

Guam's 5-Year Coral Reef Initiative Program for Research, Monitoring, Enforcement, and Education

Introduction

Guam has had a full slate of activities directly related to addressing issues of coral reef ecosystem management and protection, with funding from a variety of sources.

Research Activities

Under this general heading, the following nine particular actions stand out:

- ◆ The Guam Coastal Management Program contracted to study contaminated soil levels in Guam's boat harbors and marinas, in order to determine health considerations in harvestable biology and to address needs in dredge spoil disposal.
- ◆ University of Guam Marine Laboratory: Dr. Charles Birkeland has been conducting settlement studies to determine change in recruitment of corals over the past twenty years.(CRI funds)
- ◆ University of Guam Marine Laboratory: Dr. Robert Richmond has been researching reseeding practicality for areas impacted by sedimentation. (CRI funds).
- ◆ Legacy funds are being used to determine current patterns around Andersen AFB marine resource preserve to determine expected levels and directions of recruitment of resources.
- ◆ Historical data on benthic community percent cover is being compared to existing cover in shallow reef areas presently being extensively used by personal water craft. (USFWS Sport Restoration funds).
- ◆ 1999 is the third year Guam has conducted *reef check*, which includes training and use of community divers, snorkelers, and waders to develop information on the status of corals and fishes in specific reef areas.
- ◆ Gillnet Tracking Study: Department of Agriculture is undertaking a study to document removal of abandoned gill net, unharvested take, and an analysis of historical data for fishery impacts. (USFWS Sports Restoration Funds)
- ◆ Guam Coastal Management Program will fund a project for contaminant source identification and reduction in upland areas, which empty onto Tumon Bay reef.
- ◆ Guam Coastal Management Program will fund assessment of shore area springs and ground water seeps in Tumon Bay, to identify contaminant sources and levels for reduction measures.

Restoration

Within this general category, Guam is or has undertaken eight major efforts:

- ◆ Using funds from DOI and NOAA, Guam recovered and disposed of 40,000 lbs. of debris from Super typhoon Paka. Six tons were taken from the shallow reef areas and 14 tons were recovered in waters from 10 to 65 feet.
- ◆ Guam Coastal Management Program is taking the lead for the fourth year, for Guam's participation in the International Coastal Clean-Up. More than 1,400 volunteers per year participate in both beach and deeper water clean-ups. (Donated funds)
- ◆ Guam has now established five Marine Preserves in law, covering some 11.5% of Guam's total coastline. Research is underway to track reef and reef resource recovery over time. (USFWS Sport Fish Restoration funds).
- ◆ Guam recently installed 32 shallow water moorings at selected dive spots to reduce anchor damage. (USFWS Sport Fish Restoration funds).
- ◆ University of Guam Marine Lab and Department of Agriculture's Division of Aquatic and Wildlife Resources have joined with the private sector to undertake habitat restoration in Tumon Bay. Funded by Duty Free Shoppers (through a charity golf tournament hosted by DFS), the project will work toward resolving existing problems with storm water and nutrient loading in the bay, restoration of some corals and other resources which have been lost, and publication of a public education brochure on Bay resources and methods for protection.
- ◆ UOG Marine Lab is in the 3rd of a 4-year grant to develop environmental assessment, mitigation and restoration techniques for coral reefs. (USEPA funds).
- ◆ UOG Marine Lab hosted a one-week coral cultivation workshop. Participants included researchers and regulators from Yap, Kosrae, Palau, CNMI, American Samoa, Hawaii, Guam, and Marine Sanctuaries Program. Each individual was successful in learning the techniques for collecting corals, their sperm and eggs, fertilizing the eggs, and caring for the gametes up through larval development and the settlement process. This technique can be used to eliminate harvest of wild coral for research, pharmaceutical, medical, aquarium or ornamental uses. (Dept. of Interior funding).
- ◆ Guam Coastal Management Program is providing funding to Department of Land Management for the completion of a Territorial Seashore Reserve Plan, which is intended to control uses and activities in shallow waters (0-10 fathom), and land uses in near shore areas which may impact coral reef ecosystems.

