

Puerto Rico Report on Local Action Strategies to Protect Coral Reefs

Commonwealth of Puerto Rico
Department of Natural and Environmental Resources
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List of Acronyms

BMP	Best Management Practices
CFMC	Caribbean Fisheries Management Council
CORAL	Coral Reef Alliance
CRCP	Coral Reef Conservation Program
CRI	Coral Reef Initiative
CZM	Coastal Zone Management Program
DE	Department of Education
DNER	Department of Natural and Environmental Resources
DJ	Recreational Dingell Johnson funding
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EQB	Environmental Quality Board
GIS	Geographical Information Systems
GPS	Geographical Positioning Systems
IPM	Integrated Pest Management Program
ITF	Institute of Tropical Forestry
JEA	Joint Enforcement Agreement
JBNERR/JOBANEER	Jobos Bay National Estuarine Research Reserve
LAS	Local Action Strategies
LBS	Land-based Sources of Pollution
LEAPE	Locally-led Education and Action for Protecting the Environment
MAC	Marine Aquarium Council
MACC	Marine Aquarium Council Certification
MM	Management Measurements
MRFSS	Marine Recreational Fisheries Statistics Survey
NAP	National Action Plan to Conserve Coral Reefs
NFWF	National Fish and Wildlife Foundation
NGO	Non-Governmental Organization
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
OSDS	On Site Disposal Systems
PADI	Professional Association of Diving Instructors
PRASA	Puerto Rico and Sewer Authority
PRDA	Puerto Rico Department of Agriculture
PREPA	Puerto Rico Energy and Power Authority

PRCRCP	Puerto Rico Coral Reef Conservation Program
PRCRMP	Puerto Rico Coral Reef Management Plan
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PREQB	Puerto Rico Environmental Quality Board
RCSE	Resource Center for Science and Engineering
SCUBA	Self Contained Underwater Breathing Apparatus
UPR	University of Puerto Rico
UPRSGCP	UPR Sea Grant College Program
USCG	U.S. Coast Guard
USCGAUX	U.S. Coast Guard Auxiliary
USCRTF	U.S. Coral Reef Task Force
USFWS	U.S. Fish and Wildlife Service

Executive Summary

During the October 2002 U.S. Coral Reef Task Force (USCRTF) meeting held in Puerto Rico, a resolution was approved to improve implementation of the National Action Plan to Conserve Coral Reefs (NAP). The Puerto Rico resolution identified four impediments to the implementation of the NAP: a need to identify threat-based priorities and key actions; lack of coordination among government agencies; a need to track progress toward achievement of the NAP goals and objectives and to increase human resources supporting all entities involved in coral reef conservation efforts. Among other suggestions, the Puerto Rico Resolution recommended addressing impediments by endorsing six focus areas for priority action: overfishing, lack of awareness, recreational overuse and misuse, land-based sources of pollution, coral bleaching vs. climate change and coral diseases by developing local action strategies (LAS) for relevant focus areas.

A centerpiece of the Puerto Rico Resolution was the development of LAS to improve coordination for implementation of coral reef conservation. This recommendation was developed out of a series of interviews and meetings highlighting the need to strengthen coordination between different levels of government. These actions are expected to improve technical and financial support for local level implementation of LAS by:

- ✓ improving synchronization between federal and state/territory priorities;
- ✓ raising the profile of coral reef issues and concerns in related programs (e.g. non-point source pollution and Coastal Zone Management initiatives);
- ✓ strengthening national policy and support for coral reef conservation by providing a basis for updating national goals for coral reef management.

Planning at the local level has a history within U.S. states and territories that predates the USCRTF itself. The U.S. All Islands Coral Reef Initiative (USAICRI) produced two versions of local coral reef conservation strategies in the 1990s. On April 30 and May 1, 2003, a kickoff meeting was held to develop a draft LAS to address issues affecting coral reefs in Puerto Rico. Of the six focus areas identified for LAS development in the Puerto Rico Resolution, the following four were identified as priority areas for local emphasis: overfishing, lack of awareness, recreational overuse and misuse, and land-based sources of pollution. A core group of people was invited to help draft the Puerto Rico LAS document and to schedule activities to further develop and refine the LAS over the following five months. The objectives of the kickoff workshop were to:

- ✓ introduce the core group to the USCRTF and activities to date;
- ✓ introduce the LAS approach, including guidelines and templates;
- ✓ develop an initial draft of issue statements for priority threat areas;
- ✓ develop initial goals and objectives for identified issues;
- ✓ identify stakeholders that will contribute to goal and objective setting;
- ✓ create a schedule and a task plan for developing LAS for priority theme areas.

Several core group and stakeholder meetings were held for each focus area. The Appendix contains a participants list of meetings held for focus areas. The LAS, as currently proposed, was built on this experience, and will be strengthened through increased coordination between state and federal partners and between local agencies.

Each focus area was developed by different core groups; accordingly the document shows slight differences among focus areas which reflect particular group characteristics. Furthermore, each working group defined several outreach projects related to community and individual user group needs; for those interested in additional outreach resources, these initiatives are also listed as: Projects from other focal areas that relate to Lack of Awareness.

Although most of these projects have been designed for a 3-year timeframe, secured funding will define their start date and duration. Individual project support should be secured over time, therefore, during the next three years, only a portion of the projects included in this document will have been initiated and only a few will have been completed.

Introduction

Reefs in Puerto Rico have shown a marked loss of living coral during the past three decades. According to Morelock *et al.*, (2001), “Rapid rates of human population growth and density in Puerto Rico, have led to increased deforestation for agriculture and increased discharge of sewage and industrial waste. Some of the consequences associated with increased human pressure include high terrigenous sediment influx, increased nutrient levels, overfishing and habitat modification. In addition, natural threats such as the island-wide mortality of the herbivorous (long-spine) sea urchin, *Diadema antillarum* in the 1980s, coral disease epizootics, bleaching and storm damage have contributed to an overall reduction in coral abundance and cover increase of fleshy macroalgae.”

According to the *State of Coral Reef Ecosystems* report (2002), anthropogenic stresses affecting reefs off urbanized areas in Puerto Rico range from those originating from activities performed during the 1950s—for example massive clearing of mangrove forests, runoff from large scale agricultural developments and construction of thermo electrical plants on the north and south coasts—to ship groundings, especially those occurring during the 1980's and 1990's. The latter have been extensively damaging to reef structure and associated seagrass habitats. Other major human activities associated with reef degradation include: oil spills, anchoring of large oil cargo vessels, overfishing, uncontrolled recreational activities, eutrophication (as a result of nutrient loading from sewage and urban outfalls and which is usually associated with the overgrowth of macroalgae), thermal pollution, and military activities (particularly those performed by the U.S. Navy at their former bombing ranges in the islands of Vieques and Culebra).

The *State of Coral Reef Ecosystems* report also cites natural stresses involved in damage to coral reefs which include hurricanes, coral bleaching, coral diseases such as white- and black-band, corallivorous mollusks, and the already mentioned Caribbean-wide mortality of *Diadema antillarum*. Hurricane damage (occurring normally between August and October) tends to be most severe on the eastern (near Vieques and Culebra) and southwestern (near La Parguera) coasts, with shallow reefs dotted with branching corals like staghorn (*Acropora palmata*) and elkhorn (*Acropora cervicornis*) being primarily affected. At La Parguera, for instance, few reef-forming species like small brain corals (*Diploria* sp.), as well as soft corals (*Gorgonia* sp. and *Pseudopterigorgia* sp.) now exist in reef environments formerly dominated by staghorn coral (Morelock, *et al.*, 2001).

Knowledge of the functions and processes controlling reef environments is currently limited. This lack of knowledge along with a paucity of information on reefs in Puerto Rico and a general inaccessibility of data sources, confounds appropriate management actions that could be taken. Morelock, *et al.* also states that managers and researchers have the daunting task of compiling and organizing available data and of initiating and completing comprehensive studies of these reefs. These tasks must be undertaken to identify the most pressing needs in order to protect remaining

reefs and restore degraded areas so that future generations may benefit from the environmental and economic services these reefs can provide.

The Puerto Rico Local Action Strategies aims to facilitate the implementation of the National Action Plan to Conserve Coral Reefs (NAP) through the identification of threat-based priorities and key actions; coordination among government agencies across local, regional and national levels; tracking progress toward achievement of the NAP goals and objectives and increasing the human resources supporting all the entities involved in coral reef conservation efforts. Four focus areas for priority action are addressed: overfishing, land-based sources of pollution, recreational overuse and lack of awareness.

On this document, each focus area was developed by different core groups and the document shows slight differences which reflect particular group characteristics. Each working group defined several outreach projects related to community and individual user group needs; for those interested in additional outreach resources, these initiatives are also listed as: Projects from other focal areas that relate to Lack of Awareness.

Focal Area: Overfishing

In Puerto Rico, a significant number of the coastal population depends on coral reefs and related resources for food, recreation and income. Some of the resources and products obtained from coral reefs include fish, mollusks and other invertebrates. These are sold as food, decorations, aquarium trade organisms, and even for medicinal uses. The intense use of coral reefs resources has led to the depletion of many organisms that were once abundant on our coastal waters.

The overfishing working group, composed by representatives from state and federal agencies, the Caribbean Fisheries Management Council, university and Sea Grant personnel, has identified management gaps and issues related to fisheries laws, enforcement, protected areas, draft management plans, outreach and education as important topics that need to be addressed in order to protect coral reef resources.

A series of projects were developed to address the identified fishing issues.

Focal Area: Overfishing

Problem 1: *The approval of Regulations for Fishery Law Number 278 of November 29, 1998, is necessary to control the current overfishing problem.*

Goal 1: *Evaluate, adopt and implement Regulations for Law 278 within a period of one year or less.*

Objective 1.1:

Obtain comments from the Environmental Quality Board regarding the Environmental Impact Statement (EIS) prepared for the Regulations.

Project 1.1.1: Increase participation by interest groups to obtain the approval of Regulations for Law 278.

Description: The participation of interests groups is important for the attainment of the Environmental Quality Board comments concerning the Environmental Impact Statement (EIS) and the final approval of the Regulations.

Indicator: The approval of the EIS and signing of the Regulations.

Update: Project completed. The new Regulations were approved in February 11, 2004. The PRDNER Secretary signed an administrative order to confer an orientation period for the public on the topic of the new fishing Regulations. This period ended on January 31, 2005. A new 90 day suspension of fines was enacted by the PRDNER Secretary beginning on February 1, 2005 which should end April 30, 2005.

Objective 1.2:

Augment and improve the Puerto Rico Department of Natural and Environmental Resources (PRDNER) fisheries monitoring programs in order to evaluate the effectiveness of the fisheries regulations.

Project 1.2.1: Improve commercial and recreational fishery-monitoring programs.

Description: The commercial and recreational fishery-monitoring programs include studies of fish reproduction biology, fishery independent monitoring, bio-statistics data collection and recreational statistics surveys.

Indicator: Use the data collected to assess the effectiveness of measures implemented by the new regulations.

Expected Costs: \$158,000 for fish reproduction biology, \$159,000 for fishery independent monitoring, \$156,000 for bio-statistics, and \$170,000 for recreational statistics surveys.

Update: The PRDNER led several projects for the commercial and recreational fisheries monitoring programs:

1. Marine Recreational Fisheries Statistics Survey (MRFSS)- extended the recreational fisheries monitoring program to include

- economic information and spatial distribution of fishing effort. This project has been expanded from 2003 to 2008, receiving \$170k/yr.
2. Recreational Dingell Johnson (DJ) funding has expanded the project from 2003 through 2007 to perform fish reproduction biology studies with a total of \$261k.
 3. Additional questions (flex) were added to the MRFSS phone survey to gather data on local harvest of ornamental organisms for the home aquaria.

Objective 1.3:

Increase knowledge and understanding of user groups and the general public concerning the importance of regulating fishing activities.

Project 1.3.1: Generate a series of educational materials.

Description: Produce a series of educational materials including posters, videos and booklets, to inform the public about measures that support the wise use of resources; for example, showing the minimum reproductive size of fishes of commercial and recreational importance.

