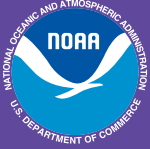




GUAM'S

CORAL REEF MANAGEMENT PRIORITIES



GUAM'S

CORAL REEF MANAGEMENT PRIORITIES

The Territory of Guam and NOAA Coral Reef Conservation Program. 2010. *Guam's Coral Reef Management Priorities*. Silver Spring, MD: NOAA.

The NOAA Coral Reef Conservation Program would like to thank all those involved in the process to identify and publish the coral reef management priorities for Guam. The commitment, time and effort invested in this process is greatly appreciated. These priorities will play an important role in defining NOAA's partnership with the jurisdiction to work towards coral reef conservation. Special thanks to Zhe Liu for graphic design and Lauren Chhay for photo support.

Cover Photo Credit: Dave Burdick

CONTENTS

- 2 INTRODUCTION
- 4 SECTION ONE: SCOPE, DEVELOPMENT AND PRIORITIZATION PROCESS
- 7 SECTION TWO: STRATEGIC CORAL REEF MANAGEMENT PRIORITIES
- 19 SECTION THREE: LINKAGES TO NOAA'S NATIONAL GOALS AND OBJECTIVES
- 24 APPENDIX ONE: PRIORITY SETTING PROCESS PARTICIPANTS
- 25 APPENDIX TWO: CONTEXT
- 27 APPENDIX THREE: PRELIMINARY IDENTIFICATION OF CAPACITY GAPS
- 29 BIBLIOGRAPHY OF CORAL REEF MANAGEMENT AND CONSERVATION DOCUMENTS FOR GUAM BY AGENCY

INTRODUCTION

The purpose of this Priority Setting document is to articulate a set of strategic coral reef management priorities developed in consensus by the coral reef managers in Guam. NOAA will use this document in conjunction with its *NOAA Coral Reef Conservation Program Goals & Objectives 2010-2015* (available at www.coralreef.noaa.gov) to direct its investment in activities in each jurisdiction through grants, cooperative agreements and internal funding. NOAA will also make the document available to other potential funders (non-governmental organizations [NGOs], federal partners, etc.) and encourage leveraging and new or expanded partnerships to build common coral reef conservation goals.

The work presented here is being facilitated by the NOAA Coral Reef Conservation Program (NOAA CRCP) as part of an ongoing effort to develop place-based, local coral reef management priorities in each of the seven U.S. state and territorial coral reef jurisdictions (American Samoa, Commonwealth of the Northern Mariana Islands, Florida, Hawai'i, Guam, Puerto Rico and the U.S. Virgin Islands) and conduct capacity assessments to identify the support needed to accomplish those priorities. The first step in this effort has been to work with the core group of coral reef managers (local, place-based) in each jurisdiction to articulate a set of strategic coral reef management priorities. The second, and next, step will be to complete a capacity needs assessment that helps each state and territory realize these priorities.

This priority setting process stems from an external review of NOAA CRCP conducted in 2007 to independently assess how effectively the program has met its goals. The review included recommendations for future improvements. In response to the review, NOAA CRCP developed a "Roadmap for the Future," laying out new principles and priorities. A key part of this new Roadmap includes developing management priorities for each and all of the coral reef jurisdictions and conducting capacity assessments to achieve these priorities. NOAA CRCP is providing support to the jurisdictions to coordinate with the broader management community in each place to determine these strategic goals and objectives for each state and territory. Priority setting initiatives began in 2009 with implementation phased in two to three jurisdictions per year. The capacity assessments will follow, beginning in late 2010.

This Priority Setting document is divided into the following sections:

1

Scope, Development and Prioritization Process: This section details the process by which the priority goals and objectives were reached, including the preparation for the workshop, work done at the workshop and the post-workshop refining process.

2

Strategic Coral Reef Management Priorities: This section presents the entire framework of goals and objectives developed and agreed upon by the core group during this process. The Priority Goals and Objectives are highlighted in this section. These are the top priorities for management action as agreed upon by the core managers group.

3

Linkages to NOAA's National Goals and Objectives: This section describes how the local jurisdiction management priorities align with NOAA CRCP's priorities and direction.

SECTION ONE: SCOPE, DEVELOPMENT AND PRIORITIZATION PROCESS

This document captures the final set of priorities agreed upon by the core managers group at the priority setting workshop. The core managers group is defined as the “place-based” coral reef managers who have the direct responsibility for managing the coral reef ecosystem in a particular geographic location. The managers as well as those who were asked to participate in the initial analysis and review this document are listed in Appendix One.

In preparation for the workshop, previously identified goals and objectives were taken from current management documents and presented in the Situation Analysis. The Situation Analysis is a preparatory document that summarizes: coral reef threats, condition and trends; key management issues; and key agencies’ management goals ahead of meetings and interviews. Its primary purpose is to compile and consolidate available management documents from various management bodies and geographic localities. Appendix Two presents a summary of the Situation Analysis’ findings.

This Situation Analysis was augmented by a series of interviews that captured managers’ working perceptions of management goals as they are stated in management documents.

Taken together, along with the current version of Guam’s Local Action Strategy (LAS) document, this information formed the basis for the workshop discussions by offering an initial set of goal areas to consider.

During the interviews with the core coral reef managers and management advisors in Guam, facilitators identified challenges to and current deficiencies in achieving stated goals and objectives, noting specific capacity gaps that likely will need attention. This information will serve as the starting point for the capacity assessment, to be completed in the following year. It is summarized in Appendix Three.

Workshop participants worked from the Situation Analysis, interviews and current version of Guam’s LAS document to create a comprehensive set of goals and objectives for five priority areas. These were agreed upon by the core group as areas that were most important to the successful management and conservation of the Guam’s coral reefs. They are:

- Impacts of Land-Based Sources of Pollution
- Fisheries and Impacts of Fishing



During the second day of the priority setting workshop, core managers met in small groups to identify specific actions to implement the agreed upon priority goals. Photo Credit: Kathy Chaston, NOAA CRCP

- Impacts of Military Build-Up
- Impacts of Recreational Use
- Impacts of Climate Change

These five priority areas are encompassed by two larger overarching goals that guide coral reef management efforts on Guam. The first is the Micronesia Challenge (www.micronesiachallenge.org). This regional commitment to effectively conserve at least 30 percent of the near-shore marine resources and 20 percent of the terrestrial resources across Micronesia by 2020, provides a framework to guide resource management and conservation in Guam. The government of Guam and its coral reef managers are committed to achieving the goals of the Challenge in Guam. Closely related to the Micronesia Challenge is the need to increase the resiliency of Guam's reefs and coastal communities in the face of climate change, rapid population increase and ocean acidification. The theme of reef

resiliency is an important component of reef management on Guam and serves as a connection between all five priority areas.

FOR THE PURPOSE OF THIS EXERCISE, THE FOLLOWING DEFINITIONS WERE USED:

Goals are defined as the highest-level result the jurisdiction seeks to achieve (e.g., stable, sustainable coral reef ecosystems) in the next five to seven years.

Objectives are defined as the environmental, social and institutional outcomes the jurisdiction must achieve to reach the end goal. Objectives are generally actionable within a three- to five-year time frame.

Actions are projects, procedures or techniques intended to implement an objective.

On the first day of the workshop, small groups presented their recommendations to all participants for discussion and evaluation. Each participant then identified his or her top eight priority objectives. During the second day of the workshop, participants identified specific management actions intended to implement those objectives they identified as having the highest priority.