Public Education/Outreach

Finally, Guam has undertaken seven efforts in the area of public education, awareness, and outreach, which are significant:

- ◆ Guam Coastal Management Program's monthly television show, *Man, Land and Sea* has, in the past two years, devoted nearly 30% of its program time to coral reef related subjects, which translates to more than 10 hours of prime time viewing, and as much as 83 hours of total television time on these subjects.
- ◆ UOG Marine Lab and Division of Aquatic and Wildlife Resources have produced a 23 minute coral reef video and distributed (free of charge) some 3,500 copies,

- not only on Guam, but throughout the Pacific and in Washington DC. (Kids For Coral donation, other)
- ◆ Guam Coastal Management Program is purchasing and making available to high school students, aquariums, microscopes, test kits, etc., to encourage students to undertake coral ecosystem related projects for local science fairs. (CRI Funding)
 - ◆ Guam is developing a “village to village road show” on coral reefs, so that persons responsible for reef science, management and regulatory duties, can take the message of conservation and use to the users at the reefs. (CRI funding).
 - ◆ Students are taking the lead with assistance from GovGuam agencies, in developing a coral reef educational CD-ROM for classroom use. (CRI funds)
 - ◆ UOG Marine Lab conducted a 5-week coral reef management course in 1999, aimed at researchers, regulators, conservationists, students and teachers from throughout Micronesia. (UOG funded).
 - ◆ Work has begun on development of an integrated and applied conservation biology curriculum for the regional colleges. This is intended to: interest students in pursuing higher education and careers in conservation biology; train regional educators; strengthen existing personnel within regional regulatory agencies; and, provide opportunities for world-class conservation biologists to pursue education in the region and serve as mentors.

This is only a sampling of the more important efforts Guam has undertaken in the past two years, and is in no way an all-inclusive listing. Coral reef research, regulation, management and education have become a central part of coordinated efforts between the four offices that comprise the Guam Coral Reef Coordinating Committee, with significant support and participation by the Governor and his office, by private sector interests, by Guam’s Delegate to Congress, and by members of the Guam community.

Summary of Projects for Guam's 5-Year Coral Reef Initiative Program

The following matrix lists projects which the Guam Coral Reef Initiative Coordinating Committee has identified as important for the improvement in management of Guam's coral reef ecosystem. While we have determined an initial prioritization of projects within the broad categories developed by the U.S. Coral Reef Task Force, there is no prioritization and can be no prioritization of projects *between* these categories. In addition, since funding specifically for coral reef projects through Congress is unreliable, Guam will always remain alert to other funding sources for these projects and, therefore, federal agencies should not assume that these priorities will remain constant. These projects, and their order of listing, is merely a snapshot of the needs which are identified at present time.

Public Education/Outreach

Project	year 1	year 2	year 3	year 4	year 5	Priority	Lead
Video for Airlines	\$75,000					High	DAWR
Diving Workshop for Decision-Makers	\$15,000		\$5,000		\$5,000	High	UOG
Support for Public Education	\$100,000	\$87,500				Med.	GCMP
Teacher Workshop	\$100,000	\$20,000	\$20,000	\$20,000	\$20,000	Med.	DAWR
Interpretive Signage	\$60,000	\$1,000	\$1,000	\$1,000	\$1,000	Med.	DAWR

Air & Water Quality

Project	year 1	year 2	year 3	year 4	year 5	Priority	Lead
Coral Reef Water Quality Monitoring Support	\$160,000	\$10,000	\$10,000	\$10,000	\$10,000	High	GEPA

Coastal Uses

Project	year 1	year 2	year 3	year 4	year 5	Priority	Lead
Coral Reef & Fishing Reg. Pamphlet	\$35,000		\$2,500		\$2,500	High	DAWR
Guam Reef Valuation Study	\$50,000					High	GCMP

Enforcement/Legal

Project	year 1	year 2	year 3	year 4	year 5	Priority	Lead
Development & Formatting of Legal Regime	\$5,000		\$2,500		\$2,500	High	DAWR
Environmental Education for Contractors	\$95,000	\$1,500	\$1,500	\$1,500	\$1,500	High	GEPA
Environmental Prosecutor	\$125,000	\$90,000	\$90,000			Med.	GCMP

Mapping & Assessment

Project	year 1	year 2	year 3	year 4	year 5	Priority	Lead
Reef Atlas	\$370,000					High	UOG

Ecosystem

Project	year 1	year 2	year 3	year 4	year 5	Priority	Lead
Coral Reef Biological Monitoring	\$90,000	\$20,000	\$20,000	\$20,000	\$20,000	High	GEPA/ DAWR
Reef Monitoring Outreach	\$10,000	\$2,000	\$2,000	\$2,000	\$2,000	Med.	UOG
Baseline Coastal Resource Assessment/State of Reef Report	\$370,000	\$35,000	\$30,000	\$30,000	\$30,000	Med.	UOG

