

A National
CORAL REEF
ACTION STRATEGY

REPORT TO CONGRESS

on Implementation of the Coral Reef Conservation Act of 2000

and the National Action Plan to Conserve Coral Reefs

in 2002-2003



Donald L. Evans
Secretary of Commerce
UNITED STATES DEPARTMENT OF COMMERCE

Conrad C. Lautenbacher, Jr.
Vice Admiral, U.S. Navy (Ret).
Under Secretary of Commerce for Oceans and Atmosphere
National Oceanic and Atmospheric Administration

James R. Mahoney
Assistant Secretary of Commerce for Oceans and Atmosphere
National Oceanic and Atmospheric Administration

Margaret A. Davidson
Assistant Administrator for Ocean Service and Coastal Zone Management (Acting)
National Ocean Service
National Oceanic and Atmospheric Administration

This document was produced by the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, in cooperation with the U.S. Coral Reef Task Force, to fulfill requirements of the Coral Reef Conservation Act of 2000 (P.L. 106-562; 16 U.S.C. 6401 et seq.).

June 2002

For information or copies please contact:

NOAA Coral Reef Conservation Program

Office of Response and Restoration

National Ocean Service

1305 East West Highway

Silver Spring, Maryland 20910

Phone: 301-713-2989

Fax: 301-713-4389

Email: roger.b.griffis@noaa.gov

<http://www.coralreef.noaa.gov/>

U.S. Coral Reef Task Force

<http://coralreef.gov/>



Cover: Feather-duster worms feeding in the current. These and thousands of other species make coral reefs some of the most diverse and valuable ecosystems on the planet. Cover design by Gini Kennedy (NOAA).

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EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

Coral reefs are some of the most biologically rich and economically valuable ecosystems on Earth. They are also in serious jeopardy, threatened by an increasing array of impacts from over-exploitation, pollution, habitat loss, invasive species, diseases, and climate change. The rapid decline and loss of these valuable marine ecosystems has significant social, economic, and environmental consequences in the U.S. and around the world. Action is needed on a wide variety of fronts to address the coral reef crisis, especially on issues of global proportions such as the impacts of climate change, increasing coastal development and persistent over-fishing of reef systems.

This document, *A National Coral Reef Action Strategy*, was produced by the National Oceanic and Atmospheric Administration (NOAA), in cooperation with the U.S. Coral Reef Task Force (Task Force), to fulfill the requirements of the Coral Reef Conservation Act of 2000 (CRCA) (P.L. 106-562; 16 U.S.C. 6401 *et seq.*) and help track implementation of *The National Action Plan to Conserve Coral Reefs* (U.S. Coral Reef Task Force 2000). The Task Force National Action Plan was the first national blueprint for U.S. action to address the loss and degradation of U.S. and international coral reef ecosystems. Based on extensive input from government and non-government organizations, scientists, resource managers, stakeholders and the public, the National Action Plan: (1) identified key threats and issues driving the loss and degradation of coral reefs, (2) established thirteen major goals to address these threats, and (3) outlined objectives and priority actions needed to achieve each goal.

The CRCA requires the NOAA Administrator to prepare, periodically review, and revise a national coral reef action strategy to achieve the purposes of the CRCA. To fulfill these requirements, NOAA worked closely with the Task Force, Task Force Working Groups and the All Islands Coral Reef Initiative to build on the existing goals, objectives, implementation plans, and other information associated with the National Action Plan. That information was used as the foundation for this strategy.

The strategy is divided into two fundamental themes and 13 goals essential to addressing and reducing threats to coral reefs worldwide:

- **THEME 1: Understand Coral Reef Ecosystems** – Better understanding of complex coral reef ecosystems will improve management and conservation of these valuable resources. The strategy outlines the following major goals to increase understanding of coral reef ecosystems:

Goal 1: Create comprehensive maps of all U.S. coral reef habitats;

Goal 2: Conduct long-term monitoring and assessments of reef ecosystem condition;

Goal 3: Support strategic research to address the major threats to reef ecosystems; and

Goal 4: Increase understanding of the social and economic factors of conserving coral reefs.