This document presents both the comprehensive set of goals and objectives as developed by the core group as well as the priorities. **The priorities are those goals and objectives the core group identified through the above process as those that require immediate attention over the short term.** These Priority Goals and Objectives will guide NOAA CRCP funding allocations for management activities. The NOAA CRCP understands and respects the flexibility required by coral reef managers in implementing complex conservation and management programs. Should the partners seek funding for projects related to off-priority issues (either in the comprehensive framework of goals and objectives in this document or a new emerging issue not reflected in this document) it will need to be fully explained why the requested funding is most appropriate for the off-priority work versus efforts to address the priority Goals and Objectives identified through this process.

The Priority Goals and Objectives are highlighted in **purple/bold** and *purple/italic* font, respectively.

THE TOP FIVE PRIORITY GOALS IDENTIFIED AND RANKED BY THE WORKSHOP PARTICIPANTS ARE:

1. Improve the condition of coral reef ecosystems by reducing the amount of sediment and pollution from development, fires, recreational users and agriculture in Guam's watersheds.
2. Protect Guam's coral reef fisheries resources for current and future generations through effective management that conserves aquatic and marine ecosystems and ensures the condition, welfare and integrity of marine ecosystems.
3. Mitigate the existing and anticipated pressures of rapid development on Guam's coral reefs by implementing the Guam Natural Resources Strategy with a focus on Apra Harbor through 2012.
4. Improve the condition of Guam's coral reef ecosystems by reducing negative recreational impacts.
5. Improve management of Guam's coral reef ecosystems to enhance resilience and recovery processes.

Within the context of these goals, several objectives call out specific priority locations for activities. Objectives highlighted Piti-Asan Watershed, Manuell-Geuss Watershed, and one other watershed (to be determined), as priorities for working toward the reduction of land-based sources of pollution. Additional objectives related to protection of Guam's fishery resources prioritize activities in the existing marine preserves and objectives related to mitigation of the military build-up focus on Apra Harbor.

SECTION TWO: STRATEGIC CORAL REEF MANAGEMENT PRIORITIES

This section presents the entire framework of goals and objectives developed and agreed upon by the core group during this process. In this section, the Priority Goals and Objectives are highlighted in **purple/ bold** and *purple/italic* font, respectively. These are the top priorities for management action as agreed upon by the core managers group. These Priority Goals and Objectives will guide funding allocations for management activities.

Not all goals or need areas identified through this initiative—either through the Situation Analysis or the workshop—rose to the level of being a priority for all managers or are encompassed in the needs of the entire jurisdiction. Many of these issues are of significant importance to specific geographic areas, but may not be relevant to the entire territory of Guam.

IMPACTS OF LAND-BASED SOURCES OF POLLUTION

GOAL 1: Improve the condition of coral reef ecosystems by reducing the amount of sediment and pollution from development, fires, recreational users and agriculture in Guam’s watersheds.

Objectives:

- 1.1 *Implement Conservation Action Plans (CAPs) for priority watersheds by 2015 as a model approach to site-based planning and management. (The Piti CAP includes activities to manage land-based sources of pollution and recreational impacts to reefs, increase awareness of the impacts to reefs and fill gaps in knowledge through management-related research.)*

Key Actions To Achieve this Objective:

- a. Develop a prioritized action plan for implementation using CAP tables by 2010 (developed using the Miradi tool).
- b. Implement action plan starting with projects designated as high priority by 2011.



Left Image: A reef community near Ana'e Island, on the southwest coast of Guam, that is heavily impacted by regular sedimentation events. Photo Credit: Dave Burdick Right Image: Algae growth shown overgrowing coral may be associated with nutrient-rich runoff in Tumon Bay. Photo Credit: Kathy Chaston, NOAA CRCP

- c. Provide effective enforcement against illegal activities.
- d. Measure effectiveness of actions on annual basis with Coral Reef Working Group (CRWG) and use this annual assessment to revisit CAP annually and revise as necessary.
- e. Identify one additional priority watershed, in addition to Manell Geus, for CAP that would be completed in the next seven years. Incorporate experience gained through the implementation of the Piti CAP and action plan by 2013.
- f. Partner with other Guam and federal agencies in additional priority watersheds to develop management plans to minimize sediment runoff.

1.2 Encourage implementation of revised Guam Soil Erosion and Sediment Control and Stormwater Rules and Regulations, Guam Seashore Reserve Plan, and updated zoning and building codes pending formal approval by Guam administration.

Key Actions To Achieve this Objective:

- a. Encourage expedited review and approval of the Guam Soil Erosion and Sediment Control and Stormwater Rules and Regulations (Revisions may be delayed by Executive Order) starting in 2010.
- b. Complete final version of CNMI and Guam Stormwater Management Manual and the Seashore Reserve Plan by 2010 (incorporate the Department of Public Works Stormwater Manual into the Guam Stormwater Management Criteria).
- c. Update zoning and building codes upon completion and approval of the CNMI and Guam Stormwater Management Criteria and Seashore Reserve Plan by 2011 (assuming approval of Guam Erosion Control and Stormwater Management Regulations).
- d. Design an enforcement strategy for the CNMI and Guam Stormwater Management Criteria and Seashore Reserve Plan by 2012.



Scoping conducted to identify stormwater retrofit opportunities; stormwater management is a tool in managing runoff.
 Photo Credit: Kathy Chaston, NOAA CRCP

- e. Design a strategy for assessing the effectiveness of the implementation of the Stormwater Management Criteria and Seashore Reserve Plan by 2013.

1.3 Educate target stakeholder groups about the sedimentation issues associated with specific watershed uses and activities.

Key Actions To Achieve this Objective:

- a. Define target stakeholder groups.
- b. Target education and outreach efforts in priority watersheds identified in Objective 1.1.
- c. Engage community before developing and implementing specific regulations by 2010.
- d. Engage social marketing expert to develop targeted outreach campaign for these watersheds by 2011. Expert should consider RARE-type campaign in addressing arson issues. (RARE is

an organization whose mission is to conserve imperiled species and ecosystems by inspiring people to care about and protect nature.) The expert should also incorporate findings from appropriate studies into outreach messages.

- e. Partner with NGOs or similar organizations to implement targeted outreach campaigns once developed and approved by CRWG by 2012.
- f. Create public information officer position. This position is needed to promote a range of coastal management and coral management initiatives, including this outreach campaign by 2010.

FISHERIES AND IMPACTS OF FISHING

GOAL 2: Protect Guam’s coral reef fisheries resources for current and future generations through effective management that conserves aquatic and marine ecosystems and ensures the condition, welfare and integrity of marine ecosystems.

Objectives:

2.1 Increase management-related monitoring and research of coral reef fisheries to determine the status of target reef fishery stocks, levels of effort that are sustainable, habitat impacts and management effectiveness.

Key Actions To Achieve this Objective:

- a. Synthesize existing fisheries data from monitoring and research projects, including but not limited to the Division of Aquatic and Wildlife Resources (DAWR) creel surveys, to establish a baseline dataset for Guam that describes current resource status. This dataset will be used to support and improve enforcement and management actions. Collect this information in a common and accessible database that allows resource managers to store and share data by 2013.
- b. Develop uniform monitoring protocols so trends in the resource can be consistently measured between sites and over time by 2011. Train agency staff and partners in uniform monitoring techniques. Provide resources to analyze data and report results to reef management community, fishermen and legislature.
- c. Identify priority-monitoring sites, including key fisheries spawning aggregations and nursery areas. Conduct monitoring inside and outside of marine preserves. Provide the necessary resources to hire and train marine protected area (MPA) guides to assist with site-specific monitoring using uniform protocols by 2012.
- d. Conduct research aimed at understanding connectivity across the archipelago, between existing marine preserves on Guam and between preserves and non-preserve areas. Research activities may involve adult and larval fish tagging/tracking, meso- and fine-scale ocean current characterization and related research endeavors.
- e. Develop connectivity models at regional, local and site-specific scales based on data obtained through targeted research activities.
- f. Implement major objectives in the National Marine Fisheries Service (NMFS) Habitat Assessment Improvement Plan, which are relevant to Guam’s coral reefs, such as conduct improved habitat assessments to: refine/narrow definitions of Essential Fish Habitat (EFH) and Habitat of Particular Concern; prioritize habitat protection, restoration, and mitigation; improve accuracy of EFH consultations regarding proposed (fishing or non-fishing) impacts; improve quantification of habitat value/loss and mitigation recommendations; and, improve integrated ecosystem assessments (ecosystem-based fishery management).