Products or Outputs: Educational materials: posters, videos and booklets.

Indicator: Production of educational materials.

Expected Costs: \$80,000

Update: The PRDNER produced booklets for distribution to fishers during registration events. These booklets contain information on the existing regulations, the minimum size of various species at reproduction, etc. Booklets and informative material to educate recreational fishers about federal and local fisheries laws, reproduction of posters and information sheets for fishers workshops were prepared under Coral Reef Conservation Program.

Project 1.3.2: Workshops and orientation meetings with stakeholders.

Description: Deliver a series of workshops and orientation meetings with resource users and the public to discuss the importance of new fishery regulations. Increase the level of awareness and compliance with regulations.

Products and Outputs: The recognition of the importance of fishery regulations.

Indicator: Number of participants per workshops and/or number of workshops.

Expected Costs: \$30,000

Update: Rangers and fishers' workshops, coordinated by NMFS and PRDNER, were successfully completed throughout Puerto Rico. These included presentations on the importance of the fishery regulations (Law 278), biological aspects of fish species important to fisheries, etc. NMFS, PRDNER and UPR Sea Grant College Program continued workshops at fishing villages and marinas. This effort began on November 2004 and ended on April 2005. Educational materials produced under the Coral Reef Conservation Program were distributed among workshop participants. In order to create partnerships with local communities contact information from interested people on coral reef conservation and protection were collected at the Fishers' Workshops coordinated by NMFS and PRDNER. Also, the participants had the opportunity to

evaluate the workshop and present needs and recommendations to be considered for amendment of fishing regulations.

Distribute educational materials and/or visit Legislators to increase awareness about fishing regulations. In addition, a series of orientation meetings have taken place to train Rangers and inform the general public. These efforts started in May 2004 and continued on 2005.

Project 1.3.3: Create partnerships with non-profit entities to promote news capsules pertaining to fisheries issues.

Description: Create partnerships with non-profit entities to promote news capsules that could encourage development of fishing activities with adequate gear that will reduce fishing pressure.

Indicator: Number of groups involved and number of new announcements.

Expected Costs: \$50,000

Update: The Non-Governmental Organization (NGO) *Fundación para la Conservación del Fondo Marino de Culebra* is promoting coral reef conservation through TV and radio advertising. With NOAA funding, the organization also produced the first comic book on coral reefs and an educational poster about coral reefs threats. The poster has been distributed to marinas. The possibility of integrating the organization as a partner on the public awareness initiative will be considered.

Project 1.3.4: Establish partnerships with coastal municipalities' educational programs to inform resource users and the public about the importance of fishing regulations.

Description: Many municipalities have personnel working on environmental issues including educational activities concerning our natural resources. It is important to include all representatives from coastal and adjacent municipalities in educational initiatives and activities related to marine resources conservation. This project could be incorporated within projected workshops for recreational and commercial fishers. Municipalities will receive information about how to obtain Spanish language educational materials specifically about coral reefs to facilitate the inclusion of this theme in their programs.

Indicator: Number of partnerships developed with coastal municipalities.

Expected Costs: \$15,000

Update: In order to promote partnerships with coastal municipal governments, representatives were invited to every workshop coordinated by NMFS and PRDNER for recreational and commercial fishers. This project has been presented to the Coral Reef Conservation Program for financial support on FY 05.

Objective 1.4:

Evaluate the implementation of a Marine Aquarium Council (MAC) Certification for commercial ornamental fish collectors in Puerto Rico.

Project 1.4.1: Evaluate the recommendations to the PRDNER regarding the implementation of the Marine Aquarium Council Certification (MACC) for commercial ornamental fish collectors.

Description: Draft and submit recommendations to the PRDNER concerning the implementation of the MACC for commercial ornamental fish collectors. Interested groups should prepare and submit recommendations to the PRDNER. The team will be coordinated through personnel from PRDNER, NMFS and the Marine Aquarium Council (MAC), recommendations will be compiled through a series of workshops.

Indicator: Approval or denial of the recommendation.

Expected Costs: \$20,000

Update: A proposal was submitted for consideration under the CRCP.

Problem 2:

Coral reefs are deteriorating due to impacts and effects of poor compliance and the lack of effectiveness in executing laws and regulations.

Goal 2: Increase the effectiveness of coral reef and fishery laws.

Objective 2.1:

Establish a Memorandum of Understanding between PRDNER and NOAA Fisheries that will permit the PRDNER Ranger Corps to have jurisdiction to rapidly process violations of fishery laws that occur in the Exclusive Economic Zone (EEZ).

Project 2.1.1: Amend Law 278 to permit rapid processing of violations that occur in the EEZ.

Description: Amend Law 278 to permit rapid processing of violations by the PRDNER Ranger Corps that occur in the EEZ.

Indicator: Obtain the amendment to the law permitting Rangers to process violations that occur in the EEZ.

Update: PRDNER personnel are working with this issue and studying several alternatives, including Ranger Law amendment rather than amend Law 278. The result will be an expedited way to process law and regulations violations.

Project 2.1.2: Amend Law 278 to enable the issuance of tickets, as opposed to administrative fines, for infractions that occur within the local and federal jurisdictions.

Description: Amend Law 278 to enable the issuance of tickets for infractions by the PRDNER Ranger Corps that occur within local and federal jurisdictions.

Indicator: Approval of the amendment.

Expected Costs: \$40,000

Update: PRDNER personnel are working on amending regulations and on defining fees for violations.

Project 2.1.3:

Deliver training workshops for PRDNER Rangers and public service agents on the subject of existing fisheries laws and regulations.

Description: Deliver training workshops for PRDNER Rangers and public service agents on existing fishery laws and regulations including training in species identification and measurement, provide regulations guides.

Indicator: Number of participants and/or number of workshops.

Update: As part of the CRCP, the NOAA Habitat Conservation Division, Caribbean Field Office in collaboration with the PRDNER completed training workshops for PRDNER Rangers on December 2003. The purpose of this activity was to train members of the Maritime Unit on the biology and importance of coral reefs as well as to clarify doubts about fisheries state and federal laws. A total of nine workshops were conducted in the areas of Piñones, Aguadilla, Boquerón, Guayama and Culebra. The recommendations and results of the evaluations are presented in a final report. In addition a series of workshops were accomplished through a NOAA funded project to instruct 50 PRDNER maritime rangers on the new Fisheries Regulation 6768 and on communication skills necessary to approach resource users.

The PRDNER personnel offered a series of orientation meetings for Rangers and the general public. This effort started in May 2004 and will continue.

Further training of Rangers is being planned, including a one-week course in Wildlife Forensics.

Objective 2 .2:

Increase the number and qualifications of PRDNER Rangers appointed as federal deputies by NOAA Fisheries.

Project 2.2.1: Finalize the Joint Enforcement Agreement (JEA) between PRDNER and NOAA Fisheries following the required Puerto Rico law amendment.

Description: Finalize the JEA between PRDNER and NOAA Fisheries following the required Puerto Rico law amendment.

Indicator: Approval of the JEA.

Updates: Efforts are being made by PRDNER personnel to establish the necessary legal base for the JEA.

Project 2.2.2: Training and equipment acquisition through JEA funds.

Description: Deliver training workshops to Rangers appointed as federal deputies regarding existing fishery laws and regulations including training in the identification of species and species measurements and the provision of equipment.

Indicator: Equipment availability and trained federal deputies.

Updates: Pending approval of JEA funds.

Objective 2 .3:

Support capacity building for PRDNER Coral Reef Rangers Team.

Project 2.3.1: Acquisition of equipment and training of the Coral Reef Ranger Team.

Description: Submit proposals through the Puerto Rico Coral Reef Conservation Program (PRCRCP) for the acquisition of equipment and training of the Coral Reef Ranger Team.

Indicator: Equipment and training available for the Coral Reef Ranger Team.

Updates: Equipment purchase and repairs are being carried out under FY 03 and FY 04 PRCRCP funds.

Project 2.3.2: Provide specialized training on coral reef enforcement and introduction to coral damage assessment and restoration techniques to PRDNER Coral Reef Ranger Team.

Description: Provide specialized training to the PRDNER Coral Reef Ranger Team at the Florida Keys National Marine Sanctuary on coral reef enforcement, coral damage assessment, restoration techniques and equipment maintenance.

Indicator: Improve intervention practices and new equipment maintenance for the Ranger Corps Team.

Updates: The training was accomplished for half the members of the team in May 2004, and the other half were trained in August 2004.

Project 2.3.3: Provide classroom and field training for administrative hearing officers jointly with the PRDNER Coral Reef Ranger Team on biology and importance of coral reefs.

Description: Proper training will result in better coral reef and fisheries cases. The project will include intensive, performance based, certifiable field training on coral identification, fish species identification and measurements of species fished by resource users. A series of photographic guides of harvested fish will also be produced.

Indicator: Number of workshops conducted and/or number of participants.

Expected Costs: \$50,000

Updates: This project has been approved to receive FY 05 Coral Reef Conservation Program funds.

Project 2.3.4: Increase the number of PRDNER Coral Reef Ranger Team to 16.

Description: A total of 8 rangers were designated and have received initial training. Under this project the Coral Reef Ranger Team will increase from 8 to 16 and will receive specialized training in certain priority areas.

Indicator: Eight new designated and trained members for the PRDNER Coral Reef Ranger Team.

Expected Costs: \$50,000

Update: Report pending

Project 2.3.5: To duplicate a NOAA funded and successful training workshop on the new Fisheries Regulation 6768 and on communication skills for an additional 50 PRDNER Rangers within the maritime unit.

Description: Conduct an interactive workshop to improve communication skills and knowledge of fisheries regulations.

Indicator: Number of participants and/or workshops.

Expected Costs: \$50,000

Update: Proposal submitted

Objective 2 .4:

Develop tools to support compliance with and effectiveness of fishery laws and regulations for the PRDNER Ranger Corps.

Project 2.4.1: Provide a hotline to facilitate instant advice for enforcement officers regarding laws and species identification.

Description: Provide a hotline to facilitate instant advice for enforcement officers regarding laws and species identification.

Indicator: Timely facilitation of information over the hotline.

Expected Costs: \$50,000

Update: Pending submission of proposal.

Project 2.4.2: Formalize communication strategies between PRDNER Rangers and other law enforcement agents (Puerto Rico Police Department Maritime Units, US Coast Guard and NOAA Enforcement) to improve the effectiveness of interventions.

Description: Support development of an official communication system between PRDNER Rangers and other law enforcement agents (Puerto Rico Police Department Maritime Units, US Coast Guard and NOAA Enforcement) to report suspected violations; this initiative will include workshops and other activities.

Indicator: Development of communication strategies between PRDNER Ranger Corps and other law enforcement agents.

Expected Costs: \$20,000

Update: Pending submission of proposal.

Objective 2 .5:

Increase the effectiveness of the Coral Law promoting the restoration and clean-up of coral reefs impacted by abandoned equipment and fishing gear.

Project 2.5.1: Establish a program for the removal of abandoned equipment and fishing gear.

Description: Establish a program for the removal of abandoned equipment and fishing gear that includes identification of impacted areas and of recovered

fishing paraphernalia. This project can be accomplished by NGO and other related groups.

Indicator: Diminished impacts to reefs from abandoned equipment and fishing gear.

Expected Costs: \$50,000

Update: The NGO Amigos De Amoná completed the project funded by NFWS that included removal of nets and garbage from Mona island's reefs. The group documented and quantified the type and amount of garbage found in Mona. A list of people interested in habitat cleaning was developed during a recent Recreational and Commercial Fisher's Workshop, coordinated by NMFS and PRDNER. Among those, communities from Guayama, Cabo Rojo and San Juan requested the removal of abandoned equipment and garbage from coastal areas.

A similar proposal has been presented for consideration for FY 05 for Coral Reef Conservation Program's funds under NOAA's Damage Assessment Program.

Problem 3: Lack of implementation of Joint Resolution 307 which established that 3% of Puerto Rico's insular platform is to be a no-take reserve.