- **THEME 2: Reduce The Adverse Impacts Of Human Activities** – Reducing the impacts of human activities is essential to conserving coral reef ecosystems. The strategy outlines the following major goals to reduce the adverse impacts of human activities:

Goal 5: Improve the use of marine protected area to reduce threats;

Goal 6: Reduce adverse impacts of fishing and other extractive uses;

Goal 7: Reduce impacts of coastal uses;

Goal 8: Reduce pollution;

Goal 9: Restore damaged reefs;

Goal 10: Improve education and outreach;

Goal 11: Reduce international threats to coral reef ecosystems;

Goal 12: Reduce impacts from international trade in coral reef species; and

Goal 13: Improve coordination and accountability.

This initial version of the strategy is designed to help track progress to implement the CRCA and National Action Plan in 2002 – 2003. The document provides an assessment of the major threats and needs in each region to help identify and prioritize key areas for management action. For each of the 13 goal areas outlined in the National Action Plan, the document provides partial summaries of accomplishments in 2001, and partial lists of key actions needed in 2002-2003 to help achieve the goals and objectives of the CRCA and National Action Plan.

This document is not intended to be a comprehensive list of accomplishments or future needs. Where possible, the Strategy indicates how to access more comprehensive information from the Task Force (see <http://coralreef.gov/> or Appendix B for list of contacts) or other sources involved in coral reef conservation activities.

As required by the CRCA, this document also provides estimates of federal funding available to directly support coral reef conservation activities.

The National Action Strategy is designed to be revisited biennially (or as need) to track progress and help identify future needs and actions in cooperation with the Task Force, the All Islands Coral Reef Initiative, other organizations, constituents and the public. A comprehensive process for future updates is being developed in cooperation with the Task Force. Input is encouraged on all aspects of the National Action Strategy (please see contact information listed in the front of the document).

ACKNOWLEDGEMENTS

The National Coral Reef Action Strategy was produced by the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, in cooperation with federal and non-federal (state, territory and commonwealth) members and staff of the U.S. Coral Reef Task Force. The goals and objectives of this Strategy are based on the *U.S. National Action Plan to Conserve Coral Reefs*, produced and adopted by the U.S. Coral Reef Task Force in 2000. This document summarizes recent accomplishments and future needs to implement the National Action Plan as identified by the members and Working Groups of the U.S. Coral Reef Task Force. This document could not have been produced without the significant contributions from these groups. NOAA thanks the U.S. Coral Reef Task Force, its Steering Committee and Working Groups, for their major input and assistance in producing this document and the National Action Plan on which it is based.

Special thanks go to the Chairs of the U.S. Coral Reef Task Force Working Groups, members and staff of the All-Islands Coral Reef Initiative, and members of the NOAA Coral Reef Conservation Program for invaluable input and assistance in preparing this Strategy.

NOAA thanks the members and staff of the U.S. Congress who provided direction and support to develop this document and implement coral reef conservation activities associated with the Coral Reef Conservation Act of 2000 (Public Law 106-562; 16 U.S.C. 6401 *et seq.*), the National Action Plan to Conserve Coral Reefs (U.S. Coral Reef Task Force, March 2000) and other applicable responsibilities.

Information in this document on federal agency funding for coral reef activities was provided by official agency contacts to the U.S. Coral Reef Task Force for use in this report.

GLOSSARY

AS	American Samoa
APEC	Asia Pacific Economic Cooperation
CBD	Convention Biological Diversity
CD	Compact Disk
CHAMP	Coral Health Monitoring Program
CHDC	Coral Health Disease Consortium
CITES	Convention on International Trade of Endangered Species of Fauna and Flora
CNMI	Commonwealth of the Northern Mariana Islands
COE	U.S. Army Corps of Engineers
CoRIS	Coral Reef Information System (NOAA)
CRCA	Coral Reef Conservation Act of 2000
CRES	Coral Reef Ecosystem Studies
CRTF	Coral Reef Task Force
CWA	Clean Water Act
CZMP	Coastal Zone Management Program
USDA	Department Of Agriculture
DOC	Department Of Commerce
DOD	Department Of Defense
DOI	Department Of the Interior
DOJ	Department Of Justice
DOS	Department Of State
DOT	Department Of Transportation
EIS	Environmental Impact Statement
EPA	U.S. Environment Protection Agency
EEZ	Exclusive Economic Zone
FL	State of Florida
FGBNMS	Flower Garden Banks National Marine Sanctuary
FKNMS	Florida Keys National Marine Sanctuary
FAS	Freely Associated States (Republic of Palau, Republic of the Marshall Islands, Federated States of Micronesia)