Totals:

1st year: \$1,650,000

2nd year:\$ 267,000

3rd year:\$ 184,500

4th year: \$ 84,500

5th year: \$ 94,500

Grant Total for Guam Projects identified above: \$ 2,280,500

A. Project: **Public Education Video for Airlines**
Lead Agency: Division of Aquatic and Wildlife Resources
Duration: One year
USCRTF Area of Effort: Public Education/Outreach

Project Description

To develop an entertaining 30-minute video on the general information that the public and visitors need to ensure healthy coral reefs. This shall include the basics on coral reef ecology, how to enjoy the reefs without damaging them, primary safety concerns, and the local laws on reefs and reef resources. This video will be available in English, Chamorro, Filipino, Japanese, Taiwanese and Korean.

Benefits of Project

If this video can be played on all in-bound commercial carriers (50 passengers or more), the million plus visitors and residents arriving will be more aware of ways to prevent unnecessary damage to coral reefs, and will better be able to enjoy the coral reef experience. This will raise awareness, protect existing resources and reduce enforcement activities.

Budget Estimate: \$75,000

B. Project:	Hands On Workshop for Decision-Makers
Lead Agency:	University of Guam Marine Laboratory
Duration:	Five Years
Area of Effort:	Public Education/Outreach

Project Description

The University of Guam, in coordination with the other, pertinent Government of Guam agencies, proposes to develop a three part workshop to provide the on-site knowledge for decision makers. The workshop would begin with a half-day session to acquaint the policy and decision-makers with the rudimentary knowledge necessary to understand the reef environment and its issues. The second and third days would include a introductory class on SCUBA, and dives on two sites, one pristine and the other an impacted reef. Both of these dives would be followed immediately by debriefing sessions to set the images and knowledge of what they've experienced in the participants minds.

Workshops could be held to accommodate the schedules of the policy and decision makers as well as to respond to weather conditions, and the debriefings could be held over an after-dive lunch. Participants should include legislators and staff, the Governor and staff, certain department directors, members of the Guam Seashore Protection Commission, and Guam EPA Board, and could also include leaders in the media.

Benefits of Project

The most important element in developing successful management regimes for coral reefs is an understanding of the resources and the issues by the political body, whether elected or appointed officials. Because the reefs are not readily accessible, it is easy to concentrate on more immediate resource or economic issues, particularly those which can be experienced. This project will make the coral reef ecosystem a reality for decision-makers and information providers, thus increasing support for science and management needs.

Budget Estimate:	\$15,000 first year
	\$ 5,000 in third and fifth years

C. Project:	Support for Public Education
Lead Agency:	Guam Coastal Management Program
Duration:	Two years
Area of Effort:	Public Education/Outreach

Project Description

The long term protection, management and understanding of Guam’s Coral Reef ecosystem is dependent upon developing a “local” pool of trained and educated people for management positions. Public middle and high schools do not have the luxury of fully equipping science labs in order to give opportunities for students to gain a more than passing knowledge of the marine environment.

In order to develop both the interest and the knowledge, the four public high schools need to be equipped with marine related test and analysis equipment for the high school science class rooms, including water and air pollution test kits, microscopes, aquarium equipment, etc.

In the second year of this project, beginning level equipment will be furnished to Guam’s seven middle schools to better prepare students as they enter high school and to increase the interest in marine sciences at an earlier age.

Benefits of Project

This would allow a better “general” education effort, as well as give the support for further individual efforts in students that wish to do more. In the long run, this effort could better prepare students for entry level positions in the government agencies with coral reef responsibilities.

Budget Estimate:	\$100,000 (\$25,000 per high school) first year
	\$ 87,500 (\$12,500 per middle school) second year

D. Project:	Teacher Workshop
Lead Agency:	Division of Aquatic and Wildlife Resources
Duration:	Five Years
Area of Effort:	Public Education/Outreach

Project Description

To develop and implement a three week continuing education teacher workshop on how to teach coral reef science in primary and secondary schools. This will require the development of suitable curriculum, development of instruction materials and identification of suitable instructors. Additionally, collaboration with the University of Guam and the Department of Education will be required to establish a continuing education program.