Goal 3: Identify, designate and implement the 3% minimum of the insular platform as a no-take marine reserve as established by Joint Resolution 307 and prepare management plans in collaboration with coastal communities for these new reserves.

Objective 3.1:

Comply with the mandate of Joint Resolution 307.

Project 3.1.1: Define in square nautical miles the total area of the insular platform and calculate the percent that represents the actual no-take zones.

Description: In order to comply with the objective of Joint Resolution 307 it is necessary to define the area of the insular platform and then calculate the percent that represents the existing no-take zones.

Indicator: Establishment of the total area of the insular platform and calculation of the current no-take zone areas.

Expected Costs: \$20,000

Update: Several efforts have been made toward compliance with the Joint Resolution 307; Law 57 of 1999 declared half mile around Desecheo Island as a no-take zone. The new fisheries regulations prohibit all fishing activities within a half mile around Mona and Monito Islands, and within Luis Pena Channel Natural Reserve in Culebra.

Objective 3.2:

Establish priority areas to be recommended for designation as no-take zones.

Project 3.2.1: Establish a committee to recommend specific areas as no-take zones.

Description: Establish a committee composed of resource users, state and federal agency personnel to recommend specific areas as no-take zones.

Indicator: The establishment of a committee.

Update: Pending approval of the PRDNER coral reef regulations.

Project 3.2.2: Identification of indicators and parameters necessary to designate no-take zone areas.

Description: A project entitled: *Habitat- Use and Habitat Zoning, Studies in Natural Reserves of Puerto Rico*, will help identify the indicators and parameters for designating no-take zone areas. This project was funded by the CRCP and the partners are NOAA-Fisheries and PRDNER.

Indicator: Identification of indicators and parameters appropriate for Puerto Rico.

Expected Costs: \$150,000

Update: NOAA- Fisheries and PRDNER have received the first report which shows technical tasks, methods and project's timetable.

Objective 3.3:

Recommend insular shelf areas for designation as no-take zone areas to comply with the required 3% minimum designation within the insular platform.

Project 3.3.1: Selection of no-take zone areas to achieve compliance with the minimum area required by Joint Resolution 307.

Description: A list of potential areas for the establishment of no-take zones will be developed based on the indicators and parameters previously identified.

Indicator: Submission of list of areas to be considered for designation to the PRDNER.

Update: Identification of indicators and parameters needed to create the list is in progress.

Objective 3.4:

Formulate a model management plan in collaboration with coastal communities for marine reserves and marine natural reserves.

Project 3.4.1: Conduct workshops to build a PRDNER marine management plan team and small groups of key stakeholders to receive guidance on how to begin and implement a process to develop a no-take or natural reserve management plan.

Description: Coordinate workshops for PRDNER to create a marine management plan team and choose three priority reserves for management

plans. Also the key stakeholder groups will receive guidance on how to begin and implement a process to develop a management plan for a natural reserve in collaboration with PRDNER, including the legal basis for community participation.

Indicator: Formation of a PRDNER team and stakeholder groups interested in becoming part of the process to develop management plans for the reserves.

Expected Costs: \$115,000

Update: The NOAA FY04 Coral Reef Conservation Program funds include a project to build a PRDNER team that can contribute to the development of management plans for the no-take marine reserves and other reserves. The project will also provide a workshop for community members who are interested in becoming involved in the development of management plans for the reserves in their areas. This project will be completed by the end of FY 05.

Objective 3.5:

Design a monitoring program to evaluate the effectiveness of the implementation of no-take zones and other reserves.

Project 3.5.1: Identify academia scientists and funding sources for the design of monitoring programs.

Description: Identify academia scientists and funding sources for completing evaluation studies using biophysical, socioeconomic, and governance indicators for no-take zones and other reserves once management plans have been implemented.

Indicator: Design of monitoring programs.

Expected Costs: \$50,000

Update: Scientists from the University of Puerto Rico are currently evaluating the effectiveness of no-take marine reserves through the Coral Reef Ecosystems Studies NOAA funded long term initiative.

Problem 4: Degradation of coral reefs due to impacts from non-fishing activities that result in habitat loss for fish recruitment (known as recruitment limitation by habitat, where juvenile fish are not recruited because there is no appropriate habitat available).

Goal 4: Reduce impacts of non-fishing activities to coral reefs such as groundings, inadequate anchoring, walking on corals, sediment and nutrient discharges, among others.

Objective 4.1:

Complete, finalize and approve regulations for Law 147 of July 15, 1999 for the protection, conservation and management of coral reefs in Puerto Rico.

Project 4.1.1: Development and approval of the regulations for Law 147.

Description: Create a draft of the regulations for public comments.

Indicator: Approval of regulations following the public review process.

Update: PRDNER prepared the final draft of the regulations for Law 147. The regulations announcement was placed in the PRDNER web site in December 2004 and public comments closed in January 2005. PRDNER is in the process of reviewing public comments and preparing for a public hearing.

Objective 4.2:

Quantify the loss of coral reefs and essential habitat (systems associated with coral reefs) due to non-fishing activities and recommend management measures for these activities.

Project 4.2.1: Select, characterize, and monitor habitats essential for fishery resources that are being affected by non-fishing activities.

Description: Establish a long-term monitoring program to assess essential habitat loss due to non fishing activities. The project results could be used for habitat restoration and development of management strategies to minimize habitat destruction.

Indicator: The quantification of the loss of coral reefs and essential habitat.

Expected Costs: \$300,000

Update: Need to identify partners and funding.

Project 4.2.2: Develop recommendations for habitat restoration measures based on the quantification of the loss of essential fish habitats.

Description: Recommend measures to state and federal agencies through meetings and/or workshops for restoration of habitats based on the quantification of the loss of coral reefs and essential habitats.

Indicator: Development of recommendations for habitat restoration.

Expected Costs: \$10,000

Update: Need to identify partners and funding.

Objective 4.3:

Reduce the impacts caused by recreational activities to coral reefs.

Project 4.3.1: Purchase, install and maintain additional mooring buoys.

Description: Purchase, install and maintain additional mooring buoys in heavily used coastal areas to reduce anchoring impacts on coral reefs.

Indicator: Number of buoys installed.

Expected cost: \$100,000

Update: PRDNER has ongoing proposals for the installation and maintenance of additional mooring buoys around Puerto Rico including the island of Desecheo. PRDNER has approved NOAA funds for the installation of mooring buoys in La Parguera Natural Reserve, Luis Peña Channel Natural Reserve and La Cordillera Natural Reserve. PRDNER and NMFS personnel are identifying zoning by habitat and areas for deployment of mooring buoys.

Project 4.3.2: Instruct boat owners in the use of anchor removal systems.

Description: Conduct orientation activities and produce educational materials to teach boat owners in the use of anchor removal systems.

Indicator: Number of people informed through field workshops.

Expected cost: \$50,000

Update: The CFMC is proposing the use of anchor retrieval systems to protect essential fish habitat. When approved, the CFMC will begin orientation about these systems.

Project 4.3.3: Disseminate information about the location and use of mooring buoys to dive shop owners, charter boat operators, navigation instructors, tourism personnel, and other interested stakeholders.

Description: In order to disseminate information, several educational activities will be performed such as workshops, development and distribution of educational materials among dive shop owners, charter boat operators, navigation instructors, tourism personnel, and others.

Indicator: Number of people reached through workshops and quantity of materials distributed.

Expected cost: \$50,000

Update: NOAA- Fisheries developed a bilingual booklet for recreational users of coral reef areas with information on the location of natural reserves and other protected areas in Puerto Rico and the US Virgin Islands. In addition, the booklet includes information on coral reefs and recommendations for the proper use of mooring buoys.

Project 4.3.4: Designate sandy areas as secure anchorage areas to complement the mooring buoy system as part of a management strategy for conservation of coral reefs.

Description: The designation of sandy areas as secure anchorage areas to complement the mooring buoy system will be presented as an additional option for safe anchorage. This project could be combined with the project 4.3.1: *Request funds for the purchase and installation of additional mooring buoys.*

Indicator: Number of designated sandy anchorage areas.

Expected Costs: \$30,000

Update: Zoning by habitat and areas for deployment of mooring buoys being currently identified by PRDNER personnel. PRDNER received \$326,000 from DJ funds to install mooring buoys around Puerto Rico.

Problem 5: *Unregulated fishing activities that result in the degradation of coral reefs.*

Goal 5: *Reduce impacts of recreational fishing on coral reefs.*

Objective 5.1 :

Quantify the impacts of recreational fishing (fishing from the shoreline, from boats, with spear guns, and with hook and line) on coral reefs.

Project 5.1.1: Inventory of fisheries status.

Description: Prepare an evaluation (inventory) of the status of the fisheries.

Indicator: Complete a baseline inventory for each of the recreational fishing methods.

Expected costs: \$50,000

Update: Recreational Inventory status - (MRFSS) - Database being established for inventory under MRFSS. January 2000 ongoing until 2005.

Project 5.1.2: Complete orientation workshops for recreational fishers concerning state and federal fisheries laws and evaluation of results obtained from the status of the fisheries.

Indicator: Number of participants and/or orientation workshops.

Description: Complete orientation workshops targeting recreational fishers regarding state and federal fisheries laws, regulations and the status of the fisheries.

Update: The workshops started on November 2004, at the same time as the Commercial Fishers' Workshops. A total of five marinas were visited. Invitations and flyers were distributed among the recreational fishers at yacht clubs and marinas. In order to create partnerships with local communities, contact information from interested people on coral reef conservation and protection was collected at the workshops coordinated by NOAA Fisheries and PRDNER. Also, the participants had the opportunity to evaluate the workshop, present needs and recommendations that they believed were needed to amend the fisheries regulations.

Objective 5.2:

Quantify ornamental fish catch and effort by non-commercial fishers.

Project 5.2.1: Establish a monitoring program to quantify/characterize collection efforts, identify areas and ornamental fish capture seasons by non-commercial collectors.

Description: Conduct surveys on highly visited coastal areas and at marine aquarium stores and pet shops. The project results will be used to identify management strategies to minimize the impact of ornamental fish capture by non-commercial collectors.

Indicator: The establishment of a monitoring program.

Expected Costs: \$170,000

Update: Need to identify additional partners and funds. A flex question was added to the MRFSS phone survey in 2004 (calendar year) to quantify the number of Puerto Rico's households that collected ornamental fish.

Project 5.2.2: Develop educational materials for public distribution in relation to impacts to coral reefs caused by the illegal collection of ornamental fish and invertebrates.

Description: The educational materials will reach the public to inform them about impacts to coral reefs caused by illegal collection of ornamental fish and invertebrates. The educational materials will be distributed among pet shops, aquarium stores, dive shops and seafood restaurants.

Indicator: Number of educational materials produced and distributed.

Expected Costs: \$10,000

Update: Need to identify partners and funds.

Focal Area: Recreational Overuse

Puerto Rico is surrounded by coral reefs, particularly on the east, south and west coasts (Fig. 1). Our coral reef ecosystems include patch, fringing and barrier reefs. As a recreational resource, they are particularly important for the nautical tourism industry and recreational overuse has serious consequences on coastal ecosystems mainly on coral reefs. Anchoring, boat groundings, reef walking, irresponsible diving and snorkeling practices cause physical damage to corals while bilge water, boat sewage, deodorants and cleaning products bring oils and chemicals that pollute coral reefs and coastal areas.

The recreational overuse work group brought together university staff, students, NGO's, recreational divers, dive shop operators, state and federal agencies representatives and other resource users. Over ten meetings were held and it took multiple hours to develop the final strategy. Additionally, three public meetings were held to present the draft strategy.

The group concluded that mayor impacts to coral reefs are caused by recreational activities including boating. This strategy was developed to target boating and diving issues.

The recreational overuse strategy identified projects for installation of mooring buoys, installation of signage in coral reef areas and development of maps and management plans for marine reserves as projects that could reduce anthropogenic impacts to reefs.