Marine preserves like Piti Bomb Holes Marine Preserve are proven fishery management tools that increase the size of reef fish within and surrounding their borders. Photo Credit: Dave Burdick

2.2 Create community management programs that increase public knowledge of, support for, and participation in marine preserves and science-based management.

Key Actions To Achieve this Objective:

- a. Initiate Limits of Acceptable Change analysis in Piti and Tumon (started in September 2009, will feed into community watch).
- b. Starting with existing MPA and priority watersheds, identify potential communities to pilot a community management program by 2012.
- c. Seek additional staff to facilitate development of community management programs, including a fisheries extension officer, public information officer and outreach specialist, by 2012.
- d. Work with community to develop and implement management programs, such as the community watch program, by 2012.

2.3 Increase socioeconomic monitoring and research to better understand the interactions of users with the resources.

Key actions To Achieve this Objective:

- a. Assess fishing techniques to determine the impacts, number of users and cultural importance of the methods.
- b. Increase creel survey analysis to assess the socioeconomic characteristics of fishermen and their effort and success at recreational and commercial fishing.

2.4 Support, enhance and improve the regulations of resource use activities that impair fisheries or fish habitat.

Key Actions To Achieve this Objective:

- a. Increase enforcement capacity of regulatory agencies, including augmenting salaries of enforcement personnel and providing needed equipment and supplies, by 2011.



Healthy coral reefs provide important habitat for reef fish. Photo Credit: Dave Burdick

- b. Establish a Conservation Officer Reserve Program by 2011. The framework for the program was recently established under Guam Public Law 28–30 and will allow DAWR to offer a stipend to part-time “reservists” and increase DAWR enforcement capacity. The program has not yet been implemented.
- c. Examine fish life history data to consider species-specific regulations.

- 2.5 Improve educational programs to enhance understanding of fisheries status and management needs.
- 2.6 Develop partnerships with federal resource managers to facilitate effective management of aquatic resources in federally controlled areas (e.g., National Park Service).

Key Actions to Achieve this Objective :

- a. Meet with federal resource managers to discuss opportunities for collaboration (e.g., Guam government

staff could assist with biological monitoring).

- b. When appropriate, develop a memorandum of agreement among management agencies to identify purpose, respective roles and authorities.

- 2.7 Develop management strategies to address indigenous fishing rights as ordered by Public Law 29–127.

Key Actions To Achieve this Objective:

- a. Review data related to cultural and historical fishing methods, areas and socioeconomics.
- b. Work with fishing community and other stakeholder groups to develop viable alternatives to address Public Law 29–127.
- c. Develop and implement regulations under Public Law 29–127.
- d. Monitor socioeconomic, cultural and biological impacts of regulations.

IMPACTS OF MILITARY BUILD-UP

GOAL 3: Mitigate the existing and anticipated pressures of rapid development on Guam's coral reefs by implementing the Guam Natural Resources Strategy with a focus on Apra Harbor through 2012.

Objectives:

3.1 *Adopt and implement Compensatory Mitigation Policy by summer 2010. The policy shall address all aspects of an effective multi-agency approach to mitigation and will be compatible with existing federal policies while addressing Guam's unique resource-management challenges.*

Key Actions To Achieve this Objective:

- a. Ensure that each relevant Guam permit agency has designed a standard review process for ensuring that permit applications comply with the Compensatory Mitigation Policy by July 2010.
 - b. Ensure that permit applicants submit mitigation plans that comply with the Compensatory Mitigation Policy by November 2010.
 - c. Ensure that each Guam permit agency has a standard process for ensuring effective technical review of the mitigation plans submitted by March 2011.
- 3.2 Develop and implement comprehensive monitoring of water quality and coral reef ecosystem parameters within watersheds targeted for watershed restoration, with a focus on evaluating the effectiveness of watershed restoration efforts implemented as compensatory mitigation for impacts to coral reef resources.

3.3 Implement the goals and conservation actions listed in Chapters 6–17 of the Guam Natural Resources Strategy. The content of each chapter is described below.

- Chapter 6, *Species of Greatest Conservation Need*, addresses biodiversity in the context of species of greatest conservation need, including terrestrial and inland aquatic resources, marine mammal protection and coral reef protection, as outlined by the Department of Agriculture.
- Chapter 7, *Invasive Species*, discusses the management context, community interest and goals and conservation actions surrounding invasive species management.
- Chapter 8, *Marine Preserves*, discusses the management context, community interest and goals and conservation actions surrounding marine preserve management.
- Chapter 9, *Impact Mitigation*, outlines the management context, community interest and goals and objectives surrounding impact mitigation.
- Chapter 10, *Monitoring Protocols*, provides the management context, community interest and goals and objectives to implement monitoring protocols.
- Chapter 11, *Agency Capacity*, provides the management context, community interest and goals and actions to address agency capacity issues.
- Chapter 12, *Historic Preservation*, provides the management context, community interest and goals and preservation actions surrounding historic preservation management.
- Chapter 13, *Wetlands and Watersheds*, provides the management context, community interest and goals and



Development activities are increasing in anticipation of the military build-up in Guam. It is important that proper mitigation planning is set in place when impacts to coral ecosystems can not be avoided. Photo Credit: Kathy Chaston, NOAA CRCP

conservation actions surrounding wetlands and watershed management.

- Chapter 14, *Legal Framework*, describes legal issues and concerns surrounding natural resource management, policy issues and agency coordination, and presents goals and action plans to address the legal framework challenges.
- Chapter 15, *Department of Defense*, summarizes integrated and cultural resource management plans developed by the U.S. Navy and U.S. Air Force.
- Chapter 16, *Guam National Wildlife Refuge (GNWR)*, describes the creation and management of the GNWR and the Comprehensive Conservation Plan being developed for the refuge.
- Chapter 17, *Financing Natural Resource Management*, presents strategies for funding natural resource management activities.

IMPACTS OF RECREATIONAL USE

GOAL 4: Improve the condition of Guam’s coral reef ecosystems by reducing negative recreational impacts.

Objectives:

- 4.1 *Adopt, implement and enforce existing recreational plans and programs including the Seashore Reserve, Recreation Water Use Management Plan, CAPs and the Marine Preserve Eco-Permit and enact new regulations for recreational use by 2015.*

Key Actions To Achieve this Objective

- a. Review existing plans and programs and synthesize existing and proposed rules and regulations and identify critical gaps by 2011.
- b. Based on these gaps, work with attorney to draft additional rules and regulations for recreational use of reefs by 2013. (Examples include



A snorkeling guide observes his clients while standing atop coral colonies in the Tumon Bay Marine Preserve, causing damage to the delicate corals. Education about recreational impacts and enactment and enforcement of regulations for recreational use should reduce negative impacts from recreational use. Photo Credit: Dave Burdick

- zoning to define areas for specific recreational uses, limiting the number of boats at dive sites, etc.)
 - c. Present rationale for regulations to chamber of commerce, Guam Visitors Bureau (GVB), etc., for new and existing regulations to build a common understanding and constituency for implementation by 2012.
 - d. Develop community education and outreach programs to inform users of existing and new regulations, plans and programs.
 - e. Collaborate with other outreach activities where possible, especially those in CAP watersheds. Link to proposal for a public information officer to coordinate all outreach programs by 2012.
 - f. Increase capacity of regulatory agencies to effectively enforce existing plans, programs and new regulations.
- 4.2 Expand education efforts tailored to specific resource user groups, including unlicensed dive operators (certification course, yearly report out).
 - 4.3 Build partnerships with GVB, Guam Hotel and Restaurant Association, the Tourism Education Council, marine-based tour operators and chamber of commerce to educate visitors and residents about how to reduce recreational threats to coral reefs.
 - 4.4 Examine sustainable finance mechanism to support the management and protection of resources. Examples include visitor fees, endowments, in-lieu fees, etc.