Benefits of Project

Guam’s school system has grown to a point that resource managers can not visit classrooms frequently enough to provide the long-term education needed on coral reef systems. A teacher training program will broaden the educational exposure tremendously and ultimately increase student education. This program will provide instruction materials that will increase the effectiveness of lessons.

Budget Estimate:	\$100,000 for first year
	\$ 20,000 for each year thereafter

E. Project: **Public Education Interpretive Signs**
Lead Agency: Division of Aquatic and Wildlife Resources
Duration: One Year
Area of Effort: Public Education/Outreach

Project Description

There is an increasing need to ensure that the community and visitors have an appreciation for Guam’s coastal resources and an understanding of how to contribute to preserving and protecting these magnificent ecosystems. Guam specific public education signs will be strategically placed to provide information about the coral reefs in each respective area. Information provided will include guides to coral reef fauna in the area, recommended actions to protect resources, and safety considerations.

Benefits of Project

Guam’s coral reefs are subjected to many impacts on a daily basis. The million plus visitors yearly plus public use of these resources represent a tremendous potential negative impact. Education can minimize this impact tremendously while also raising awareness and appreciation for the resources. This facilitates lesser needs for enforcement actions, and increases the community connection with their environment.

Budget Estimate: \$60,000 first year
\$ 1,000 each following year for maintenance.

F. Project: **Coral Reef Water Quality Monitoring Support**

Lead Agency: Guam Environmental Protection Agency

Duration: One year

Area of Effort: Air and Water Quality

Project Description

The successful continuation of coastal water quality monitoring, the planned biological monitoring of reefs and the surveying of damages to the reef environment from ship groundings, pollutant spills and other accidents and natural disasters, all are hampered by the need for an appropriate boat at Guam EPA. The small, aging boat presently used must be replaced soon. In order to safely maneuver through the exposed waters and frequent large waves outside the reefs, a 24 foot twin engine dive boat with trailer, a 4WD vehicle to tow it, and a secure garage for boat and monitoring equipment storage are needed. Operations and maintenance will be covered by GEPA budgets.

Benefits of Project

This boat will allow Guam's well-established monitoring of chemical, physical and microbiological coastal water quality by GEPA to continue. This monitoring will have to be suspended when the currently used boat fails. The projects will also support the proposed biological monitoring of coral reef areas and will permit GEPA and other agency response personnel to safely and rapidly respond to marine accidents and pollution incidents impacting coral reefs anywhere in Guam's waters.

Budget Estimate: \$ 160,000

G. Project: **Coral Reef and Fishing Regulation Pamphlet**

Lead Agency: Division of Aquatic and Wildlife Resources

Duration: One year, with reprintings every two years.

Area of Effort: Coastal Uses

Project Description

To develop a pamphlet for public distribution which describes Guam’s existing laws and regulations regarding the harvesting or protection of Guam’s corals, fishes, or other reef resources.

Benefits of Project

Guam has not produced a public pamphlet on coral or fishing laws in 15 years, during which a number of major changes have been made. In addition, five new Marine Preserves have been established. This pamphlet would raise public awareness of the laws and the reasons for the laws in an easily understood and distributed format.

Budget Estimate: \$35,000 for initial printing
\$ 2,500 in the 3rd and 5th years for reprinting.

H. Project:	Guam Reef Valuation
Lead Agency:	Guam Coastal Management Program
Duration:	One Year
Area of Effort:	Coastal Uses

Project Description

Guam’s coral reef contributions to the economy are easily measured in the hundreds of millions of dollars. This study will evaluate the contributions of the reef from economic activities which are directly related to the presence of the reef, such as diving, marine related retail sales, dolphin watching, jet skis, dinner cruises, etc. To reach the widest audience most effectively, both a printed study and a companion educational video are necessary.

Benefits of Project

The contribution of coral reefs to the economy is not understood because there has only been generalized efforts to determine values, based on individual interests or industries. A more thorough analysis would help the general population understand the need for protections and management measures, which they are asked to support. A more thorough analysis would help policy and decision makers understand the need for both legislative and budgetary support in management, and a more thorough understanding would help private sector businesses understand the opportunities and the need for protective action on their part.

Budget Estimate: \$50,000 (\$35,000 for printing - \$15,000 for video production).

I. Project:	Development and Formatting of Legal Regime
Lead Agency:	Division of Aquatic and Wildlife Resources
Duration:	Five Years
Area of Effort:	Enforcement

Project Description

The laws, and rules and regulations needed for better management of human activities which impact coral reef ecosystems, are developed in several agencies of the government, but because of the lack of trained personnel, are not finalized in form, or developed to be consistent with those developed in other agencies.