In order to implement successful projects we have to develop an effective outreach and education approach toward resource users; for this reason the recreational overuse and lack of awareness strategies are a perfect match. Our working unit has identified techniques that will help the educational component of the lack of awareness strategy and has recognized NGO's, dive shops and the US Coast Guard Auxiliary (USCGAUX) as groups that will help to implement the educational plan. Good communication and coordination among stakeholders will improve our coral reefs conservation efforts.

Focal Area: Recreational Overuse

Goal 1: Reduce damage caused by recreational activities in heavily used coastal areas to promote healthy coral reefs for island residents and the tourism industry.

Objective 1.1:

For a period of three years address coral reef damage from anchoring and trampling at Parquera, Guánica, Cordillera Reefs and Canal Luis Peña natural reserves.

Project 1.1.1: Assess damage caused by grounding, anchoring or human trampling at target coral reef areas.

Description:

Identify frequently used coral areas to determine mechanical impact on coral reefs. Divers will gather data utilizing sound science and methodologies to assess damage to corals caused by the recreational activities mentioned above. The project will allow management agencies to identify impacted areas inside the reserves as well as to evaluate tools to address impacts to critical spots. The project will be replicated in three sites at a cost of \$30,000 per locality during a three-year period.

Indicator: Number of identified frequently used areas showing mechanical damage to coral reef communities.

Lead Group: Sociedad de Ambiente Marino, University of Puerto Rico, Río Piedras; Department of Marine Sciences, Mayagüez campus.

Proposed Partners: Sea Ventures and PRDNER

Timeline: yr 1 La Cordillera & Guánica, yr 2 Canal Luis Peña, yr 3 La Parquera

Products and Outputs: Baseline assessment of the level of damage caused to coral reef by watercraft groundings and anchoring. Damage database, trained personnel for continuing monitoring projects.

Expected Costs: \$90,000

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & PRDNER

New Staff, Training & Technical expertise needs: training on RECON & Coral Reef Alliance Survey Methodology.

Objective 1.2:

Reduce recreational watercraft impact caused by indiscriminate anchoring on coral reefs and sea grass areas within La Parquera, Guánica, Cordillera Reefs and Canal Luis Peña natural reserves.

Project 1.2.1: Identify potential anchoring areas within the three target sites.

Description: Identify barren (sandy) areas where users may anchor without harming benthic organisms including corals and sea grass beds. This project aims to identify barren bottom areas for anchoring.

Indicators: a) Number of potential anchoring areas identified, b) Location of identified potential anchoring areas.

Lead Group: PRDNER

Proposed Partners: NOAA, recreational diving groups and boat operators

Timeline: All sites on year 1

Products and Outputs Identification of adequate anchoring areas, provide maps with coordinates for potential anchoring areas.

Expected Costs: \$40,000-\$50,000

Proposed Funding Source: Fish and Wildlife Service- Sport Fish Restoration, NOAA

New Staff, Training & Technical expertise needs:

One staff member

Project 1.2.2: Design signage for anchoring and no-anchoring areas and install them at designated locations.

Description: Installation of signage to show anchoring and no-anchoring areas. This project will start in La Cordillera reefs followed by Canal Luis Peña, La Parguera and Guánica.

Indicators: a) Number of installed signs for anchor/no-anchor areas.

b) Number of sites where anchor/no-anchor areas signs are installed.

Lead Groups: Dive shops and NGO's

Proposed Partners: PRDNER & NOAA

Timeline: yr 2 Guánica, La Cordillera reefs, yr 3 Canal Luis Peña, yr 4 La Parguera.

Products and Outputs: Signage demarking safe anchoring zones on each of the three reefs sites.

Expected Costs: \$150,000 or more

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & PRDNER, NFWS

New Staff, Training & Technical expertise needs: staff

Project 1.2.3: Develop site maps and educational materials for highly visited coral reef areas.

Description: This project will develop new site maps showing anchoring and no-anchoring areas as well as live rock and coral cover zones on our three target sites: La Cordillera Reefs, Canal Luis Peña, La Parguera and Guánica. These maps and posters will be tailored to different user groups, will complement signage installed under Project 2.2 and will integrate information on anchoring areas identified under Project 2.1. They will integrate NOAA benthic maps and other site-specific information into a GIS format.

Indicator: Number of maps/posters/etc. produced for each site.

Lead Group: NOAA

Proposed Partners: PRDNER, recreational diving groups and NGO's

Timeline: year 4-5

Products and Outputs: Maps with specific information on coral reef sites for recreational boaters and the general public.

Expected Costs: \$70,000 first edition

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & PRDNER

New Staff, Training & Technical expertise needs: staff

Objective 1.3:

Reduce recreational watercraft groundings on natural reserves.

Project 1.3.1: Identify areas impacted by boat groundings.

Description: This project aims to complement project 1.1; will identify and characterize coral reef and sea grass zones that are potential boat grounding areas and will review previous grounding reports from PRDNER, USCG, NOAA and others. It will also survey resource users within target areas.

Indicator: *Number of identified areas showing impact from boat groundings on coral reefs inside natural reserves.*

Lead Group: PRDNER

Proposed Partners: NOAA

Timeline: yr 1 La Cordillera & Guánica, yr 2 Canal Luis Peña, yr 3 La Parguera

Products and Outputs: Map showing high-risk areas for boat groundings, list of sites for signage installation and a final report. This report should include depth, type of substrate and coordinates of suggested installation sites as well as criteria, activities and actions used in their selection.

Expected Costs: \$40,000-\$50,000

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & PRDNER

New Staff, Training & Technical expertise needs: staff

Project 1.3.2: Identify the need for signage to prevent boat groundings on shallow coral reefs and seagrass areas.

Description: This project aims to evaluate impacted coral reefs/seagrass zones and determine which areas are in need of signage to prevent groundings.

Indicator: *Number of areas affected by groundings and in need of signs.*

Lead Groups: PRDNER, USCGAUX

Proposed Partners: Recreational boaters, divers, NOAA, other NGO's

Timeline: yr 2 La Cordillera, yr 3 Canal Luis Peña, yr 4 La Parguera

Products and Outputs: Development of sign design and message; final signage selection.

Expected Costs: \$40,000- \$50,000

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & PRDNER

New Staff, Training & Technical expertise needs: one new staff member

Project 1.3.3: Install signage at designated areas.

Description: Acquire and Install signage on previously identified areas.

Indicators: *a) Number of installed signs on designated areas.*

b) Number of locations with new signs.

Lead Group: PRDNER

Proposed Partners: USCGAUX, Power Squadron and recreational diving groups.

Timeline: yr 2 La Cordillera & Guánica, yr 3 Canal Luis Peña, yr 4 La Parguera

Products and Outputs: Zoning and demarcation of shallow coral reef areas.

Expected Costs: \$150,000

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & PRDNER

Objective 1.4:

Promote the incorporation of coral reef and environmentally friendly educational materials into navigational courses offered by the US Coast Guard Auxiliary, US Power Squadron, PRDNER and other nautical groups.

Project 1.4.1: Coordinate and provide coral reef educational materials to target groups.

Description: The Department of Natural and Environmental Resources will work in partnership with the U.S. Coast Guard Auxiliary and the U.S. Power Squadron to incorporate an ecological section into the navigational courses offered to the public. These educational materials could be available in a web site either hosted by the PRDNER or the USCGAUX for ease of access by the general public.

Indicator: *Number of educational materials (brochures, videos, etc.) produced.*

Lead Group: USCGAUX

Proposed Partners: PRDNER, NOAA, NGO's

Timeline: year 3

Products and Outputs: Incorporation of an ecological component into the PRDNER, USCGAUX and Power Squadron safe boating training courses.

Expected Costs:

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & PRDNER

Objective 1.5:

Reduce and minimize recreational diving impacts to coral reefs.

Project 1.5.1: Develop an environmentally friendly diving educational campaign for the diving community in Puerto Rico.

Description: This project aims to develop and coordinate an eco-friendly program for divers in coordination with hotels, dive shops, dive magazines and the Puerto Rico Tourism Company. Dive masters, instructors, dive shop owners and other industry leaders will be trained in environmentally friendly diving practices and will be expected to pass along knowledge and information to their

clients as well as to implement an environmentally friendly behavior in their business. This initiative will strengthen efforts to create an environmentally friendly attitude toward corals within recreational diving groups.

Indicators: a) Number of dive instructors/dive masters/dive shop owners/etc. trained.

b) Number of educational materials (brochures, videos, etc.) produced.

Lead Group: The dive industry

Proposed Partners: PRDNER, CORAL, NOAA, Reef check, Sociedad Ambiente Marino and Ocean Sports

Timeline: year 2

Products and Outputs: Development of eco-friendly educational initiatives within the recreational diving industry.

Expected Costs: \$70,000

Proposed Funding Source: NOAA, NFWF, Sea Grant

Project 1.5.2: Develop a tracking system to identify buoys deployed in coral reef areas.

Description: On public domain areas, DNER mooring buoys will be identified by the letters DRN. Through this project all mooring buoys will also be identified and marked with numbers. This system will help agency managers and resource users to identify buoys that are missing or damaged.

Indicator: Number of marked/numbered mooring buoys.

Lead Group: PRDNER

Proposed Partners: NOAA and the dive industry

Timeline: Year 1

Products and Outputs: A well mapped and identified mooring buoy system.

Expected Costs: \$10,000

Proposed Funding Source: NOAA, NFWF

Project 1.5.3: Develop the “adopt a buoy” campaign.

Description: We will build up the “adopt a buoy” campaign by identifying recurrent mooring buoy user groups on each dive site and turn them into caretakers of the buoys. Academic institutions, dive shops, hotels, guesthouses, boat charters, other nautical groups and individuals can become part of the program and report to DNER missing or damaged buoys at their sites. DNER will develop logistics for the program to facilitate reporting the status and conditions of the buoys.

Indicators: a) Number of identified mooring buoy users at each site.

b) Number of identified mooring buoy users becoming mooring buoys caretakers.

Lead Group: PRDNER and the dive industry.

Proposed Partners: tourism companies and the nautical tourism industry.

Products and Outputs: This project will allow monitoring of mooring buoys in places where the PRDNER has no presence.

Expected Costs: \$70,000

Proposed Funding Source: NOAA, NFWF

Objective 1.6:

Revise and draft management plans for key marine reserves around Puerto Rico

Project 1.6.1: Develop a Management Plan for the Canal Luis Peña No Take Zone.

Update: This project has already started.

Description: This project will produce a strategic management plan for the Canal Luis Peña No Take Zone. A series of workshops and meetings involving all stakeholders will take place to gather opinions and comments that will serve as a guideline for development of the plan.

Indicator: A newly developed management plan for the Canal Luis Peña No Take Zone.

Lead Group: PRDNER, Municipality of Culebra and the local community

Proposed Partners: NOAA

Timeline: yr 1-2

Products and Outputs: Canal Luis Peña Management Plan

Expected Costs: \$50,000

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & DNER

Update: This project has already started and is being developed by PRDNER, community groups in Culebra, NOAA and others.

Project 1.6.2: Revise and update La Cordillera Reefs management plan.

Description: This project will revise and update the current management plan for La Cordillera Reefs Natural Reserve. A series of workshops and meetings involving all stakeholders will take place to gather opinions and comments that will serve as a guideline for development of the plan.

Indicator: *One revised/updated management plan for this area.*

Lead Group: PRDNER

Proposed Partners: NOAA and the local Community

Timeline: yr 1-2 La Cordillera

Products and Outputs: a new management plan

Expected Costs: 50,000

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & DNER

Update: *Education Consultants*, a private firm, is already revising and developing the new Cordillera Reefs Management Plan financed through a NOAA grant award.

Project 1.6.3: Revise and update La Parguera management plan.

Description: This project will revise and update the current management plan for La Parguera Reefs. A series of workshops and meetings involving all

stakeholders will take place to gather opinions and comments that will serve as a guideline for development of the plan.

Indicator: One revised/updated management plan for this area.