Bleached coral in the shallow waters of the Tumon Bay Marine Preserve. Photo Credit: Dave Burdick

IMPACTS OF CLIMATE CHANGE

GOAL 5: Improve management of Guam's coral reef ecosystems to enhance resilience and recovery processes.

Objectives:

5.1 Establish and prepare response teams to address bleaching events, disease and predator outbreaks and other acute events (e.g., ship groundings, chemical spills).

Key Actions To Achieve this Objective:

- a. Finalize response plans for bleaching events, disease and predator outbreaks, and other acute events (e.g., ship groundings, chemical/oil spills) and develop toolkits for response.
- b. Develop and implement regulations to facilitate improved response to anthropogenic acute events (e.g.,

ship groundings, chemical/oil spills), including natural resource damage assessment, fines and compensatory mitigation, by 2012.

- c. Facilitate annual training to improve response-team skills.
- d. Develop and test approaches for mitigation and rehabilitation after impacts.

5.2 Address the issue of human community resilience to climate change, in the presence of coral reef loss and degradation. (Resilient communities are capable of bouncing back from adverse situations. They can do this by actively influencing and preparing for economic, social and environmental change.)

Key Actions To Achieve this Objective:

- a. Evaluate the social, economic and political impacts of increased frequency of reef impacts, particularly bleaching/disease events.



Healthy coral in the shallow waters of Guam. Photo Credit: Dave Burdick

- b. Incorporate adaptation strategies developed by other islands and jurisdictions into the climate change LAS, as appropriate.

- 5.3 Investigate connectivity at site-specific, local, archipelagic, and regional scales for multiple taxa (corals, fish, other inverts, algae) and develop management strategies (such as marine protected area siting and prioritizing land management) to increase reef resiliency.

Key Actions To Achieve this Objective:

- a. Develop connectivity models at site-specific, local, archipelagic and regional scales based on data obtained through targeted research activities, including current modeling, tagging/tracking and genetic analysis.
- b. Use models to identify sources and sinks for key species of various taxa and conduct targeted research to investigate the validity of the

models. Use the data to refine reef management strategies to maximize resilience (e.g., MPA siting, prioritization of land-based management activities, etc.).

- 5.4 Increase understanding of the causes of coral bleaching and disease-associated mortality on Guam and investigate approaches to stimulate recovery and rehabilitation.

Key Actions To Achieve this Objective:

- a. Increase understanding of the causes, spread and impacts of the six known diseases affecting Guam's reefs and identify three main environmental drivers of bleaching and disease in Guam.
- b. Develop and test approaches for rehabilitation of key reef areas.



*Resilient coral ecosystems are better able to recover from adverse impacts; Guam's objectives include addressing ecosystem resilience.
Photo Credit: Dave Burdick*

- 5.5 Quantify the extent of nuisance and invasive species affecting Guam's reefs and investigate and test management approaches.

Key Actions To Achieve this Objective:

- a. Provide input to and implement the marine portion of the Micronesia Biosecurity Plan.
 - b. Collect baseline data on invasive species presence and impacts in Guam's near-shore habitats, particularly Apra Harbor by 2012. Continue evaluation at regular intervals.
- 5.6 Establish current baselines and investigate consequences of climate change, such as ocean acidification and sea level rise in coral reef ecosystems of the Western Pacific.

SECTION THREE: LINKAGES TO NOAA'S NATIONAL GOALS AND OBJECTIVES

Table 1 shows how Guam's Priority Goals and Objectives correlate to the NOAA CRCP National Goals and Objectives for coral reef conservation. Table 1 was developed after the Guam Coral reef management priority setting process was complete to explicitly identify potential partnerships between the managers in Guam and NOAA CRCP. Addressing both local jurisdictional priorities and national goals and objectives will increase efficiency and leveraging of the resources available for coral reef conservation. NOAA CRCP will use this table to inform future investments in coral reef conservation in Guam.

Guam’s Priority Goals and Objectives	NOAA’s National Goals and Objectives for Coral Reef Conservation	Explanation of Correlation (as needed)
GOAL 1: IMPROVE THE CONDITION OF CORAL REEF ECOSYSTEMS BY REDUCING THE AMOUNT OF SEDIMENT AND POLLUTION FROM DEVELOPMENT, FIRES, RECREATIONAL USERS AND AGRICULTURE IN GUAM’S WATERSHEDS.		
<p>OBJECTIVE 1.1: Implement CAPs for priority watersheds by 2015 as a model approach to site-based planning and management. (The Piti CAP includes activities to manage land-based sources of pollution and recreational impacts to reefs, increase awareness of the impacts to reefs and fill gaps in knowledge through management-related research.)</p>	<p>Land-Based Sources of Pollution (LBSP) Impacts Objective 1.3: Implement watershed management plans and relevant LAS within priority coral reef ecosystems and associated watersheds to improve water quality and enhance coral reef ecosystem resilience. Where needed, develop (or update) watershed management plans that incorporate coral reef protection measures.</p>	<p>CAPs are site-based plans that address watershed management and other issues and identify specific actions at the local level to reduce threats to resources.</p>
<p>OBJECTIVE 1.2: Encourage implementation of revised Guam Soil Erosion and Sediment Control and Stormwater Rules and Regulations, Guam Seashore Reserve Plan and updated zoning and building codes pending formal approval by Guam administration.</p>	<p>LBSP Impacts Objective 3.4: Ensure that the necessary and consistent regulatory and programmatic framework exists and is enforced to implement watershed management strategies necessary to protect coral ecosystems.</p>	<p>In Guam, the plans, rules and regulations identified in the objective make up the regulatory and programmatic framework for addressing land-based sources of pollution.</p>
<p>OBJECTIVE 1.3: Educate target stakeholder groups about the sedimentation issues associated with specific watershed uses and activities.</p>	<p>LBSP Impacts Objective 3.5: Increase public and political awareness and understanding of the ecological and socioeconomic impacts of land-based sources of pollution on coral reef resources to promote better stewardship and informed decisions regarding activities in watersheds that may adversely impact coral reef ecosystems.</p>	<p>No explanation needed.</p>

