recover over-fished stocks; and to protect and interpret shipwrecks for maritime education. These descriptors of an MPA are reflected in the site's Conservation Focus, which represents the characteristics of the area that the MPA was established to conserve. The Conservation Focus, in turn, influences many fundamental aspects of the site, including its design, location, size, scale, management strategies and potential contribution to surrounding ecosystems. U.S. MPAs generally address one or more of these areas of Conservation Focus:

Natural Heritage: MPAs or zones established and managed wholly or in part to sustain, conserve, restore, and understand the protected area's natural biodiversity, populations, communities, habitats, and ecosystems; the ecological and physical processes upon which they depend; and, the ecological services, human uses and values they provide to this and future generations.
Examples: Natural Heritage MPAs include most national marine sanctuaries, national parks, national wildlife refuges, and many state MPAs.

Cultural Heritage: MPAs or zones established and managed wholly or in part to protect and understand submerged cultural resources that reflect the nation's maritime history and traditional cultural connections to the sea.
Examples: Cultural Heritage MPAs include some national marine sanctuaries, national and state parks, and national historic monuments.

Sustainable Production: MPAs or zones established and managed wholly or in part with the explicit purpose of supporting the continued extraction of renewable living resources (such as fish, shellfish, plants, birds, or mammals) that live within the MPA, or that are exploited elsewhere but depend upon the protected area's habitat for essential aspects of their ecology or life history (feeding, spawning, mating, or nursery grounds).
Examples: Sustainable Production MPAs include some national wildlife refuges and many federal and state fisheries areas, including those established to recover over-fished stocks, protect by-catch species, or protect essential fish habitats.

(b) Level of Protection (select the one attribute that applies to the MPA or zone)

MPAs in the U.S. vary widely in the level and type of legal protections afforded to the site's natural and cultural resources and ecological processes. Any MPA, or management zone within a larger MPA, can be characterized by one of the following six levels of protection, which will directly influence its effects on the environment and human uses.

Uniform Multiple-Use: MPAs or zones with a consistent level of protection and allowable activities, including certain extractive uses, across the entire protected area.
Examples: Uniform multiple-use MPAs are among the most common types in the U.S., and include many sanctuaries, national and state parks, and cultural resource MPAs.

Zoned Multiple-Use: MPAs that allow some extractive activities throughout the entire site, but that use marine zoning to allocate specific uses to compatible places or times in order to reduce user conflicts and adverse impacts.
Examples: Zoned multiple-use MPAs are increasingly common in U.S. waters, including some marine sanctuaries, national parks, national wildlife refuges, and state MPAs.

Zoned Multiple-Use With No-Take Area(s): Multiple-use MPAs that contain at least one legally established management zone in which all resource extraction is prohibited.
Examples: Zoned no-take MPAs are emerging gradually in U.S. waters, primarily in some national marine sanctuaries and national parks.

No-Take: MPAs or zones that allow human access and even some potentially harmful uses, but that totally prohibit the extraction or significant destruction of natural or cultural resources.
Examples: No-take MPAs are relatively rare in the U.S., occurring mainly in state MPAs, in some federal areas closed for either fisheries management or the protection of endangered species, or as small special use (research) zones within larger multiple-use MPAs. Other commonly used terms to connote no-take MPAs include marine reserves or ecological reserves.

No Impact: MPAs or zones that allow human access, but that prohibit all activities that could harm the site's resources or disrupt the ecological or cultural services they provide. Examples of activities typically prohibited in no-impact MPAs include resource extraction of any kind (fishing, collecting, or mining); discharge of pollutants; disposal or installation of materials; and alteration or disturbance of submerged cultural resources, biological assemblages, ecological interactions, physiochemical environmental features, protected habitats, or the natural processes that support them.
Examples: No- impact MPAs are rare in U.S. waters, occurring mainly as small isolated MPAs or in small research-only zones within larger multiple-use MPAs. Other commonly used terms include fully protected marine (or ecological) reserves.

No Access: MPAs or zones that restrict all human access to the area in order to prevent potential ecological disturbance, unless specifically permitted for designated special uses such as research, monitoring or restoration.
Examples: No-access MPAs are extremely rare in the U.S., occurring mainly as small research-only zones within larger multiple-use MPAs. Other commonly used terms for no access MPAs include wilderness areas or marine preserves.

(c) Permanence of Protection (select the one attribute that applies to the MPA or zone)

Not all MPAs are permanently protected. Many sites differ in how long their protections remain in effect, which may in turn profoundly affect their ultimate effects on ecosystems and users.

Permanent: MPAs or zones whose legal authorities provide some level of protection to the site *in perpetuity* for future generations, unless reversed by unanticipated future legislation or regulatory actions.
Examples: Permanent MPAs include most national marine sanctuaries and all national parks.

Conditional: MPAs or zones that have the potential, and often the expectation, to persist administratively over time, but whose legal authority has a finite duration and must be actively renewed or ratified based on periodic governmental reviews of performance.
Examples: Conditional MPAs include some national marine sanctuaries with 'sunset clauses' applying to portions of the MPA in state waters

Temporary: MPAs that are designed to address relatively short-term conservation and/or management needs by protecting a specific habitat or species for a finite duration, with no expectation or specific mechanism for renewal.
Examples: Temporary MPAs include some fisheries closures focusing on rapidly recovering species (e.g. scallops).

(d) Constancy of Protection (select the one attribute that applies to the MPA or zone)

Not all MPAs provide year-round protection to the protected habitat and resources. Three degrees of constancy throughout the year are seen among U.S. MPAs.

Year-Round: MPAs or zones that provide constant protection to the site throughout the year.
Examples: Year-round MPAs include all marine sanctuaries, national parks, refuges, monuments, and some fisheries sites.

Seasonal: MPAs or zones that protect specific habitats and resources, but only during fixed seasons or periods when human uses may disrupt ecologically sensitive seasonal processes such as spawning, breeding, or feeding aggregations.
Examples: Seasonal MPAs include some fisheries and endangered species closures around sensitive habitats.

Rotating: MPAs that cycle serially and predictably among a set of fixed geographic areas in order to meet short-term conservation or management goals (such as local stock replenishment followed by renewed exploitation of recovered populations).
Examples: Rotating MPAs are still rare in the U.S. They include some dynamic fisheries closures created for the purpose of serially recovering a suite of localized population to harvestable levels.

(e) Ecological Scale of Protection (select one attribute that applies to the MPA or zone)

MPAs in the U.S. vary widely in the ecological scale of the protection they provide. MPA conservation targets range from entire ecosystems and their associated biophysical processes, to focal habitats, species, or other resources deemed to be of economic or ecological importance. The ecological scale of a site's conservation target generally reflects its underlying legal authorities and, in turn, strongly influences the area's design, siting, management approach, and likely effects.

Ecosystem: MPAs or zones whose legal authorities and management measures are intended to protect all of the components and processes of the ecosystem within its boundaries.
Examples: Ecosystem-scale MPAs include most marine sanctuaries, national parks and national monuments.

Focal Resource: MPAs or zones whose legal authorities and management measures specifically target a particular habitat, species complex, or single resource (either natural or cultural).
Examples: Focal-resource MPAs include many fisheries and cultural resource sites, including some national wildlife refuges and marine sanctuaries.

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