Lead Group: PRDNER & NOAA

Proposed Partners: Community / NGO's

Timeline: yr 3-4 La Parguera

Products and Outputs: a new management plan

Expected Costs: \$50,000

Proposed Funding Source: NOAA, Sea Grant, External Grants (NFWF) & DNER

Focal Area: Land Based Sources of Pollution

The core group that developed the strategy for addressing issues on land based sources of pollution concluded that in order to reduce sediment and pollutant loadings to coastal waters Federal and Commonwealth agencies must require and enforce best management practices (BMP's) and preventive management measurements (MM's) per land use and activities. BMP's and MMs have been developed and implemented for different levels and categories of non-point sources of pollution as part of the Coastal Management Program. The projects identified by the LBS Strategy are important for all the watersheds in Puerto Rico, however pilot projects are being implemented at the **Jobos Bay National Estuarine Research Reserve (JBNERR)** watershed.

These strategies address the impacts to coral reefs caused by erosion and sedimentation transported by runoff, rivers and creeks. The land-based sources of pollution (LBS) planning group based their workplan on the Puerto Rico's Coastal Nonpoint Source Pollution Plan. This document was developed by DNER in coordination with 15 commonwealth agencies and 6 federal advisory agencies and includes information provided by local scientists. This plan considers fine sediments transported by ocean currents (which depend on local patterns of water circulation near the coastal zone) as main pollutants and stressors affecting coral reefs. Agricultural compounds and nutrients were also identified as major stressors to wetlands and coral reefs within the watersheds. In order to address problems affecting corals, key projects were identified that entail the BMP's and MM's by: 1) category type of non point source pollution which include agricultural, urban, marinas, wetlands, etc. 2) inventory of all the non point sources of pollution and 3) training for agronomists and marina operators.

The proposed projects are being implemented in watersheds that are affected by: intensive agricultural activities, urban areas, high number of septic tanks and areas with large land cover removal. These pilot projects are being implemented in the JBNERR watershed and will be subsequently replicated at important watersheds on the island municipality of Culebra, Arrecifes de la Cordillera, Añasco, La Parguera, Guánica and Cabo Rojo as identified by the Coastal Nonpoint Source Pollution– Coral Reef Committee. The group of people working on this strategy includes representatives from state and federal agencies that manage or regulate activities that may impact coral reef ecosystems in close coordination with university and local community representatives.

Focal Area: Land Based Sources of Pollution

Goal 1: To reduce the loss of live coral reef cover through the promotion and implementation of integrated watershed and land-use management

Objective 1.1:

To reduce sediment and nutrient loading in coastal waters by implementing nutrient management plans in 500 acres of agricultural land.

Project 1.1.1: Establish priority conservation areas for the implementation of vegetative conservation practices.

Description: Identify priority conservation areas using the Natural Resources Conservation Service (NRCS) and Puerto Rico Department of Agriculture (PRDA) database in order to recommend the best management practices for the selected sites/farms.

Lead Group: NRCS

Proposed Partners: PRDA, UPR Cooperative Extension Service and JOBANERR.

Timeline: 7/30/03 to 6/30/06

Products and Outputs: GIS database on priority areas for the implementation of vegetative conservation practices.

Expected Costs: \$6,000

Proposed Funding Source: NRCS, JOBANERR

Project 1.1.2: Establish vegetative conservation practices in priority areas.

Description: After identifying priority conservation areas, encourage farmers/land owners to preserve vegetation within selected areas.

Lead Group: NRCS

Proposed Partners: PRDA, UPR Cooperative Extension Service, JOBANERR

Timeline: 7/1/02 to 6/30/03

Products and Outputs: More farms using vegetative conservation practices.

Expected Costs: \$15,000

Proposed Funding Source: EQIP, CRP, CTP, CNP

New Staff, Training & Technical expertise needs: Train PRDA agronomists that prepare conservation plans.

Update: A one-day training was provided to a group of farmers from the Jobos Bay Estuary Watershed area; training included conservation practices and USDA program applicable to agricultural enterprises within the watershed. A fact sheet in Spanish was distributed to make farmers aware of farming operations impact to coral reefs and the Farm Bill program opportunities to reduce nutrients, pesticides, erosion and sedimentation at Jobos Bay Estuary. Another one day

workshop was provided to state agency agronomists working in the Jobos watershed. The main topic of this workshop was conservation planning for erosion control and water quality in the watershed. There's a need to identify new watersheds for project implementation. NRCS is available and can provide training to agronomists, however new funding as well as other agency or group has to be identified to develop project logistics.

Project 1.1.3: Characterization of Star Grass (*Cynodon nlemfuensis*) efficiency for soil retention and nutrients absorption.

Evaluate the efficiency of the star grass (*Cynodon nlemfuensis*) as a filter strip at different widths. Filter strips entrap and transform pollutants that are generated in areas up-gradient to them.

Description: Star grass is recommended for vegetative conservation practices. This project will evaluate its efficiency as a filter strip on farm field plots. Filter strips entrap and transform pollutants that are generated at up-gradient areas. Data will be obtained on nutrient and sediment concentration retained or absorbed by different width areas of star grass filter strips. On most filter systems, width areas define their potential for pollutant entrapment and removal.

Lead Group: NRCS

Proposed Partners: land owners, University of Puerto Rico at Mayagüez, Soil Conservation District, UPR Cooperative Extension Service

Timeline: 7/30/05 to 6/30/06

Products and Outputs: research report

Expected Costs: \$ 20,000

Proposed Funding Source: USDA-NRCS

Project 1.1.4: Pilot project for coffee sowing using "Media Luna" practices.

Description: A new coffee sowing method is under research to improve water, fertilizer and soil retention. The technique is being developed to be used on individual trees and will be implemented on coffee plantations in western Puerto Rico. On farm field plots, data on concentration of nutrient and sediment loads in runoff water will be obtained and compared using two planting methods: media luna planting vs. traditional planting.

Lead Group: NRCS

Proposed Partners: land owners, University of Puerto Rico at Mayagüez, Soil Conservation District, UPR Cooperative Extension Service

Timeline: 7/30/05 to 6/30/06

Products and Outputs: Research report.

Expected Costs: \$ 20,000

Proposed Funding Source: USDA - NRCS

Objective 1.2:

To implement use of the cumulative impact assessment method for conducting project permit reviews on projects within watersheds.

Project 1.2.1: Provide workshops on land use and cumulative impacts assessments to agencies' technical staff (state and municipal).

Description: Organize workshop logistics and provide presentation handouts of procedures and regulations regarding cumulative impacts.

Lead Group: To be announced

Proposed Partners: Planning Board, DNER, EQB, UPRSGCP

Timeline: 7/1/06 to 6/30/07

Products and Outputs: workshop materials, number of trained personnel

Expected Costs: \$20,000

Proposed Funding Source: NOAA - CRI

Objective 1.3:

Apply the best management practices and management measures for the prevention of coastal non-point and point source pollution in Puerto Rico

Project 1.3.1: Perform groundwater wells inventory in critical communities within the Jobos Bay watershed.

Description: The inventory will start as a pilot project in land adjacent to Jobos Bay.

Lead Group: PRDNER-CZM

Proposed Partners: PRASA, JOBANERR, University of Puerto Rico

Timeline: 10/1/04 to 9/30/05

Products and Outputs: a GIS database for groundwater wells within the Jobos Bay watershed.

Expected Costs: \$38,000

Proposed Funding Source: NOAA – CRI

Project 1.3.2: Inventory of septic systems and establishment of alternate practices within Jobos Bay.

Description: There's a need to quantify septic systems within the Jobos Bay area and to establish an orientation program on alternate systems for sewage disposal. This project will also address serious water quality problems which impact coral reefs and other coastal habitats on the Jobos Bay National Estuarine Research Reserve.

Lead Group: PRDNER-CZM

Proposed Partners: JOBANERR, UPR School of Public Health

Project 1.3.3: Household practices to improve the On Site Disposal Systems (OSDS) in Añasco and Culebra.

Description: This project will train fifty families on the island of Culebra and a hundred seventy families on the Rio Grande de Añasco watershed on simple practices and techniques to improve and optimize their OSDS to control non-point source pollution.

Timeline: 10/1/05 to 9/30/06

Products and Outputs: workshops, direct advise and field visits to 220 families.

Expected Costs: \$50,000

Proposed Funding Source: Section 6217

Lead Group: PRDNER-CZM

Proposed Partners: University of Puerto Rico Sea Grant College Program

Project 1.3.4: Inventory of septic tanks as a source of pollution to groundwater and coral reefs in the Belvedere Natural Reserve in western Puerto Rico.

Description: This project will include an inventory of septic tanks and groundwater wells within communities of the Belvedere watershed and will develop an educational and demonstration project to improve the construction quality of septic tanks in the communities. A second phase of the project will sample and analyze the quality of underground and coastal waters that impact coral reef areas.

Lead Group: University of Puerto Rico-School of Public Health

Proposed Partners: PRDNER

Timeline: 8/30/05 to 7/30/07

Products and Outputs: GIS database for septic tanks and groundwater wells in addition to underground and coastal water quality database for the Belvedere watershed.

Expected Costs: \$56,000

Proposed Funding Source: NOAA - CRI

Project 1.3.5: Convene appropriate agencies to evaluate septic tanks inventory results and develop a strategy to apply Best Management Practices.

Description: Present septic tanks inventory results through meetings and workshops to foster discussion and information exchange among agencies and other pertinent entities, such as municipalities, in order to evaluate and develop strategies to apply best management practices for septic systems.

Lead Group: To be announced

Proposed Partners: PRASA, DNER, EQB, Department of Health, municipalities

Timeline: 10/1/06 to 9/30/07

Products and Outputs: reports from meetings and workshops; ideas on strategies for implementation of best management practices for septic systems.

Expected Costs: \$40,000

Proposed Funding Source: NOAA - CRI

Project 1.3.6: Develop a sediment and erosion control handbook for areas that are being developed.

Description: Provide proper specifications of Best Management Practices including construction standards to engineers and technicians who will work with earth crust extractions.

Lead Group: EQB

Proposed Partners: Natural Resources Conservation Service, PR Environmental Quality Board (EQB), PR Planning Board, US Environmental Protection Agency

Timeline: 10/1/04 to 9/30/05

Products and Outputs: Handbook

Expected Costs: \$50,000

Proposed Funding Source: 319(h), USDA

Update: Project completed, on March 2005 NRCS submitted handbook to the Environmental Quality Board.

Project 1.3.7: Distribute the handbook on sediment and erosion control.

Description: Once the handbook is developed, it is important to share it with pertinent agencies and users, such as engineers and technicians who work with earth crust extractions. This tool will be valuable for agencies staff in evaluating permit applications and in monitoring conditions for project approval. Hard copies of the document will be distributed among interested groups. The handbook will be posted on internet and will also be presented to interested groups through a series of workshops.

Lead Group: EQB

Proposed Partners: Natural Resources Conservation Service, PREQB, PR Planning Board, US Environmental Protection Agency, DNER

Timeline: 06/1/05 to 9/30/05

Products and Outputs: Handbook

Project 1.3.8: Prepare a Spanish summary of the handbook on sediment and erosion control.

Description: In order to facilitate the use of the handbook and improve procedural knowledge of technicians and other users a summary will be prepared in Spanish.

Lead Group: EQB

Proposed Partners: Natural Resources Conservation Service, PREQB, PR Planning Board, US Environmental Protection Agency, DNER

Timeline: 06/1/05 to 9/30/05

Products and Outputs: a Spanish document to facilitate sediment and erosion control.

Expected Costs: \$50,000

Project 1.3.9: Impact of the Culebra municipal landfill to the eastern side of the Canal Luis Peña Natural Reserve.

Description: Analysis of the potential effect of soil erosion of the Culebra landfill to the Natural Reserve will be carried out through the use of Remote Sensing, Geographical Information Systems techniques and field observations.

Lead Group: University of PR- School of Health

Proposed Partners: Natural Resources Conservation Service, PREQB, PR Planning Board, US Environmental Protection Agency, DNER

Timeline: 04/1/06 to 9/30/08

Products and Outputs:

Expected Costs: \$50,000

Proposed Funding Source: NOAA-CRI

Project 1.3.10: Reach the non-scientific community in an easy to understand format on ways to prevent non-point sources of pollution.