GIS	Geographic Information System
GPS	Geographic Positioning System
GU	Guam
HI	State of Hawaii
HCRI	Hawaii Coral Reef Initiative
ICRI	International Coral Reef Initiative
IHO	International Hydrographic Organization
IMO	International Maritime Organization
MCBH	Marine Corps Base Hawaii
MPA	Marine Protected Areas
NAP	U.S. National Action Plan to Conserve Coral Reefs
NASA	National Aeronautics and Space Administration
NCRI	National Coral Reef Initiative
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPS	National Park Service
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
NWHI	Northwestern Hawaiian Islands
PR	Puerto Rico
PSSA	Particularly Sensitive Seas Area
ROV	Remotely Operated Vehicle
SPAW	Special Protected Areas Wildlife
USAID	U.S Agency for International Development
UNEP	United Nations Environment Program
USVI	U.S. Virgin Islands
UV	Ultra Violet

valuable ecosystems in peril

global response

national action plan

strategy

constraints

INTRODUCTION



INTRODUCTION

Coral reefs are among the most diverse and biologically complex ecosystems on Earth. These *rainforests of the sea* provide economic and environmental services to millions of people as areas of natural beauty and recreation, sources of food, jobs, chemicals, pharmaceuticals, and shoreline protection. Now under threat from multiple stresses that are overwhelming their natural resilience, coral reefs are deteriorating worldwide at alarming rates.

The *Status of Coral Reefs of the World 2000* report estimates that 27 percent of the world's coral reefs have been effectively lost due to human activities and climate impacts (Wilkinson 2000). By 1997, an estimated 11 percent of the world's reefs had been lost to a variety of human activities including shoreline development, polluted runoff from agricultural and land-use practices, over-harvesting, destructive fishing, and ship groundings. In 1998, a massive climate-related coral bleaching event destroyed or degraded an additional 16 percent of the coral reefs of the world. It is estimated that an additional 32 percent of the world's coral reefs are now seriously threatened. If urgent management action is not taken to protect these ecosystems, a total of 40 percent of the world's coral reefs may be lost by 2010, particularly those near human populations. If current pressures continue unabated, 58 percent may be lost by 2030.

In many areas, the trend in coral reef health is downward, and these ancient ecosystems are in peril. In other areas, there is not adequate monitoring and information to assess the reef condition, or determine the effectiveness of management actions. Recent assessments of U.S. reef ecosystems suggest that many U.S. reefs are under increasing threats and are showing clear signs of serious degradation from human impacts (Bryant et al 1989; Turgeon et al 2002).

In response to this crisis, the U.S. has taken a number of significant actions over the past 5 years to help halt the decline of coral reef ecosystems and sustain the communities and economies that depend on them.

In 1998, the U.S. Coral Reef Task Force (Task Force) was established by Executive Order 13089 to help lead and coordinate U.S. efforts to address the coral reef crisis. The Task Force, co-chaired by the Secretary of the Interior and the Secretary of Commerce, includes the heads of eleven federal agencies (Department of Agriculture, Department of Commerce, Department of Defense, Department of the Interior, Department of Justice, Department of State, Department of Transportation, Environmental Protection Agency, National Aeronautics and Space Administration, National Science Foundation, U.S. Agency for International Development) and the Governors of seven states, territories and commonwealths (American Samoa, Florida, Guam,

Hawaii, Northern Marianas Islands, Puerto Rico, U.S. Virgin Islands) with responsibilities for coral reefs.

In March 2000, the Task Force adopted the National Action Plan to Conserve Coral Reefs (National Action Plan), the first national blueprint for U.S. action to address the loss and degradation of valuable U.S. and international coral reef ecosystems (U.S. Coral Reef Task Force 2000). The National Action Plan was produced by the Working Groups of the Task Force in response to its request for a cohesive national strategy to implement the President's 1998 Executive Order 13058 on Coral Reefs. The National Action Plan also incorporated the coral reef strategies of state and territory members of the Task Force (U.S. all Islands Coral Reef Initiative Strategy 1999). The National Action Plan was developed in consultation with a diverse variety of stakeholders and covered the spectrum of coral reef conservation activities, from mapping, monitoring, management and research, to education and international cooperation.