Table 1

Guam's Priority Goals and Objectives	NOAA's National Goals and Objectives for Coral Reef Conservation	Explanation of Correlation (as needed)
GOAL 2: PROTECT GUAM'S CORAL REEF FISHERIES RESOURCES FOR CURRENT AND FUTURE GENERATIONS THROUGH EFFECTIVE MANAGEMENT THAT CONSERVES AQUATIC AND MARINE ECOSYSTEMS AND ENSURES THE CONDITION, WELFARE AND INTEGRITY OF MARINE ECOSYSTEMS.		
<p>OBJECTIVE 2.1: Increase management-related monitoring and research of coral reef fisheries to determine the status of target reef fishery stocks, levels of effort that are sustainable, habitat impacts and management effectiveness.</p>	<p>Fishing Impacts Objective 1.3: Obtain essential life history and ecological information on key species or functional groups to support management actions.</p> <p>Fishing Impacts Objective 1.4: Obtain necessary information on fishing effort in U.S. coral reef ecosystems by measuring fishing intensity, fishing mortality, frequency, area coverage, community dependence, etc., to inform management activities.</p> <p>Fishing Impacts Objective 1.5: Predict appropriate levels of extraction for key species or groups by developing and utilizing valid, precise, place-based and realistic ecosystem dynamics models.</p> <p>Fishing Impacts Objective 1.6: Conduct applied biological, social and economic research and monitoring to evaluate effectiveness of coral reef ecosystem management actions on key species or groups.</p>	<p>Guam's objective identifies the need for more information on fishery status, which is addressed in the National Fishing Impacts Objectives 1.3 and 1.4. The objective also identifies the need for information on levels of fishing effort that are sustainable, which correlates to National Fishing Impact Objective 1.5. And finally, the Guam objective identifies the need for understanding efficacy of management actions, which is called out in Fishing Impacts Objective 1.6.</p>
<p>OBJECTIVE 2.2: Create community management programs that increase public knowledge of, support for, and participation in marine preserves and science-based management.</p>	<p>Fishing Impacts Objective 2.4: Work with relevant agencies, offices and communities to create, implement and improve the management of MPAs that protect key coral reef ecosystem components and functions.</p> <p>Fishing Impact Objective 3.1: Increase participation of stakeholder or citizen groups in fisheries management planning, decision-making and monitoring activities that improve conservation of coral reef ecosystems.</p> <p>Fishing Impact Objective 4.3: Develop targeted, locally-relevant outreach and communication strategies to increase community understanding and support for regulations to protect key coral reef ecosystem species/ functional groups and expanded use of marine protected areas.</p>	<p>Each of the national objectives identify better engagement of communities to support MPAs or fisheries management, which correlates with Guam's objective.</p>

Table 1 continued

Guam's Priority Goals and Objectives	NOAA's National Goals and Objectives for Coral Reef Conservation	Explanation of Correlation (as needed)
<p>OBJECTIVE 2.3: Increase socioeconomic monitoring and research to better understand the interactions of users with the resources.</p>	<p>Fishing Impacts Objective 1.4: Obtain necessary information on fishing effort in U.S. coral reef ecosystems by measuring fishing intensity, fishing mortality, frequency, area coverage, community dependence, etc., to inform management activities.</p> <p>Fishing Impacts Objective 2.5: Conduct biological and socioeconomic research and monitoring to assess the performance of MPAs with respect to protection and restoration of key coral reef ecosystem components and functions.</p> <p>Fishing Impacts Objective 3.4: Conduct biological and socioeconomic research and monitoring necessary to assess the effectiveness of compliance and enforcement activities, understand community concerns, flag roadblocks to implementation and incorporate into management efforts.</p>	<p>National Fishing Objective 1.4 identifies the need to obtain information on community dependence to inform management activities, which correlates to Guam's intent to better understand the interaction between users and fisheries resources.</p> <p>National Fishing Objective 2.5 identifies the need for socioeconomic research to assess MPA performance, which correlates to Guam's objective to the extent that users' perceptions of effectiveness or the social and economic factors that influence MPA effectiveness is investigated.</p> <p>National Fishing Objective 3.4 identifies the need for socioeconomic research and monitoring to understand community concerns and assess compliance effectiveness, which corresponds to Guam's intent to better understand the interactions of users with the resources.</p>
<p>OBJECTIVE 2.4: Support, enhance and improve the regulations of resource use activities that impair fisheries or fish habitat.</p>	<p>Fishing Impacts Objective 3.2: Strengthen local agency and community capacity for effective and consistent enforcement of regulations or behaviors that reduce impacts of fishing on coral reef ecosystems.</p>	<p>No explanation needed.</p>
<p>GOAL 3: MITIGATE THE EXISTING AND ANTICIPATED PRESSURES OF RAPID DEVELOPMENT ON GUAM'S CORAL REEFS BY IMPLEMENTING THE GUAM NATURAL RESOURCES STRATEGY WITH A FOCUS ON APRA HARBOR THROUGH 2012.</p>		
<p>OBJECTIVE 3.1: Adopt and implement Compensatory Mitigation Policy by summer 2010. The policy shall address all aspects of an effective multi-agency approach to mitigation and will be compatible with existing federal policies while addressing Guam's unique resource-management challenges.</p>	<p>None</p>	

Table 1 continued

Guam's Priority Goals and Objectives	NOAA's National Goals and Objectives for Coral Reef Conservation	Explanation of Correlation (as needed)
GOAL 4: IMPROVE THE CONDITION OF CORAL REEF ECOSYSTEMS BY REDUCING NEGATIVE RECREATIONAL IMPACTS.		
OBJECTIVE 4.1: Adopt, implement and enforce existing recreational plans and programs including the Seashore Reserve, Recreation Water Use Management Plan, CAPs and the Marine Preserve Eco-Permit and enact new regulations for recreational use by 2015.	None	
GOAL 5: IMPROVE MANAGEMENT OF GUAM'S CORAL REEF ECOSYSTEMS TO ENHANCE RESILIENCE AND RECOVERY PROCESSES.		
OBJECTIVE 5.1: Establish and prepare response teams to address bleaching events, disease and predator outbreaks and other acute events (e.g., ship groundings, chemical spills).	Climate Impacts Objective 1.3: Develop and implement climate-related crisis response plans in all U.S. coral reef jurisdictions to provide a framework for early warning, communication, monitoring, research and management response to protect coral reef ecosystems from acute events such as coral bleaching, infectious disease outbreaks, tropical storm impacts and major rainfall events.	The framework provided in the development of climate-related crisis response plans can also be used to address other acute events, such as ship groundings and chemical spills as identified by Guam.

Table 1 continued

APPENDIX ONE: PRIORITY SETTING PROCESS PARTICIPANTS

Core Group: place-based managers of specific coral reef areas.

Each member of this group was invited to attend the workshop, to partake in an interview prior to the workshop and to participate in document revisions.

Vangie Lujan, Bureau of Statistics and Plans,
Guam Coastal Management Program
(GCMP)

Dave Burdick, GCMP

Esther Taitague, GCMP

Victor Torres, GCMP

Jay Gutierrez, Department of Agriculture
DAWR (could not attend the workshop)

Brent Tibbatts, DAWR—in lieu of Jay
Gutierrez

Tino Aguon, DAWR

Jeffrey Quitugua, DAWR

Val Brown, NOAA, NMFS, at DAWR

Jesse Cruz, Guam Environmental Protection
Agency (GEPA) (could not attend
the workshop but attended the second
meeting)

Trina Leberer, The Nature Conservancy

Mark Capone, National Park Service

Joseph Torres, Department of Agriculture
and WPRFMC, Member

Charles Sayon, Department of Defense

Randel Sablan, Joint Guam Program Office

Science Advisors: members of the scientific community with expertise in various aspects of coral reef ecosystems.

Each member of this group was invited to review documents and to offer revisions.

Laurie Raymundo, University of Guam (UOG)

Tom Schils, UOG

Peter Schupp, UOG

Bob Richmond, University of Hawai'i

Bob Schroeder, NOAA, Pacific Islands
Regional Office

Arielle Levine, NOAA, Pacific Islands Fisheries
Science Center (PISFC)

Oliver Vetter, NOAA, PIFSC, Coral Reef
Ecosystem Division (CRED)

Rusty Brainard, NOAA, PIFSC, CRED

Joyce Miller, NOAA, PIFSC, CRED

Benjamin Richards, NOAA, PIFSC, CRED

Bernardo Vargas-Angel, NOAA, PIFSC, CRED

Dwayne Minton, U.S. Fish and Wildlife Service

Advisors: managers of jurisdictions and populations impacting Guam's coral reefs.