Description: Develop educational campaigns for students and the general public on alternatives to prevent non-point source pollution.

Lead Group: To be announced.

Proposed Partners: DNER, Department of Education, Natural Resources Conservation Service, PREQB, EPA

Timeline: 06/1/06 to 9/30/08

Products and Outputs: educational materials, people reached

Expected Costs: \$70,000

Proposed Funding Source: To be determined.

Project 1.3.11: School curriculum on Non-Point Source Pollution.

Description: Develop student activities, teacher guides and workshops on Non Point Source Pollution.

Lead Group: PRDNER-CZM

Proposed Partners: University of Puerto Rico

Timeline: 10/1/05 to 9/30/06

Products and Outputs:

Expected Costs: \$50,000

Proposed Funding Source: Section 6217

Project 1.3.12: Puerto Rico Clean Marina Program

Description: Development of an environmentally friendly boating program to target recreational boaters at marinas.

Lead Group: PRDNER-CZM

Proposed Partners: University of Puerto Rico Sea Grant Program

Timeline: 2/1/05 to 12/30/05

Products and Outputs: clean boating booklet, brochures, workshops, stencil program and environmental literature stations.

Expected Costs: \$100,000

Proposed Funding Source: Section 6217

Project 1.3.13: Development of an Integrated Pest Management Program (IPM) for Golf Courses in Puerto Rico.

Description: Develop a Golf course IPM manual to assist county agents, agrochemical distributors and other agricultural educators in training golf course personnel to understand and implement effective and environmentally responsible pest management strategies.

Lead Group: PRDNER-CZM

Proposed Partners: University of Puerto Rico Cooperative Extension Service

Timeline: 10/1/05 to 9/30/06

Products and Outputs: educational materials and two train-the-trainer workshops.

Expected Costs: \$35,000

Proposed Funding Source: Section 6217

Project 1.3.14: Non Point Source Pollutants Affecting Rio La Plata Watershed in Puerto Rico.

Description: This educational project will develop a curriculum, prepare seven train and guide one hundred fifty farmers, homemakers, and youth on non-point source pollutants generated from solid waste disposal, pesticide, fertilizer and household chemical application practices.

Lead Group: PRDNER-CZM

Proposed Partners: University of Puerto Rico Cooperative Extension Service

Timeline: 10/1/05 to 9/30/06

Products and Outputs: training curriculum, educational materials, trained staff and participants.

Expected Costs: \$50,000

Proposed Funding Source: Section 6217

Project 1.3.15: Adapting a computer assisted Non Point Source Pollution Educational Program for Puerto Rico: Marinas, On-site Wastewater Treatment and Stormwater Runoff.

Description: This project will integrate LEAPE (Locally-led Education and Action for Protecting the Environment) which targets local government officials and community leaders with education about non-point source pollution control and provide local management options for on-site wastewater treatment systems, stormwater runoff and marina management.

Lead Group: PRDNER-CZM

Timeline: 10/1/05 to 9/30/06

Products and Outputs: County agents and DNER personnel will be trained in the use of LEAPE, will receive program materials to support implementation and will have access to laptop computers for use in conducting local LEAPE workshops.

Expected Costs: \$50,000

Proposed Funding Source: Section 6217

Under this goal, the Commonwealth of Puerto Rico recommends development of applied marine research projects that need to be carried out by other group or agency such as the new Coral Reef Institute under the leadership of the Marine Sciences Department at the Mayagüez Campus of the University of Puerto Rico. Identified priorities are:

1. Continue monitoring priority coral reef areas including sites previously established by PRDNER.
2. Characterization and monitoring of suspended sediments and analysis of their impact on Puerto Rican coral reefs.
3. Develop research to assess effectiveness of erosion control measures.
4. Analysis of data on coral cover and fisheries population around Natural Reserves.
5. Regional workshop to develop indicators and protocols to assess coral reef health and threats from land-based sources of pollution.
6. Development of a Coral Reef Symposium to present results of current efforts.
7. Impact of suspended sediment on light attenuation and coral physiology.
8. Cost-benefit analysis of different management and financing regimes of marine managed areas.
9. Assessment of anthropogenic impacts on highly visited coral reef sites.

Goal 2: To improve compliance and enforcement of laws, rules and regulations related to construction and land development permits

Objective 2.1:

To increase enforcement capabilities of agencies that issue permits and administer regulations related to coastal wetlands.

Project 2.1.1: Train DNER rangers and EQB technicians to effectively monitor compliance of laws, rules and regulations related to construction and land development permits.

Description: Deliver workshops with updated information on rules and regulations related to construction and land development permits, including the use of tools such as GPS.

Lead Group: To be announced

Proposed Partners: PRDNER, EQB

Timeline: 10/10/07 to 9/30/08

Products and Outputs: workshop materials and number of trained DNER rangers.

Expected Costs: \$40,000

Proposed Funding Source: NOAA – CRI

Project 2.1.1: Provide appropriate tools and equipment to DNER Rangers, DNER and EQB technicians to effectively monitor compliance of laws, rules and regulations related to construction and land development permits.

Description: To acquire appropriate equipment such as GPS and cameras for DNER Rangers and technicians from DNER and EQB, to effectively and efficiently enforce laws and regulations related to earth crust extraction, and other construction activities.

Lead Group: To be announced

Proposed Partners: PRDNER, EQB

Timeline: 10/01/06 to 9/30/07

Products and Outputs: GPS, cameras and other needed tools.

Expected Costs: \$100,000

Proposed Funding Source: NOAA, EPA

Goal 3: *To reduce the loss of coral reefs due to the loss of coastal wetlands, estuaries and beaches.*

Objective 3.1:

Improve distribution of freshwater, both surface and ground water.

Project 3.1.1: Construct ponds to obtain freshwater from the Aguirre Power Plant

Description: Construction of artificial ponds is necessary to recover freshwater that can be routed to increase freshwater supply for JOBANERR wetlands.

Lead Group: DNER-JOBANEER

Proposed Partners: PREPA, JOBANERR, DNER

Timeline: ongoing effort

Products and Outputs: new ponds and drainage channels constructed for fresh water distribution.

Expected Costs: to be announced

Proposed Funding Source: to be announced

Project 3.1.2: Perform jurisdictional determination of wetlands, maritime zone and reserve limits in the JOBANERR watershed.

Description:**Indicator:****Lead Group:** DNER (RFP)**Proposed Partners:** PRDA, NRCS, COE, EPA**Timeline:** 10/1/05 to 9/30/06**Products and Outputs:** JD Map**Expected Costs:** \$75,000**Proposed Funding Source:** NOAA- CRI**New Staff, Training & Technical expertise needs:** Train DNER staff on jurisdictional determination of wetlands.**Update:** reserve limits have been already identified.**Objective 3.2:****Implement Land Acquisition Plans****Project 3.2.1:** Acquire already identified priority areas within DNER for watershed protection.**Description:** DNER has a list of priorities among ecologically sensitive areas that need to be acquired by the agency to ensure their conservation. Many of these areas are important for watershed and/or coastal protection. It is recommended to request matching funds to the Legislature for the acquisition of coastal wetlands. The agency will initiate the acquisition process once the Legislature appropriates the funding.**Lead Group:** DNER**Proposed Partners:** state legislators, Institute of Tropical Forestry (ITF)**Timeline:** ongoing activity**Products and Outputs:** 200 acres of land on the Jobos Bay area (Rafael Vargas parcel (Lot D)) have been acquired for the Jobos Bay National Estuarine Research Reserve.**Expected Costs:** \$5,000,000**Proposed Funding Source:** State funds, USFWS, NOAA, USDA

Focal Area: Lack of Awareness

There's a need for knowledge about the intricate relationships between human beings and coral reefs and the services that they provide for our benefit. More important, we do not recognize the fact that when people cause damage inland, it could in turn cause damage to coral reefs and associated coastal ecosystems. It is important to promote awareness on the gamut of interrelations and the consequences of people's actions.

Ocean related services and attractive marine recreational activities are key to the local tourism industry and fundamental to Puerto Rico's economy. There is a need to promote public awareness on the importance of coral reef ecosystems and we have addressed our goals to students and communities as well as to the private sector and the legislature.

Different stakeholders in the educational arena provided reasonable information on gaps and current needs that must be addressed in order to increase conservation of coral reef ecosystems in Puerto Rico. The stakeholders group included educators, scientists, university students, NGO's, personnel from government agencies and the tourism industry.

Some of the gaps that the group identified were: 1) a need for better coordination among local and federal government agencies on coral reef conservation and planning efforts, 2) a need to gather information on people's knowledge about our coral reef resources 3) new outreach programs that include development of effective educational campaigns and 4) a need for accurate information on critical coral reef areas.

Pilot projects were drafted to address lack of awareness issues and several educational gaps that were identified as missing key elements for the conservation of coral reefs in Puerto Rico. Focal areas were worked individually by different committees and every group has projects that overlap lack of awareness. For the benefit of those interested, at the end of this section we are including a list of projects from other groups that relate to Lack of Awareness.

Focal Area: Lack of Awareness

Goal 1: Promote public awareness on the importance of coral reef ecosystems to Puerto Rico's economy.

Objective 1.1:

Promote participation of municipal governments and coastal communities in planning efforts and protection of coral reefs.

Project 1.1.1: Organize and conduct at least four meetings within coastal communities to discuss coral reefs conservation efforts.

Description: Coastal communities within priority areas will be invited to participate in meetings to discuss coral reefs related issues, problems, conservation efforts and opportunities for community involvement. These inputs should be incorporated into the Puerto Rico Coral Reef Management Plan (PRCRMP).

Indicator: number of meetings conducted and number of concerned community groups willing to work on coral reefs conservation initiatives.

Lead Group: DNER-Education Division

Proposed Partners: Municipal governments, NGO's, NOAA-NMFS, USFWS, EQB, PB, DNER and academic institutions.

Timeline: YR 2, 3 and 4.

Products and Outputs: Four coastal community meetings.

Expected Costs: \$15,000.00

Proposed Funding Source: NOAA and NFWF.

New Staff, Training & Technical expertise needs: Staff training on community work and on strategies to develop partnerships or cooperative agreements.

Project 1.1.2: Develop and deliver coral reef conservation workshops to municipal governments on how to encourage communication between government agencies and coastal communities.

Description: Coastal municipal governments will be invited to regional workshops on conservation of coral reefs, management plan efforts and strategies to address coastal communities.

Lead Group: DNER-Education Division

Proposed Partners: Municipal governments, NOAA-NMFS, USFWS, EQB, DNER and academic institutions.

Timeline: YR 2, 3 and 4.

Products and Outputs: Two regional workshops addressed to coastal municipal governments and agreement on their participation on community coral reef conservation and outreach efforts.

Expected Costs: \$15,000.00

Proposed Funding Source: NOAA and PRDNER

Project 1.1.3: Establish at least two cooperative agreements between communities and government to conserve marine ecosystems within their regional areas.

Description: An agreement between communities and government is necessary to establish compromise and guarantee continuity of project efforts.

Indicator:

Lead Group: PRDNER

Proposed Partners: Municipal governments, local communities and other interested groups

Timeline: YR 4, 5 and 6

Products and Outputs: two cooperative agreements to develop coral reef conservation and education projects.

Expected Costs: 25,000

Proposed Funding Source: NOAA/PRDNER

Objective 1.2:

Develop and distribute a survey to assess public attitudes and behavior toward coral reefs.

Project 1.2.1: Identify criteria to develop a survey to assess public attitudes and behavior toward coral reefs, prepare questionnaire and survey 500 users and/or potential users; analyze survey data and prepare report.

Description: Conduct internal meetings to identify topics needed to assess resource users through a short survey. Design questions for each topic, revise and produce final questionnaire. DNER and volunteers will visit at least 13 different beaches throughout Puerto Rico to administer questionnaire to resource users. Data will be organized and analyzed using MS Excel and Access. A final report will integrate survey results.