Based on extensive input from government and non-government organizations, scientists, resource managers, stakeholders and the public, the National Action Plan (1) identified key threats and issues driving the loss and degradation of coral reefs, (2) established thirteen major goals to address these threats, and (3) outlined specific objectives and priority actions needed to achieve each goal.

This document, *A National Coral Reef Action Strategy* (strategy), was produced by the National Oceanic and Atmospheric Administration (NOAA), in cooperation with the U.S. Coral Reef Task Force, to fulfill the requirements of the Coral Reef Conservation Act of 2000 (CRCA) (P.L. 106-562; 16 U.S.C. 6401 *et seq.*) and implement the National Action Plan to Conserve Coral Reefs.

The CRCA requires the NOAA Administrator to prepare, periodically review, and revise a national coral reef action strategy to achieve the purposes of the CRCA. The CRCA states that NOAA may consult with the Task Force in developing the strategy. The strategy is to include a statement of goals and objectives, an implementation plan, and a description of the funds obligated each fiscal year to advance coral reef conservation. The CRCA also requires NOAA to establish a coral reef conservation grants program to address priorities identified in the national strategy. The Act states that the strategy shall include a discussion of:

- Coastal uses and management;
- Water and air quality;
- Mapping and information management;
- Research, monitoring, and assessment;
- International and regional issues;

- Outreach and education;
- Local strategies developed by the states and federal agencies, including regional fishery management councils; and
- Conservation, including how marine protected areas will be developed in a manner consistent with local practices and traditions to serve as replenishment zones.

To fulfill these requirements, NOAA worked closely with the Working Groups and representatives of the Task Force to build on the existing goals, objectives, implementation plans, and other information associated with the National Action Plan to Conserve Coral Reefs. This information was used as the foundation for this strategy, although, this strategy does not necessarily represent the views of the Task Force.

Action is needed on a wide variety of fronts to address the coral reef crisis, especially on threats of global proportions such as the impacts of climate change on reef systems (Best et al 2002). The actions and strategies described in this document depend on a variety of other efforts by governmental and non-governmental entities to successfully address threats and reverse the degradation and loss of coral reef ecosystems.

STRATEGY TO CONSERVE CORAL REEFS

The strategy is designed to track progress and needs to fulfill the purposes of the CRCA and implement the National Action Plan by providing a mechanism to biennially (or as needed): (1) provide information on the major threats and needs in each region, (2) track progress to achieve the goals and objectives, and (3) identify priority actions needed to achieve the goals and objectives. It also provides estimates of federal funding available to support coral reef conservation activities as required by the CRCA.

Based on the U.S. National Action Plan to Conserve Coral Reefs, this strategy is divided into two fundamental themes and 13 goals crucial to addressing and reducing threats to coral reefs worldwide:

- **THEME 1: Understand Coral Reef Ecosystems** - Better understanding of complex coral reef ecosystems will improve management and conservation of these valuable resources. The strategy outlines the following major goals to increase understanding of coral reef ecosystems:

Goal 1: Create comprehensive maps of all U.S. coral reef habitats;

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Goal 4: Increase understanding of the social and economic factors of conserving coral reefs.

- **THEME 2: Reduce The Adverse Impacts Of Human Activities** – Reducing the impacts of human activities is essential to conserving coral reef ecosystems. The strategy outlines the following major goals to reduce the adverse impacts of human activities:

Goal 5: Improve the use of marine protected area to reduce threats;

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Goal 7: Reduce impacts of coastal uses;

Goal 8: Reduce pollution;

Goal 9: Restore damaged reefs;

Goal 10: Improve education and outreach;

Goal 11: Reduce international threats to coral reef ecosystems;

Goal 12: Reduce impacts from international trade in coral reef species; and

Goal 13: Improve coordination and accountability.