Each member of this group was invited to interview prior to the workshop and to participate in document revisions.

Mike Gawel, GEPA

Peggy Denney, Guam Environmental
Education Partners Incorporated

Justin K. Santos, Department of Agriculture—
Forestry

APPENDIX TWO: CONTEXT

The Situation Analysis is a preparatory document that summarizes coral reef threats, condition and trends; key management issues; and key agencies' management goals. As an initial step in the priority setting process, it was used ahead of meetings and interviews to provide a reference point and boundary for priority setting discussions with place-based coral reef managers in Guam. The documents that make up the basis of this analysis were identified during interviews with place-based coral reef managers in Guam and via a desk review of existing management plans from those agencies that are responsible for or affect Guam's coral management. The coral reef managers interviewed for this study were identified by the NOAA CRCP team with input from the NOAA CRCP point of contact in Guam and included NOAA CRCP, NOAA National Marine Fisheries Service (NMFS), NOAA–NMFS/ Western Pacific Regional Fishery Management Council, Bureau of Statistics and Plans Coastal Management Program, Guam Department of Agriculture/Division of Aquatic and Wildlife Resources, Guam Department of Agriculture/ Division of Forestry and Soil Resources, The Nature Conservancy, Guam Environmental Protection Agency, National Park Service, Guam Environmental Education Partners, Inc. and Department of Defense.

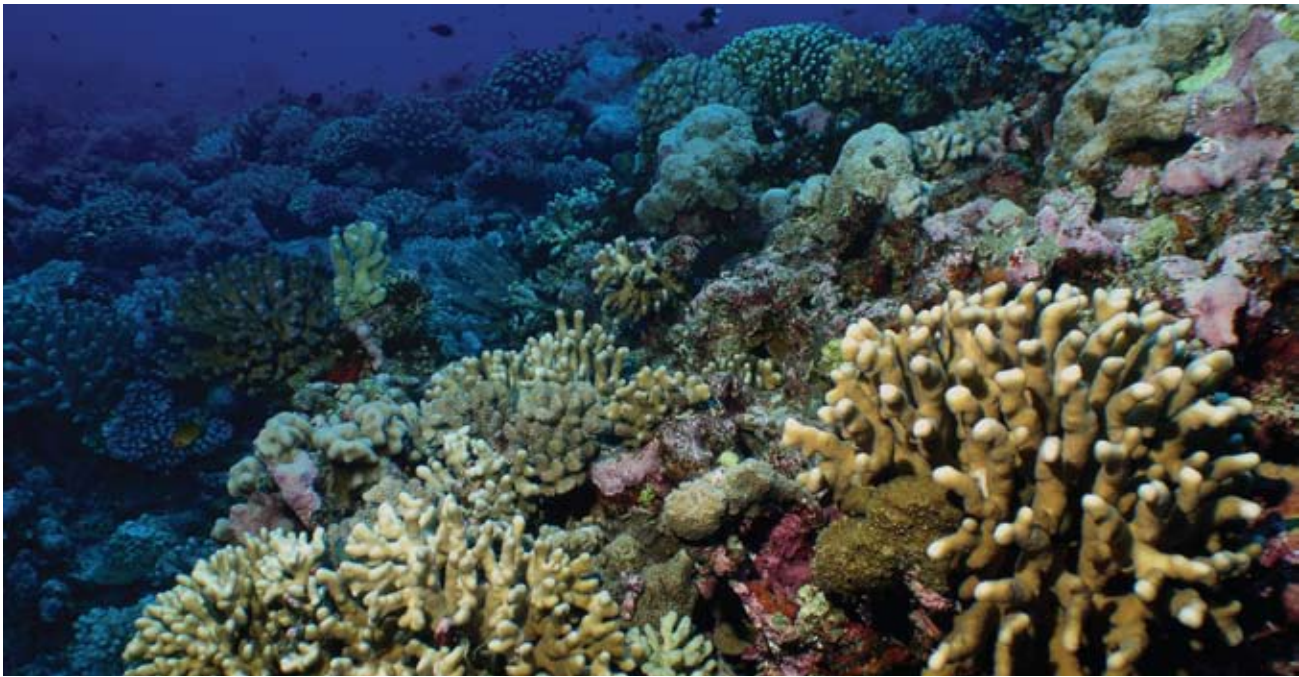
The Situation Analysis identified the following issue areas—which reflect both specific threats as well as tools to mitigate threats—as those that were most commonly referred to in the documents reviewed. These results are listed in no particular order.

Regulation and Enforcement refers to enforcing regulations already in place as well as updating regulations to reflect current needs and stresses.

This includes permitting, reviewing construction plans and fishery regulation. As the ecosystem evolves due to changing uses and increased anthropogenic stresses as well as the effects of global climate change, regulations must evolve to meet the needs. As such, research and monitoring are often linked to updating regulations. In addition, this issue often coincides with significant education and outreach goals, as having public input to regulations and dispersing information on regulations is the first step toward user-group compliance.

Construction and Human Impacts refers both to development meant to improve environmental quality as well as efforts to mitigate human impacts due to construction and commercial development. This includes stormwater and waste-water management, efforts to mitigate and control non-point source pollution and dredging and other coastal development activities. A major developer in Guam is the U.S. Department of Defense, which is planning to expand the base, including the harbor usage. This issue area also includes the impacts of recreational reef use (fishing, diving, boating, etc.) as well as the expansion and maintenance of trail networks and park facilities.

Education and Outreach goals cut across all areas of management and conservation. Because of its geography, the culture and economy of the island are irrevocably intertwined with the condition of the coral reef ecosystem. The reefs are a tourism draw and a fishery, and they protect the island from the full impact of strong storm systems. The status of the ecosystem is dependant upon sustainable users. Education and outreach programs are vital to public and visitor understanding of human impact and sustainable use.



*A reefscape in the waters offshore of southwestern Guam demonstrates some of the biodiversity found in this region.
Photo Credit: Dave Burdick*

Research and Maintaining Natural Habitats

includes research and monitoring in high impact areas, such as popular snorkel/dive sites and highly developed coastlines. Research and habitat maintenance goals also include designating and enforcing no-motor and no-take areas. Maintaining natural habitats refers to MPAs, as well as fish stocks, beaches and other areas for the purpose of tourism.

Based on the literature reviewed in this document, other important goals for coral reef management in Guam relate to the following:

Fishing is an economic keystone for Guam. Fishing is both a commercial and personal livelihood for residents as well as a recreational activity for visitors and locals alike. This issue area includes goals related to commercial fish stock management and gear regulation, protection of designated species, permitting and enforcement of regulations, and water quality and pollution.

Water Quality includes monitoring and data collection from a number of sites for bacteria and nutrient levels as well as turbidity, sedimentation

reduction and management to control pollution through permits and water quality standards. This issue area overlaps significantly with land-based sources of pollution because major contributors to poor and declining water quality are point and non-point sources of pollution. In addition, water quality issues overlap with goals pertaining to research and natural habitats, particularly in reference to monitoring.

Land-Based Sources of Pollution pertains to actions that degrade water quality or have a direct impact on reef condition. Most common LBSP are stormwater, waste water and sediment from erosion and runoff from construction, urban/commercial areas, wild-lands off-roading and grasslands arson.

Zoning and Mooring refers to the need to designate specific areas for specific activities and includes recommendations for general calls for area-wide zoning schemes, such as a mix of MPAs, anchoring/no-anchoring areas, multi-use areas, no-take marine reserves, etc.