Indicator: Final report on survey results.

Lead Group: DNER-Bureau of Coasts, Reserves and Refuges

Proposed Partners: DNER staff, NOAA Coral Reef Management Fellow

Timeline: YR 1

Products and Outputs: Questionnaire produced, data acquired and analyzed, final report.

Expected Costs: \$10,000.00

Proposed Funding Source: NOAA

New Staff, Training & Technical expertise needs: Training on questionnaire design, MS Excel and Access

Objective 1.3.

Develop an educational tool targeted to elementary and middle school children.

Project 1.3.1a: Appraise existing educational materials with emphasis on coral reefs that are relevant to Puerto Rico and categorize them by topic and school level.

Description: Compile available educational materials on coral reefs that are significant to Puerto Rico; revise and classify according to school level and/or intended audience and level of understanding.

Indicator: Number of materials compiled and appraised.

Lead Group: DNER-Bureau of Coasts, Reserves and Refuges

Proposed Partners: Coral Reef Management Fellow, FWS, NOAA, Dept. of Education and Sea Grant.

Timeline: YR 1 & 2

Products and Outputs: Catalog of educational materials to become available on the PRDNER web site: www.coralpr.net.

Expected Costs: \$10,000

Proposed Funding Source: DNER and NOAA.

Project 1.3.1b: Reprint educational materials on coral reef ecosystems.

Description: This project will fill educational gaps on the area of marine education by reprinting educational materials for coral reef workshops.

Indicator: number of materials reprinted.

Lead Group: DNER

Proposed Partners: NOAA, Sea Grant

Timeline: YR 2 & 3

Products and Outputs: Reproduction of targeted educational materials.

Expected Costs: \$30,000.00

Proposed Funding Source: NOAA

New Staff, Training & Technical expertise needs

Project 1.3.2: Develop and deliver educational workshops on coral reefs.

Description: Develop workshop contents, arrange logistics and deliver a series of six training workshops for 5-7 grade teachers on different island regions.

Indicator: Number of schools, students and teachers reached.

Lead Groups: PRDNER & NGO

Proposed partners: Academic Institutions (for example, RCSE), NOAA & NGO's, DE, University of Puerto Rico

Timeline: YR 3

Products and Outputs: 5-7 grade school teachers trained on coral reef educational strategies that can be integrated into their regular curriculum.

Expected costs: \$50,000.00

Proposed funding source: NOAA, NFWF, USFWS

Objective 1.4:

Design and publish an educational interactive CD or DVD on coral reefs.

Project 1.4.1: Develop project outline for the educational interactive coral reef project.

Description: Gather visual aids and literature to develop project outline.

Indicator: CD or DVD produced. (being done through NMFS 2004-2005)

Lead Group: NMFS

Proposed Partners: NGO's

Timeline: YR1

Products and Outputs: Outline

Expected Costs: Projects 1-4 (\$25,000.00)

Proposed Funding Source: NOAA-NMFS

Project 1.4.2: Compile and organize available audio-visual resources and materials on Puerto Rico's and Caribbean coral reefs.

Description: Prepare graphic representation layout of the contents for review in a draft cd.

Lead Group: NMFS

Proposed Partners: NGO's

Timeline: YR1

Products and Outputs: Draft cd.

Expected Costs: Projects 1-4 (\$25,000.00)

Proposed Funding Source: NOAA-NMFS

Project 1.4.3: Obtain permits for media reproduction and replicate copies of audiovisual resources compiled on project 1.4.2.

Description: Produce copies of audiovisual materials for distribution to schools, hotels, beaches, etc.

Lead Group: NMFS

Proposed Partners: NGO's

Timeline: YR 2

Products and Outputs: Final cd product for distribution

Expected Costs: Projects 1-4 (\$25,000)

Proposed Funding Source: NOAA-NMFS

Project 1.4.4: Incorporate these educational products into a DNER coral reef web page.

Description: Incorporate coral reefs audiovisual materials into PRDNER-Coastal Zone Management Program (CZM) web page as well as information on PRDNER Coral Reef Management and Conservation Program.

Lead Group: DNER

Proposed Partners: PRDNER Coastal Zone Management Program, NOAA

Timeline: YR 3

Products and Outputs: New information site within the CZM web page.

Expected Costs: \$5,000

Proposed Funding Source: NOAA

Objective 1.5:

Develop a coral reef conservation campaign to target fifty tourism-oriented businesses within our coastal areas.

Project 1.5.1: Identify and contact our target groups: fifty coastal businesses and/or maritime industries.

Description: This project will present our coral reef education proposal to several commercial groups that are coastal/ocean resource users and will select fifty of those willing to be part of our coral reef conservation efforts.

Indicator:

Lead Group: DNER

Proposed Partners: Tourism Company

Timeline: YR 3

Products and Outputs: List of businesses and contacts.

Expected Costs: Project 1-2 (\$50,000.00)

Proposed Funding Source: NOAA, Puerto Rico Tourism Company

Project 1.5.2: Produce educational information on the importance of coral reefs to our island economy to target coastal businesses and maritime industries.

Description: Coral reef conservation efforts need to target diverse groups within the private sector. It is extremely important that groups within the maritime load and cruise ship industries as well as hotels and resorts become proactive towards the conservation of coral reefs and aware of their importance to our economy. Our outreach efforts will highlight on services that coral reefs provide for our benefit and enjoyment.

Lead Group: PRDNER

Proposed Partners: Puerto Rico Tourism Company, NGO's

Timeline: YR 3 & 4

Products and Outputs: Orientation, production and distribution of materials.

Expected Costs: Project 1-2 (\$50,000.00)

Proposed Funding Source: NOAA and PRDNER
New Staff, Training & Technical expertise needs

Project 1.5.3: Write educational articles on coral reefs for publication in local magazines and periodicals.

Description: A series of articles targeting coral reefs conservation issues will be published in local magazines and periodicals such as the PR Tourism Company magazine !Que Pasa! and the nautical newspaper La Regata. Our articles will also reach regional and all-island distribution newspapers.

Lead Group: PRDNER

Proposed Partners: Tourism Company, NGO's, PR Sea Grant

Timeline: YR 3 & 4

Products and Outputs: A series of articles published in magazines and periodicals.

Expected Costs: \$5,000.00

Proposed Funding Source: NOAA - PRDNER

Objective 1.6:

Develop a coral reef awareness campaign to reach recreational boaters, divers, snorkelers and other coastal resource users.

Project 1.6.1: Supplement DNER navigational courses by incorporating new information on coastal environments and boater's environmentally friendly practices.

Description: Develop and integrate supplementary information on coastal ecosystems and marine benthic communities to emphasize safe navigation in shallow areas and reinforce coral reef conservation. This supplement will discuss the interrelationship between mangroves, seagrass beds and coral reefs as well as simple navigational and boat maintenance practices that help to keep a healthy marine environment.

Indicator: Number of users reached or number of sites impacted by campaign.

Lead Group: PRDNER

Proposed Partners: U.S. Coast Guard Auxiliary and the U.S. Power Squadron

Timeline: YR 2

Products and Outputs: Development of a Coral Reef Ecosystem Supplement for navigational courses.

Expected Costs: \$15,000

Project 1.6.2: Select and reprint educational literature for public distribution at PRDNER boat registration and fishing licenses office.

Description: There's a need to reach recreational boaters and fishermen for orientation on coral reef laws and regulations, coastal environments and boater's environmentally friendly practices. This project will select and reproduce already published coral reef literature and will develop new ones as required.

Lead Group: PRDNER

Proposed Partners: NGO's (boater associations and environmental groups)

Timeline: YR 3 & 4

Products and Outputs: Reproduction and distribution of coral reef educational booklets

Expected Costs: \$30,000.00

Proposed Funding Source: NOAA-NMFS, PRDNER

Project 1.6.3: Design and deliver at least six coral reefs workshops for dive shop owners, dive instructors and dive charters to emphasize on the ecological and economical importance of these ecosystems.

Description: This activity will provide the latest information on coral reef scientific and economic research and will encourage inclusion of an educational component on coral reefs and marine ecosystem conservation on SCUBA courses, snorkeling lessons and charter operations.

Lead Group: Sociedad Ambiente Marino (NGO)

Proposed Partners: PRDNER, NGO's (Reef Check, CORAL, PADI Project Aware), and Sea Grant

Timeline: YR 4

Products and Outputs: Grant report including workshop outline and content, visual aids and other educational materials used or developed for the project.

Expected Costs: \$15,000

Proposed Funding Source: NOAA, NFWF

Project 1.6.4: Develop and distribute public service radio spots on coral reef conservation topics.

Description: This project will generate four radio spots.

Lead Group: PRDNER

Proposed Partners: Academic institutions, NGO's, and Sea Grant

Timeline: YR 4

Products and Outputs: Four radio spots

Expected Costs: \$5,000

Proposed Funding Source: NFWF

Project 1.6.5a: Develop a signage system on ways to protect coastal marine ecosystems.

Description: Signs will be designed and installed on coastal areas to promote awareness among resource users on the importance of coral reefs and associated ecosystems, encouraging practices that we can carry out to protect coral reefs.

Lead Group: PRDNER

Proposed Partners: PRDNER Coastal Zone Management Program, NGO's and Sea Grant.

Timeline: YR 1 & 2

Products and Outputs: Sign design and a study to define priority areas within our coastal zone.

Expected Costs: Projects 1-2 (\$25,000.00)

Proposed Funding Source:

Project 1.6.5b: Define criteria for art selection and sign information.

Description: Look for a universal symbol system to design the signs.

Lead Group:

Proposed Partners: PRDNER Coastal Zone Management Program

Timeline: YR 3 & 4

Products and Outputs: The production and installation of signs.

Expected Costs: Projects 1-2 (\$25,000.00)

Proposed Funding Source: NOAA, NFWF, PRDNER

Goal 2: Develop communication strategies to improve interactions among government agencies working on coral reef issues and encourage information transfer between the scientific community and decision makers.

Objective 2.1:

Develop a coral reef network to obtain a better communication among local agencies and between local and federal agencies.

Project 2.1.1: Develop a directory of all local/federal agencies, universities and other NGO's involved in coral reef management and conservation issues.

Description: There are several coral reefs programs in different government agencies. A directory will provide updated information on projects and contact persons, helping any search for available coral reef programs.

Lead Group: PRDNER

Proposed Partners:

Timeline: YR 2

Products and Outputs: A directory that will include name, mailing address, telephone number, fax number and e-mail for each of the government agencies, universities and NGO's working on coral reefs. This publication will also include information on coral reef working areas and priority projects within each group.

Expected Costs: Project 1-2 (\$15,000.00)

Proposed Funding Source: NOAA

Project 2.1.2: Organize local/federal agencies, universities and NGO's to conduct two project management meetings for staff members working on coral reef programs.

Description: Each meeting will request project management personnel to present coral reef projects and initiatives on their domain.

Indicator: Number of agencies reached, number of consultations with agencies accomplished, number of meetings conducted, number of participants and cooperative agreements achieved.

Lead Group: PRDNER

Proposed Partners: NMFS, USFWS, NOAA,

Timeline: YR 2 & 3

Products and Outputs: Two meetings held.

Expected Costs: Project 1-2 (\$15,000.00)

Proposed Funding Source: NOAA

Project 2.1.3: Conduct a forum every four years for information exchange between the scientific community and decision-makers.

Description: It is necessary for legislators to have correct and updated information at times of crucial decision making. To carry out this forum it is extremely important to have scientific and technical personnel that can communicate in a non-technical format.

Lead Group: PRDNER

Proposed Partners: Legislature, University of Puerto Rico

Timeline: YR 3

Products and Outputs: A meeting every four years between these sectors.

Expected Costs: \$3,000

Proposed Funding Source: NOAA

Projects from other focal areas that relate to Lack of Awareness

Overfishing

Project 1.3.1:

Produce a series of educational materials including posters, videos and booklets, to inform the public about measures that support the wise use of resources; for example, showing the minimum reproductive size of fishes of commercial and recreational importance.