This initial strategy focuses on tracking and implementing the CRCA and the National Action Plan in 2001 – 2003. It includes partial summaries of accomplishments in 2001 and partial lists of key needs to be addressed by government and non-governmental entities in 2002-2003 to help achieve the goals and objectives outlined in the CRCA and the National Action Plan. It is intended to provide brief summaries and access to additional information. It is not intended to be a comprehensive list of accomplishments or future needs. Additional information is available in annual reports from the member organizations and working groups of the Task Force (see <http://coralreef.gov/> or Appendix B for list of contacts) or other sources and organizations involved in coral reef conservation activities.

The strategy is designed to be revisited biennially (or as need), in cooperation with the Task Force, other organizations, and the public, to track progress and help identify future needs and actions. A comprehensive process for the development of future reports is being prepared in cooperation with the Task Force.

CONSTRAINTS ON FEDERAL AGENCY ACTION

This document identifies goals and objectives set forth in the U.S. National Action Plan to Conserve Coral Reefs, accomplishments towards reaching those goals, and key actions needed in 2002-2003 to fulfill the purposes of the CRCA and implement the National Action Plan. This document is intended to help track progress and guide future actions. However, all decisions on future actions remain the responsibility and authority of federal or other governmental agencies, subject to appropriate authorities and fiscal constraints as outlined below.

Resource Constraints. This strategy assumes the TASK FORCE agencies will work cooperatively wherever their missions, authorities, and resources allow them to implement the actions laid out in this plan. All actions are subject to appropriations and budgetary constraints in the context of Administration priorities. Moreover, agency priorities from year to year will reflect emerging threats and needs, as well as new technologies available to meet those challenges.

Legal and Policy Constraints. In addition to fiscal constraints on federal action, all actions proposed in this plan must conform to legal and policy requirements set forth in domestic policy and international law. These include: applicable legal authorities and statutory mandates; available appropriations; intergovernmental agreements between federal, state and territorial entities; international laws, rules and standards, including the Law of the Sea Principles as reflected in the United Nations Convention on the Law of the Sea; national security; and, Presidential directives.

Annual Priorities. The strategy is designed to be revisited biennially (or as needed) to track progress and help identify future needs and actions, in cooperation with the Task Force, other organizations, and the public. A comprehensive process for the development of future reports is being prepared in cooperation with the Task Force and other organizations.

CORAL REEFS — THREATENED ECOSYSTEMS

valuable ecosystems in peril

major threats

regional impacts



CORAL REEFS – ECOSYSTEMS AT RISK

A. CORAL REEFS ARE VALUABLE ECOSYSTEMS

Coral reefs and their associated sea grass and mangrove habitats are among the most diverse and valuable ecosystems on Earth. These reef systems are storehouses of immense biological wealth and provide economic and environmental services to millions of people as shoreline protection, areas of natural beauty, recreation and tourism, and sources of food, pharmaceuticals, jobs, and revenues. According to one estimate, these *rainforests of the sea* may provide good and services valued at \$375 billion each year – an amazing figure for an ecosystem that covers less than one percent of the Earth’s surface (Costanza et al., 1997).

The U.S. has significant interests in protecting our Nation’s coral reef ecosystems. U.S. coral reefs cover approximately 17,000 square kilometers of the U.S. Exclusive Economic Zone (EEZ). Current estimates suggest that approximately ninety percent of U.S. reefs are located in the Western Pacific (i.e. Hawaii, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands); the remainder is located near Florida, Texas, Puerto Rico and the U.S. Virgin Islands. In addition, reef habitats play a central cultural role in many U.S. islands, where community-based management, subsistence fisheries, and protected areas have historically been part of local culture and practice.

The U.S. also has interests in helping to protect coral reef ecosystems internationally. Healthy marine ecosystems are critical to U.S. efforts to promote economic and food security, social stability, democratic governance, improved human health, disaster and climate change mitigation, and biodiversity conservation in many countries. Coral reef ecosystems have great economic, social and cultural importance to many Nations and entire regions (Best et al 2002; Cesar 2000). These valuable ecosystems constitute the economic and biological foundation for sustainable development in many countries, particularly small island nations.