APPENDIX THREE: PRELIMINARY IDENTIFICATION OF CAPACITY GAPS

During the interviews with coral reef managers in Guam, facilitators worked to understand the working relationship between managers and management documents. Facilitators noted and identified challenges to and current deficiencies in achieving stated goals and objectives, noting specific capacity gaps that likely will need attention.

Using a tool developed by the Coastal Resources Center at the University of Rhode Island for comparative assessments of coastal ecosystem governance, a capacity and governance baseline was established from data collected during the pre-workshop interviews. This approach involves three categories, phrased as key statements, for enabling conditions that allow an initiative to successfully execute a sustained plan of action designed to influence the course of events in an ecosystem.

The three categories are constituencies, commitment and capacity. This baseline will also identify the immediate capacity gaps that are directly related to implementing this strategic approach. These gaps will be explored further and a capacity assessment will be developed in phase II of this effort, beginning in fiscal year 2010.

CONSTITUENCIES

Premise:

To achieve success, a core of well-informed and supportive **constituencies** comprised of stakeholders in both the private sector and government agencies must actively support the program.

Measures:

1. The user groups who are affected by your program understand and support the goals, strategies and targets.

2. There is public support for your program.
3. The institutions that assist in implementing your program, or the institutions that are affected by the plan, understand and support it.

Results:

The goals of the GCMP are strongly supported by key resource managers in the GEPA, the Department of Agriculture and several prominent nongovernmental organizations, including The Nature Conservancy. These resource managers understand the need for strengthened controls over land-based sources of pollution, including runoff from construction activities, burning of fields as part of hunting activities and the increasing land disturbance caused by off-road vehicles. All are also in agreement about the potential impacts of the military build-up and the need for careful analysis and mitigation. GCMP staff are working closely with the consultants preparing the Environmental Impact Statement governing build-up activities. Beyond the initial circle of resource managers, the support of resource users is more mixed. Some dive shops and other commercial recreational users understand and actively support minimizing the impacts of snorkeling, diving, anchoring and the like. On the other hand, some small, primarily foreign-owned recreation operations are less familiar with the goals of marine preserve management and how easily corals can be damaged. Among fishers, support is also mixed. A small, but vocal, group of fishers and their supporters are seeking to increase access to marine preserves on the part of a few users.

COMMITMENT

Premise:

To achieve success, it is necessary that the delegated authorities have expressed **commitment** to the policies of a program and to the allocation of financial resources required for long-term program implementation.

Measures:

1. The appropriate level of government has formally approved the plan of action.
2. The government provided the program with the authorities it needs to successfully implement its plan of action.
3. Sufficient financial resources have been committed to fully implement the program over the long-term.

Results:

One of the principal components of coastal resource management in Guam is the system of five marine preserves. There is strong commitment to the reserves on the part of key resource managers, but less support among some fisher groups and their political supporters and some recreational users. A bill currently under consideration would open the preserves to preferred users, but is opposed by the marine resource management community. Encouraging compliance with preserve rules is a key concern. Outreach efforts are generally good. Enforcement is uneven, in part because of inadequate funding and access to boats. Prosecution of violators is almost nonexistent. Regarding LBSP, new stormwater regulations are now being reviewed. The intent is to reduce site-based runoff and sedimentation in near-shore waters. There seems to be general support for these new regulations. Planning and zoning controls in near-shore areas need updating and strengthening in order to reduce land-based sources of pollution, minimize impacts on wetlands and maintain aesthetic values.

CAPACITY

Premise:

To achieve success, it is necessary for sufficient **capacity** be present within the institutions responsible for the program to implement its policies and plan of action.

Key questions:

1. Your program possesses the human resources to implement its plan of action.
2. Your program possesses the institutional resources (equipment, materials, etc.) to implement its plan of action.
3. There are internal or external barriers to successfully implement plan of action. What are these?

Results:

Guam has a core of skilled, knowledgeable and capable resource managers. However, there are several primary capacity barriers. One is that the scale of the military build-up makes it very difficult for Guam to stretch its limited management resources to engage in sufficient oversight. The military itself seems committed to ensuring that new infrastructure is carefully designed, meets Leadership in Energy and Environmental Design requirements, etc., but the volume of construction activities, the large number of contract workers and the proliferation of contractors and subcontractors make it impossible for Guam officials to ensure compliance with management goals without substantial federal assistance. Two, the federal need for talented resource managers is resulting in "brain drain" among Guam's managers. Talented managers and resource specialists are being offered generous contracts that far exceed their Guam salaries. Loss of key people, salaries that are low relative to colleagues and the immensity of the resource management needs combine to undermine the morale of some staff.

This initial assessment will be followed by a more detailed assessment and analysis that will focus on capacity gaps in relation to the specific management goals and objectives that are finalized in this priority setting process.

BIBLIOGRAPHY OF CORAL REEF MANAGEMENT AND CONSERVATION DOCUMENTS FOR GUAM BY AGENCY

Bureau of Statistics and Plans Guam Coastal Management Program

- Burdick, David R. (2005). Guam Coastal Atlas. University of Guam Marine Laboratory, Technical Report 114. 149pp.
- Bureau of Statistics and Plans (2006). *Direct, Cumulative and secondary Impacts of Personal Watercraft in East Agana Bay*
- Bureau of Statistics and Plans (2007) *Locations of Guam Land Use/Seashore Protection Commission and Federal Consistency Projects*. GIS shape files
- Bureau of Statistics and Plans (2007) *Locations and Names of Shallow Water Mooring Systems & Popular Dive sites*. GIS Shape files
- Bureau of Statistics and Plans (2009) *Report To Identify, Map and Analyze Basic SCUBA Instructional Dive Sites and Develop Plans to Help Reduce Pressures on Guam's Coral Reefs*.—pending final completion by August 2009.
- Guam Coastal Management Program, Bureau of Statistics and Plans (2005). *Guidebook to Development Requirements on Guam*
- Guam Coastal Management Program, Bureau of Statistics and Plans (2007). *Comprehensive Long-Term Monitoring at Permanent Sites in Guam*. State and Territory Coral Reef Ecosystem Monitoring Grant Package.
- Guam Coastal Management Program, Bureau of Statistics and Plans (2008). *Draft Recreational Water Use Management Plan (RWUMP) Interim Report*
- Guam Coastal Zone Management Program. (2009) *Guam Seashore Reserve Plan DRAFT*.
- Guam Coral Reef Initiative, GYOR (2008). *Save Our Reefs: Recreational Users Stewardship Workshop* September 25, 2008, Tumon Bay , Guam. (Materials available from Guam Coastal Management Program.)
- Guam CRI (2008). *Guam Climate Change and Reef Resilience Local Action Strategy for Guam*. CCRR LAS Working Group—working draft.
- Guam CRI (2005). *Fisheries Management LAS spreadsheet*—working draft.
- Guam Government (1997). Executive Order No. 97–10 *Adoption of the Guam Coral Reef Initiative To Establish A Policy Development Mechanism For The Protection Of Guam's Coral Reef* (May 12, 1997).
- ICF International Washington: (March 2009). *North and Central Guam Land Use Plan, Bureau of Statistics and Plans-Government of Guam*
- Micronesia Challenge (2006). *Workplan-Guam, General Overview. PowerPoint Presentation December 4–7 (2006)*. Koror, Palau.
- RARE (2009) *The Guam RARE Pride Watershed Campaign*. Accessed at: <http://rareplanet.org/en/campaign/guam-watershed-campaign>.

van Beukering, P., W. Haider, M. Longland, H. Cesar, J. Sablan, S. Shjegstad, B. Beardmore, Y. Liu, and G.O. Garces (2007). *The Economic Value of Guam's Coral Reefs*. xviii + 102pp.