Project 1.3.2:

Deliver a series of workshops and orientation meetings with resource users and the public to discuss the importance of new fishery regulations. Increase the level of awareness and compliance with regulations.

Project 1.3.3 Create partnerships with non-profit entities to promote news capsules that could encourage development of fishing activities with adequate gear that will reduce fishing pressure.

Project 1.3.4: Establish partnerships with coastal municipalities through their educational programs to inform the public and users of the importance of fishing regulations.

Project 2.1.3:

Deliver training workshops for PRDNER Rangers and public service agents on the subject of existing fisheries laws and regulations.

Project 2.3.3: Provide classroom and field training for administrative hearing officers jointly with the PRDNER Coral Reef Ranger Team on biology and importance of coral reefs.

Project 2.3.5: To duplicate a NOAA funded and successful training workshop on the new Fisheries Regulation 6768 and on communication skills for an additional 50 PRDNER Rangers within the maritime unit.

Project 3.4.1: Conduct workshops to build a PRDNER marine management plan team and small groups of key stakeholders to receive guidance on how to begin and implement a process to develop a no-take or natural reserve management plan.

Project 4.3.2: Conduct orientation activities and produce educational materials to instruct boat owners in the use of anchor removal systems.

Project 4.3.3: Disseminate information about the location and use of mooring buoys to dive shop owners, charter boat operators, navigation instructors, tourism personnel, and other interested stakeholders.

Project 5.1.2: Complete orientation workshops for recreational fishers concerning state and federal fisheries laws and evaluation of results obtained from the status of the fisheries.

Project 5.2.2: Develop educational materials for public distribution in relation to impacts to coral reefs caused by the illegal collection of ornamental fish and invertebrates.

Recreational Overuse

Project 1.2.3: Develop site maps and educational materials for highly visited coral reef areas. This project will develop new site maps showing anchoring and no-anchoring areas as well as live rock and coral cover zones on our three target sites: La Cordillera Reefs, Canal Luis Peña, La Parguera and Guánica.

Project 1.4.1: Coordinate and provide coral reef educational materials to target groups. The Department of Natural and Environmental Resources will work in partnership with the U.S. Coast Guard Auxiliary and the U.S. Power Squadron to incorporate an ecological section into the navigational courses offered to the public. These educational materials could be available in a web site either hosted by the PRDNER or the USCGAUX for ease of access by the general public.

Project 1.5.1: Develop an environmentally friendly diving educational campaign for the diving community in Puerto Rico. This project aims to develop and coordinate an eco-friendly program for divers in coordination with hotels, dive shops, dive magazines and the Puerto Rico Tourism Company. Dive masters, instructors, dive shop owners and other industry leaders will be trained in environmentally friendly diving practices and will be expected to pass along knowledge and information to their clients as well as to implement an environmentally friendly behavior in their business.

Project 1.5.3: Develop the “adopt a buoy” campaign. We will build up the “adopt a buoy” campaign by identifying recurrent mooring buoy user groups on each dive site and turn them into caretakers of the buoys. Academic institutions, dive shops, hotels, guesthouses, boat charters, other nautical groups and individuals can become part of the program and report to DNER missing or damaged buoys at their sites. DNER will develop logistics for the program to facilitate reporting the status and conditions of the buoys.

Land-based Sources of Pollution

Project 1.1.2: Establish vegetative conservation practices in priority areas. After identifying priority conservation areas, deliver workshops to encourage farmers/land owners to preserve vegetation through conservation planning for erosion control and water quality in the watershed.

Project 1.2.1: Provide workshops on land use and cumulative impacts assessments to agencies' technical staff (state and municipal). Organize workshop logistics and provide presentation handouts of procedures and regulations regarding cumulative impacts.

Project 1.3.3: Development of a community-based program to improve the use of septic systems in Añasco and Culebra.

Project 1.3.10: Reach the non-scientific community in an easy to understand format on ways to prevent non-point sources of pollution; develop educational campaigns for students and the general public on alternatives to prevent non-point source pollution.

Project 1.3.11: School curriculum on Non Point Source Pollution

Project 1.3.12: Puerto Rico Clean Marina Program. Development of an environmentally friendly boating program to target recreational boaters at marinas.

Project 1.3.12: Puerto Rico Clean Marina Program

Description: Development of an environmentally friendly boating program to target recreational boaters at marinas.

Lead Group: PRDNER-CZM

Proposed Partners: University of Puerto Rico Sea Grant Program

Timeline: 2/1/05 to 12/30/05

Products and Outputs: clean boating booklet, brochures, workshops, stencil program and environmental literature stations.

Expected Costs: \$100,000

Proposed Funding Source: Section 6217

Project 1.3.13: Development of an Integrated Pest Management Program (IPM) for Golf Courses in Puerto Rico.

Develop a Golf course IPM manual to assist county agents, agrochemical distributors and other agricultural educators in training golf course personnel to understand and implement effective and environmentally responsible pest management strategies.

Description: Develop a Golf course IPM manual to assist county agents, agrochemical distributors and other agricultural educators in training golf course personnel to understand and implement effective and environmentally responsible pest management strategies.

Lead Group: PRDNER-CZM

Proposed Partners: University of Puerto Rico Cooperative Extension Service

Timeline: 10/1/05 to 9/30/06

Products and Outputs: educational materials and two train-the-trainer workshops.

Expected Costs: \$35,000

Proposed Funding Source: Section 6217

Project 1.3.15: Adapting a computer assisted Non Point Source Pollution Educational Program for Puerto Rico: Marinas, On-site Wastewater Treatment and Storm water Runoff.

This project will integrate LEAPE (Locally-led Education and Action for Protecting the Environment) which targets local government officials and community leaders with education about non-point source pollution control and provide local management options for on-site wastewater treatment systems, storm water runoff and marina management.

Description: This project will integrate LEAPE (Locally-led Education and Action for Protecting the Environment) which targets local government officials and community leaders with education about non-point source pollution control and provide local management options for on-site wastewater treatment systems, stormwater runoff and marina management.

Lead Group: PRDNER-CZM

Timeline: 10/1/05 to 9/30/06

Products and Outputs: County agents and DNER personnel will be trained in the use of LEAPE, will receive program materials to support implementation and will have access to to laptop computers for use in conducting local LEAPE workshops.

Expected Costs: \$50,000

Proposed Funding Source: Section 6217

APPENDIX

Threat Areas Core Groups

Name	Agency	Phone	E-mail	Focus Group
Ortiz, Álida	Consultora	(787) 850-7641	al.ortiz@webmail.uprh.edu	Lack of awareness
Bayó, Dixie	DNER			Lack of awareness
Delgado, Damaris	DNER		prczmp@caribe.net	Lack of awareness
González, Felicita M	DNER	(787) 999-2200 X2609		Lack of awareness
Green, Astrid	DNER	(787) 999-2200 X5417		Lack of awareness
Mercado, Nuria	DNER	(787) 723-1808		Lack of awareness
Velazco, Aileen T.	DNER	(787) 999-2200 2706	avelazco@caribe.net	Lack of awareness
Pacheco, Carlos G.	DNER-Guánica Commonwealth Forest Reserve	(787) 821-5706	cpacheco@coqui.net	Lack of awareness
Alejandro, Pedro J.	Sociedad Ambiente Marino (NGO)	(787) 764-0466		Lack of awareness
Candelas, Frances	Sociedad Ambiente Marino (NGO)	(787) 374-9379	frenchypr@hotmail.com	Lack of awareness
López, Christian L.	Sociedad Ambiente Marino (NGO)	(939) 642-7264 (787) 368-5330		Lack of awareness
Menéndez-Delmestre, Raissa	Sociedad Ambiente Marino (NGO)	(787) 761-2361	raissam@hotmail.com	Lack of awareness
Ortiz, Edgardo	UPR - Humacao	(787) 850-7641	787-850-7641 (fx)	Lack of awareness
Hernández, Edwin	UPR-Río Piedras	(787) 449-0566	coral_giac@yahoo.com	Lack of awareness
Díaz, Ernesto	DNER	(787) 999-2200 X2629		Land Based Sources

Name	Agency	Phone	E-mail	Focus Group
Ortiz-Romper, Ana	DNER	(787) 999-2200		Land Based Sources
Quevedo-Bonilla, Vicente	DNER	(787) 999-2200 X2523		Land Based Sources
SantaRosa, Verónica	DNER	(787) 999-2200 X2415	vicky1@tld.net	Land Based Sources
Toro, Julio A.	DNER	787-999-2200 X2840		Land Based Sources
Rodríguez, Tere	EPA	(787) 977-5864	rodriguez.teresita@epa.gov	Land Based Sources
Varas, Esteban	JCA-Agua	(787) 767-8181 x2530/2601	(787) 767-1962 (fx)	Land Based Sources
Ortiz, Rose A.	Junta de Planificación	(787) 726-0289	ortiz_r@jp.gobierno.pr	Land Based Sources
Wusinich-Méndez, Dana	NOAA	(301) 563-1159	dana.wusinich-mendez@noaa.gov	Land Based Sources
Colon, Emilio	U.S. Army Corps of Engineers	(787) 729-6876		Land Based Sources
Morales, Marisol	USDA-NRCS	(787) 766-5206 x233	marisol.morales@pr.usda.gov	Land Based Sources
García-Moliner, Graciela	CFMC	(787) 766-5926	graciela@coqui.net	Over-fishing
Lilyestrom, Craig	DNER	(787) 999-2200 X 2615	craig@caribe.net	Over-fishing
Padilla, Walter	DNER	(787) 999-2200		Over-fishing
Rosario, Aida	DNER-Fisheries Research Laboratory	(787) 833-2025	lipdrna@coqui.net	Over-fishing
Pabón, Aitza E.	NMFS-HCD	(787) 851-3700	Aitza.Pabon@noaa.gov	Over-fishing
Alicea, Eileen	NOAA	(301) 713-3078 x218	eileen.alicea@noaa.gov	Over-fishing

Name	Agency	Phone	E-mail	Focus Group
Ojeda, Edgardo	Sea Grant	(787) 832-8045	e_ojeda@rumac.uprm.edu	Over-fishing
García, Jorge (Reni)	UPR-Mayagüez DMS		renigar@caribe.net	Over-fishing
Díaz Colon, Lourdes	Compañía de Turismo	(787) 721-1544 (787) 721-6561 (fx)	ldiaz@prtourism.com	Recreational misuse
Díaz Rivera, Clarimar	DNER	(787) 999-2200 X 2555		Recreational misuse
Beltrán-Burgos, Luis D.	DNER	(787) 999-2200	ldbelt@caribe.net	Recreational misuse
Grana, Félix	DNER	(787) 999-2200 X2676	787-723-1791 (fx)	Recreational misuse
Rivera, Manuel	DNER	(787) 725-9593	manriveortiz@hotmail.com	Recreational misuse
Rodríguez, Carlos	DNER	(787) 999-2200 X5611		Recreational misuse
Lugo, Miguel	NOAA	(301) 713-2989x102	miguel.lugo@noaa.gov	Recreational misuse
Weil, Ernesto	UPR-Mayagüez DMS	(787) 899-2048 x241		Recreational Misuse
Suleiman, Samuel	Sociedad Ambiente Marino (NGO)	(939) 642-7264 764-0000 x7322	buzo@coqui.net	Recreational Misuse
Schuttenberg, Heidi	NOAA	(301) 713-2989 x224	heidi.schuttenberg@noaa.gov	USCRTF Staff

Federal and State Navigators

Threat Area	Federal Navigator	State Navigator
Lack of Awareness	Miguel Lugo (NOAA)	Astrid Green (DNER) Aileen T. Velazco (DNER)
Recreational Overuse	Miguel Lugo (NOAA)	Lourdes Díaz (PR Tourism) Aileen T. Velazco (DNER)
Land Based Sources of Pollution	Dana Wusinich-Méndez (NOAA)	Teresita Rodríguez (EPA) & Marisol Morales (USDA) Ernesto Díaz (DNER)
Over-fishing	Aitza Pabón (NOAA)	Craig Lilyestrom (DNER)