In addition, the health and value of many U.S. coral reefs depends on the condition of reef ecosystems in other countries. For example, juvenile corals, fish, and other reef species are carried by currents from the broader Caribbean and Central America to U.S. coral reefs in Puerto Rico, the U.S. Virgin Islands and Florida. This “seeding” of U.S. reefs from non-U.S. is important to sustaining healthy U.S. reef systems. These currents can also carry potentially harmful pollutants and diseases, further emphasizing the need for sound ocean and coastal management internationally. Similarly, the coral reefs of many of the U.S. Pacific territories are

connected to those of other Indo-Pacific reefs. Conserving coral reefs is a challenge of global dimensions.

Coral reefs provide a vast array of valuable services to the Nation and the world (Cesar 2000). For example:

- TOURISM** -- The tourism industry is one of the fastest growing sectors of the global economy. U.S. coral reefs are a major destination for snorkelers, scuba divers, recreational fishers, boaters and sun seekers. Diving tours, fishing trips, hotels, restaurants, and other businesses based near reef systems provide millions of jobs and contribute billions of dollars in tourism-dependent revenue annually in many U.S. regions. Recent studies show that millions of people visit coral reefs in the Florida Keys every year, and these reefs support significant economic activity through sales, income and employment. For example, over 3.6 million people participated in a reef-related activity in the Florida Keys coral reefs of Monroe County in 2001. These reefs supported \$363 million in sales, \$106 million in income, 8,000 jobs and an asset value of \$1.8 billion. Overall for southeast Florida's coral reefs, 18 million people participated in reef related activities during 2001, and these reefs are estimated to have an asset value of \$7.6 billion (Johns et al., 2001).
- **FISHING** – Approximately 50 percent of all federally managed fisheries species depend on coral reefs for part of their life cycle (*TASK FORCE Coastal Uses Working Group Summary Report*, 1999). The annual dockside value of commercial U.S. fisheries from coral reefs is over \$100 million (NOAA/National Marine Fisheries Service). The annual value of reef-dependent recreational fisheries probably exceeds \$100 million per year. In developing countries, coral reefs contribute about one-quarter of the total fish catch, providing critical food resources for tens of millions of people (Cesar 2000).
 - **COASTAL PROTECTION** -- Coral reefs buffer adjacent shorelines from wave action and prevent erosion, property damage and loss of life. Reefs also protect the highly productive mangrove fisheries and wetlands along the coast, as well as ports and harbors and the economies they support. Globally, half a billion people are estimated to live within 100 kilometers of a coral reef and benefit from its production and protection.
 - **BIODIVERSITY** -- Reefs support more species per unit area than any other marine ecosystem, including about 4,000 documented species of fish, 800 species of hard corals and hundreds of other species. Scientists estimate that there may be another 1 to 8 million undiscovered coral reef species (Reaka-Kudla 1997). In many ways, coral reefs rival and surpass tropical rainforests in their biological diversity and complexity. This biodiversity may be a source of natural products derived from reef dwelling organisms. Many pharmaceuticals are now under development from coral reef animals and plants as possible cures for cancer, arthritis, human bacterial infections,

viruses, and other diseases. Coral reef ecosystems are considered to be a key source of natural compounds for new medicines for the 21st century.

- **NATURAL HERITAGE** -- Coral reefs are an important part of our natural heritage, rivaling the longevity and complexity of some treasured land-based ecosystems like old growth forests, Joshua trees, Sequoia trees, Saguaro cacti, and other ancient features. For example, a well-developed reef may be the manifestation of thousands of years of incremental accretion by its resident coral colonies, sometimes growing outwards only millimeters each year. Many coral species have no known limit on colony size or age and can thus continue growing indefinitely in favorable habitats. As a result, some of the largest individual coral colonies found on U.S. reefs today were almost surely alive centuries ago, long before modern uses and pressures developed. The scientific, aesthetic and conservation values of such ancient animals and their complex biogenic habitats are unparalleled in the world's oceans, and indeed on land as well. These are truly living museums of the world's marine biological diversity.