It is necessary for the efforts of the various agencies to be compiled, and put into a format which would allow for political approval (bill form, rules, or executive order form). This would also allow for inter-agency review for discovery of gaps or over-lap. For Guam, these efforts include laws regulating harvest of corals and live rock, regulating net abandonment and spear fishing, resource collection, and some on-land activities such as rules for regulating the timing and scale of land clearing based on rainfall expectance.

This task could be completed through coordination by a paralegal, and the product would be a necessary tool for the Guam Coral Reef Policy Advisory Committee as well as for the agencies of responsibility.

Benefits of Project

Compilation and formatting of laws and rules for action by the Governor or Legislature would result in clearer mandates, and in better protection of coral reef resources. With increased attention on reef systems and their values over the past several years, the time is ripe for increased legal support for management policy.

Budget Estimate: \$5,000 for the first year, with \$2,500 per year in the third and fifth years for developing and formatting additional regulation as coral protection regimes become more mature.

J. Project: Environmental Education for Contractors

Lead Agency: Guam Environmental Protection Agency
Duration: Continuous
Area of Effort: Enforcement

Project Description

While contractors are required to take an examination to demonstrate their knowledge of contract regulations, there is no similar requirement for them to demonstrate their knowledge of the environment on which their work may impact.

Guam proposes to develop a simple certification program which would provide contractors with a basic text on Guam’s environment and the impacts of development, which contractors could read on their own, and a test, passage of which would be a requirement for licensing. This effort is not intended to be onerous, but to better acquaint contractors with the reasons behind conditions placed on their skills, such as the need for erosion control and clearing and grading plans, or landscaping.

Benefits of Project

Through a better knowledge of the potential impacts of their actions, contractors can reduce negative impacts on reefs through implementation of better work habits and best management practices. The biggest problem created by contractors, erosion which leads to sedimentation on reefs, could be significantly reduced by education.

Budget Estimate: \$95,000 in first year for development of workbook and tests.
\$ 1,500 in each succeeding year for reprinting of test forms.

K. Project: Environmental Prosecutor

Lead Agency: Guam Coastal Management Program
Duration: One year, with annual support for two years, after which time the continuation will be the responsibility of the Government of Guam
Area of Effort: Enforcement

Project Description

The reasons environmental violations are either not prosecuted, or prosecution fails, is that the environmental laws are complex and based on concepts which are not as easily understood as other more generalized community laws. Guam has no person trained as an environmental prosecutor in the Attorney General's Office, and therefore must rely on efforts by attorneys with skills in unrelated areas. Unfortunately, over the past fifteen years Guam has experienced the two economic conditions which lead to greater problems in environmental protection, boom and bust economies.

This project would fund an attorney with environmental law training and experience for three years, after which incorporation into the local budget process could be more feasible.

Benefits of Project

This would increase Guam's success in prosecution of environmental violations, thus increasing the effectiveness of laws and reducing violations. It would also give support for Guam's enforcement officers, who are often frustrated by the lack of Attorney General attention, or by prosecutors who do not understand the reasoning behind the laws, and are, therefore, incapable of rendering the best possible support.

Budget Estimate: \$125,000 for the first year. \$90,000 per year for two years thereafter.

L. Project: **Guam Reef Atlas**

Lead Agency: University of Guam Marine Laboratory
Duration: One Year
Area of Effort: Mapping (resource assessment)

Project Description

To develop a color-coded coastal reef atlas for Guam in printed and compact disc formats (suitable for both MacIntosh and PC environments) that clearly depicts coral reef morphology and valuable resource areas. Species of special importance, user areas, and environmental concerns will be marked appropriately. Format will include a grid system for easy area calculation and total reef area. The project will require 100 printed copies and 250 compact discs.

Benefits of Project

Resource managers, commercial interests and terrestrial developers will be given a quick reference guide that can be utilized in evaluating potential environmental impacts of actions and afford better guidance in policy and decision making.