U.S. Department of Commerce, National Oceanic Atmospheric Administration National Ocean Service Office of Response and Restoration Hazardous Materials Response Division (August 2005). *Sensitivity of Coastal Environments and Wildlife to Guam and the Northern Marianas Islands Atlas*.

Sablan Environmental Inc. (August 2008). *Guam Natural Resources Strategy 2012*, Guam Buildup

Sablan Environmental Inc. (2009). *The Guam Compensatory Mitigation Policy DRAFT*.

Department of Agriculture

5 GCA Government Operations CH. 60 Department of Agriculture.

5 GCA Government Operations CH. 63 Fish, Game, Forestry & Conservation

Bell, Fred, Falanruw, Margie, Lawrence, Bart, Limtiaco, Dave and Duane Nelson (2002). *Vegetation Strategy for Southern Guam—DRAFT* (September 2002).

Government of Guam. Title 16 Natural Resources and Recreation. Chapter 2 Fishing Regulation

Guam Department of Agriculture, *Civilian Volunteer Conservation Officer Reserve Program Rules and Regulations*.

Guam Department of Agriculture, Division of Aquatic and Wildlife Resources (2005). *Guam Comprehensive Wildlife Strategy (GCWCS)*. pp256.

Guam Department of Agriculture Division of Aquatic and Wildlife Resources (2008) *Annual Performance Reports*. FY 2007

Cetti Bay Operational Plan (October 25, 2006).

USDA Forest Service Institute of Pacific Islands Forestry Cetti Watershed Sediment Gage Installation and Effectiveness Monitoring Program.

USDA Forest Service (2008) *Cetti Watershed Reforestation Implementation Plan for Kilo Wharf Extension Project—DRAFT* (June 2008).

USDA Natural Resources Conservation Service Pacific Basin, Agana, Guam. (1995). *Resource Assessment Ugum Watershed, Guam*.

USDA–Natural Resources Conservation Service (NRCS). *Fouha Demonstration Project. Construction and Materials Specifications*.

Guam Environmental Protection Agency (GEPA)

GEPA–Water Programs Division. Accessed at: <http://node.guamepa.net/programs/water/index.html>

GEPA *Draft Recreational Beach Monitoring Plan for Guam Coastal Waters*. Accessed at: <http://node.guamepa.net/programs/emas/index.html>

GEPA *Non Point Source Pollution Program*. Accessed at: <http://node.guamepa.net/programs/water/poll.html>

Tetra Tech, Inc. and US Environmental Protection Agency (2006). *Sediment TMDL Ugum Watershed, Guam USA—DRAFT* (September 14, 2006).

Joint Agency Documents

Clean Water Action Plan for Guam, Unified Watershed Assessment (September 15, 1998).

Guam Comprehensive Watershed Planning Process. Guam Environmental Protection Agency in cooperation with the Bureau of Statistics and Plans, Guam Coastal Management Program (October 2003).

Jennifer Kozlowski and Bill Millhouser (eds.) (May 2008). *Report on the Status of Local Action Strategies to Conserve and Protect Coral Reefs for years 2002–2006, Report to the U.S. Coral Reef Task Force from the Task Force Steering Committee.*

USDA Forest Service, Government of Guam Division of Forestry and Soil, USFWS, NOAA and ACOE. *Cetti Bay Reforestation Monitoring Plan.*

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management and the Guam Coastal Management Program, Bureau of Planning, Government of Guam (August 1994). *Procedures Guide For Achieving Federal Consistency with the Guam Coastal Management Program*

Citations for Capacity Assessment

2008 Status of the Reefs

Burdick, D., V. Brown, J. Asher, M. Gawel, L. Goldman, A. Hall, J. Kenyon, T. Leberer, E. Lundblad, J. McIlwain, J. Miller, D. Minton, M. Nadon, N. Pioppi, L. Raymundo, B. Richards, R. Schroeder, P. Schupp, E. Smith and B. Zgliczynski (2008). *The State of Coral Reef Ecosystems of Guam.* pp. 465-510. In: J.E. Waddell and A.M. Clarke (eds.), *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008.* NOAA Technical Memorandum NOS NCCOS 73. NOAA/ NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, Maryland. 569pp.

Burdick, D., V. Brown, J. Asher, M. Gawel, L. Goldman, A. Hall, J. Kenyon, T. Leberer, E. Lundblad, J. McIlwain, J. Miller, D. Minton, M. Nadon, N. Pioppi, L. Raymundo, B. Richards, R. Schroeder, P. Schupp, E. Smith and B. Zgliczynski (2008). *Status of the Coral Reef Ecosystems of Guam: 2008.* Guam Coral Reef initiative.

2005 Status of the Reefs

Porter, V., Leberer, T., Gawel, M., Burdick, D., Gutierrez, J., Torres, V. and Lujan, E. (2005). *The State of the Coral Reef Ecosystems of Guam in The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005.* NOAA Technical Memorandum NOS NCCOS 11. NOAA/ NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, Maryland. 522 pp.

Porter, V., Leberer, T., Gawel, M., Burdick, D., Gutierrez, J., Torres, V. and Lujan, E. (2005). *Status of the Coral Reef Ecosystems of Guam.* University of Guam Press, Mangilao. Technical Report 113. 80 pp.

Coral Reef Economic Valuation

van Beukering, P., H. Wolfgang, M. Longland, H. Cesar, J. Sablan, S. Shjgstad, B. Beardmore, Y. Liu and G. O. Garces (2007). University of Guam Technical Report No. 116: *The economic value of Guam's coral reefs.* 6 pp.

Pacific CREIOS Workshop

NOAA Coral Reef Conservation Program (2009). *Pacific CREIOS Workshop Report.*

Workshop held November 18–20, 2008, in Honolulu, HI. Accessed at: http://coralreef.noaa.gov/creios/pac_report.pdf

NOAA Coral Reef Conservation Program (2008). *Pacific CREIOS Workshop Briefing Book.* Accessed at: http://coralreef.noaa.gov/creios/pac_brffbook.pdf

Guam Coral Reef Initiative (2008). *Pacific CREIOS Workshop: Guam Team Presentation.* Accessed at: http://coralreef.noaa.gov/creios/pac_guam.pdf

Guam Year of the Reef

GYOR (2008). Abstract Booklet. *Guam Coral Reef Symposium 2008.* Accessed at: http://www.guamiyor08.com/files/Abstract_Booklet_web.pdf

Other

- Gombos, M., J. Gutierrez and V. Brown (2007).
Guam Coral Reef MPA Summary. pp89–96.
In Wusinich-Mendez, D. and C. Trappe
(ed.) (2007). *Report on the Status of Marine
Protected Areas in Coral Reef Ecosystems
of the United States Volume 1: Marine
Protected Areas Managed by U.S. States,
Territories and Commonwealths: 2007*.
NOAA Technical Memorandum NOS.
NOAA Coral Reef Conservation Program.
Silver Spring, Maryland. 153pp. Accessed
at: [http://node.guamepa.net/programs/
emas/index.html](http://node.guamepa.net/programs/emas/index.html)
- All Islands Committee (2009). *Guam overview*.
Accessed at: [http://allislandscorals.org/
index.php?option=com_content&task=vi
ew&id=45&Itemid=55](http://allislandscorals.org/index.php?option=com_content&task=view&id=45&Itemid=55)

To access this report online or for more information, visit:
<http://coralreef.noaa.gov/aboutcrp/strategy/reprioritization/managementpriorities/>



To access this report online or for more information, visit:
<http://coralreef.noaa.gov/aboutcrpcp/strategy/reprioritization/managementpriorities/>