B. MAJOR THREATS TO CORAL REEF ECOSYSTEMS

The value of coral reefs to the Nation is matched only by their vulnerability to harmful environmental changes, particularly those resulting from human activities. In 2000, the Global Coral Reef Monitoring Network estimated that 27 percent of all coral reefs were effectively lost; a total of 40 percent of the world's coral reefs may be lost by 2010, particularly those near human populations; and, if current pressures continue unabated, 58 percent may be lost completely by 2030 unless urgent management action is taken to reduce human impacts on reef ecosystems (Wilkinson 2000).

Over the past decade, many expert groups have documented and evaluated the growing number of anthropogenic threats to coral reefs, and possible management solutions to reduce these threats (Bryant 1998; Wilkenson 2000; Burke 2002; Best et al. 2002; Schuttenberg 2001; Turgeon et al 2002). The U.S. Coral Reef Task Force identified 7 specific and widely accepted threats as being particularly important, and tractable, for immediate action by its member agencies and non-governmental partners:

- **POLLUTION**, including eutrophication and sedimentation from poor or overly intensive land use, chemical loading, oil and chemical spills, marine debris and invasive alien species.
- **OVER-FISHING AND OVER-EXPLOITATION** of coral reef species for recreational and commercial purposes, and the collateral damage and degradation to habitats and ecosystems from fishing activities.
- **HABITAT-DESTRUCTION AND HARMFUL FISHING PRACTICES**, including those fishing techniques that have negative impacts on coral reefs and associated habitats. This can include legal

techniques such as traps and trawls used inappropriately, as well as illegal activities such as cyanide and dynamite fishing.

- **DREDGING AND SHORELINE MODIFICATION** in connection with coastal navigation or development.
- **VESSEL GROUNDINGS AND ANCHORING** that directly destroy corals and reef framework.
- **DISEASE OUTBREAKS** that are increasing in frequency and geographic range are affecting a greater diversity of coral reef species.
- **GLOBAL CLIMATE CHANGE** and associated impacts including reduced rates of coral calcification, increased coral bleaching and mortality (associated with variety of stresses including increased sea surface temperatures), increased storm frequency, and sea level rise.

C. RANKING OF MAJOR THREATS TO CORAL REEF ECOSYSTEMS BY REGION

In developing this strategy, NOAA worked closely with representatives from the U.S. Coral Reef Task Force, regional managers, scientists and others to identify the major threats or causes of reef decline and loss in each region as a first step in understanding the key problems to be addressed in each area. The results of this assessment are shown in Table 1.

Table 1 provides a general summary of the relative impact (H = high, M = medium, L = low) of natural and human-related threats to U.S. and international coral reefs in each region. The rankings were provided by regional scientists and managers, and representatives to the U.S. Coral Reef Task Force, for use in this report and the first biennial report on the status of U.S. coral reef ecosystems (Turgeon et al 2002).

Please refer to the Table for specific rankings of threats in each region or jurisdiction. In general, the Table illustrates that:

- The relative impact of different threats varied by jurisdiction and region.
- Some jurisdictions had a few high impact threats; most indicated 6-7 of the 13 threats having high impact.
- Some threats are consistently ranked as having high to medium impact on reefs across most regions (e.g., coastal development and run-off; coastal pollution; fishing; ships, boats and groundings).

- Some threats are of high concern in some regions but not others (e.g., diseases are high concern in the Atlantic/Caribbean, but low concern in the Pacific).
- Some threats were ranking as currently having relatively low impact (e.g., offshore oil and gas exploration).

Although the actual impacts of each threat will vary within and between regions depending on conditions, location and other factors, this information is critical to developing effective local, regional and national efforts to address threats to coral reef ecosystems.

NATIONAL CORAL REEF ACTION STRATEGY

priority actions

mapping

monitoring

research

social /
economic

MPAs

fishing

coastal uses

pollution

restoration

education

global action

international trade

coordination



NATIONAL CORAL REEF ACTION STRATEGY

This strategy is divided into two major themes based on the National Action Plan to Conserve Coral Reefs: (1) Understand Coral Reef Ecosystems and (2) Reduce Human Impacts to Coral Reef Ecosystems.

Under these themes, the strategy includes thirteen major goals to guide U.S. action to address the most serious threats to U.S. and international coral reefs. For each goal, the document outlines (1) the importance of the goal in addressing the major threats to reefs, (2) the strategy and major objectives, (3) a partial summary of recent accomplishments to address the goal, and (4) a partial summary of actions needed in 2002-2003 to implement the strategy and achieve the goal and objectives.