Budget Estimate: \$370,000

M. Project:	Establishment of Coral Reef Biological Monitoring
Lead Agency:	Guam EPA/DAWR
Duration:	One year, with follow up for four years
Area of Effort:	Ecosystem Conservation

Project Description

Biological monitoring of coral reefs is needed to evaluate and record changes in coral reef health and to complement GEPA’s physical, chemical and microbiological monitoring program in Guam’s coastal waters. The DAWR’s biologists and GEPA’s biologists have met with UOG coral biologists to coordinate biological monitoring of certain coral reef areas. A practical, efficient common approach for the two regulatory agencies to use in monitoring health of corals and coral reef organisms will be designed and started up, including a GIS database for storage and analysis of data. Coordination of use among GEPA, DAWR, UOG Mare lab, USMPS and others as well as incorporation of PACICOMP, Reef Base, GCRMN and US CRTF activities will be established. A monitoring specialist will be contracted at GEPA. Monitoring staff and UOG marine scientists will select sites and establish long term transects, protocols and data recording systems during the first 12 months. The permanent DAWR staff and UOG biologists will train GEPA staff to carry out continuous regular data collection and analysis. Two computers and GIS programs, GPS, and equipment and materials for transects will be purchased. Marine Lab scientists will donate use of their underwater video equipment and will advise on video transect establishment.

Benefits of Project

Unpredicted problems on coral reefs such as damages from diseases, recreational uses, non-point source and point source pollutants, invasion of alien species, coral bleaching, etc., will be noted. Also, changes in coral coverage, recruitment, diversity and other measures of reef health will be quantified and documented. Coral community health will be compared to water quality data and human resource uses. This monitoring will provide a comprehensive and scientific basis to direct management actions to protect Guam’s reefs.

Budget Estimate:	\$90,000 for the first year \$20,000 each year for the succeeding four years.
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N. Project: Reef Monitoring Outreach

Lead Agency: University of Guam Marine Laboratory
Duration: Continuous
Area of Effort: Ecosystem (monitoring)

Project Description

Guam has initiated an annual *reef check up*, which involves the community in assessing the health of Guam's reefs. It would be more useful, however, if there was an organized system for collecting reef information from divers and snorkelers on a regular basis. To do this, two things are necessary.

First, there is a need for the creation and printing of waterproofed resource identification cards which could be carried in the water. These would include, at a minimum, cards identifying corals, fishes, sea grasses, and other species which are territorial and therefore can indicate an absence or presence of problems on the reefs.

In addition to the identification cards, there is a need for waterproofed checklists, which can accompany the divers and snorkelers for on-site information recording. Both the I.D. cards and checklists could be distributed from dive shops as well as from government agencies.

Second; there is a need for centralization and maintenance of data. This could be accomplished through a dedicated computer and weekly inputting of information. Monthly reports based on analysis of information provided during that period would help both the science side and management side in early identification of trends and in developing management responses.

Benefits of Project

This would provide a continuous source of information and could alert managers and scientists to problems or recoveries at the earliest stages. It would also involve the public in the management and monitoring process, thereby creating a large sense of "ownership" of the issue at the user level.

Budget Estimate: \$10,000 for the first year
\$2,000 per year for years 2-5 for reprinting materials.

O. Project:	Baseline Coastal Resource Assessment & Guam State of the Reef Report
Lead Agency:	University of Guam Marine Laboratory
Duration:	Five Years
Area of Effort:	Ecosystem conservation

Project Description

In order to better understand and convince decision-makers and the public of the actions necessary to preserve, protect and better use the coral reefs around Guam, it is necessary to determine the current status of corals, including coral cover and predominant species.

Guam will re-conduct a completed mid 1970s project “Survey and Species Inventory of Representative Pristine Marine Communities on Guam” to perform comparative status of primary resources. This study encompasses surveys of benthic algae, corals, macroinvertebrates and fishes at 12 sites. Each of these sites requires a variety of reef zones and a multitude of transects to adequately assess the resources present. Completion of the project will require statistical comparison of new information with historical information to determine changes and expected explanations.

The information will then be compiled and developed into a document which can be easily accessible by policy makers, managers, and the general public. While the information should be updated on a consistent basis, the State of the Reef Report, accomplished through this task, must be updated every two to three years, in order to demonstrate anthropogenic caused changes.

Benefits of Project

This project will enable scientists, managers and decision-makers to clearly assess the impacts of “boom” development over a 25 year period, and to suggest necessary changes to resource management, to land use planning and development conditions. It will also allow the public to better understand their impacts on their community and its resources.

Budget Estimate:	\$370,000 first year for the studies.
	\$ 35,000 in the second year for the State of the Reef Report
	\$ 30,000 in the third through fifth years for updating and printing