Information for the strategy was produced in cooperation with the Working Groups of the Task Force and state, territory and commonwealth representatives of the All Islands Coral Reef Initiative. It is intended to provide brief summaries and access to additional information. It is not intended to be a comprehensive list of accomplishments or future needs. More comprehensive information is available from the member organizations and Working Groups of the Task Force (see <http://coralreef.gov/> or Appendix B for list of contacts), the All Islands Coral Reef Initiative, and other sources and organizations involved in coral reef conservation activities.

The strategy is designed to be revisited biennially (or as need) to track progress and help identify future needs and actions, in cooperation with the Task Force and other organizations, constituents and the public. A comprehensive process for the development of future reports is being prepared in cooperation with the Task Force.

A. ROLE OF MANAGEMENT ACTIONS IN REDUCING THREATS TO CORAL REEFS.

Table 2 is a general summary of the relative importance (H = high, M = medium, L = low) of the Strategy's 13 major goal areas in reducing threats to coral reef ecosystems. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input from the Working Groups and contacts of the U.S. Coral Reef Task Force, the All Islands Coral Reef Initiative and other

sources. The actual importance of each goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

The results illustrate that some actions are currently considered high priority to address many threats, while others are high priority for addressing specific impacts on reefs. For example, goal areas identified as high priority actions to address many threats included:

- Assess and Monitor Reef Health;
- Understand Social and Economic Factors;
- Improve Education and Outreach;
- Reduce Threats to International Reefs; and
- Improve Coordination and Accountability.

B. ASSESSMENT OF PRIORITY ACTIONS TO REDUCE THREATS TO U.S. CORAL REEFS

Table 3 is a general summary of the relative importance (H = high, M = medium, L = low) of actions under the goals and objectives outlined in the strategy, to address key threats to U.S. coral reef ecosystems in each region. The rankings were provided by official state, territory or commonwealth representatives to the U.S. Coral Reef Task Force in each region for use in this document.

A higher ranking suggests that conducting activities under the goal and objectives are considered more important to addressing current threats to coral reefs in the region. Lower rankings suggest that although activities under the goal or objective may make significant contributions, they are currently less important to address the major threats to coral reefs in the region. The actual importance of each goal to addressing threats to reefs will depend on conditions, location and other factors.

In general, the results illustrate that the priority ranking of actions to address the goals varies among regions, although some goal/action areas consistently ranked as high priority needs across most or all regions to reduce threats to coral reefs. The following goal or action areas were ranked as high priority needs by all or most U.S. regions:

- Map all shallow U.S. coral reefs;
- Monitor and assess reef conditions (living resources);
- Monitor and assess reef conditions (assess water and substrate quality);
- Improve use of marine protected areas (strengthen existing marine protected areas);
- Reduce adverse impacts of fishing (reduce overfishing);
- Reduce pollution (reduce sediment pollution);
- Improve education and outreach (increase awareness); and
- Reduce international threats to reefs (increase capability for resource management).

C. ASSESSMENT OF PRIORITY ACTIONS TO REDUCE THREATS TO INTERNATIONAL CORAL REEFS.

Table 4 is a general summary of the relative importance (H = high, M = medium, L = low) of actions under the goals and objectives (outlined in the strategy) to address key threats to international coral reef ecosystems by region. The rankings were provided by official representatives to the International working group of the U.S. Coral Reef Task Force for use in this document. A higher ranking suggests that conducting activities under the goal and objectives are considered more important to addressing current threats to coral reefs in the region. Lower rankings suggest that although activities under the goal or objective may make significant contributions, they are currently less important to address the

major threats to coral reefs in the region. The actual importance of the goals or objectives in addressing threats to reefs will vary within and between regions depending on conditions, location and other factors. The results illustrate that (1) actions to address the goals vary in their priority among regions, and (2) there are some actions considered high priority across many regions (e.g., monitor and assess reef conditions, monitor global warming, reduce overfishing, reduce pollution, reduce threats to international reefs, reduce impacts from international trade, and strengthen existing MPAs).

D. ACTION THEME 1: UNDERSTANDING CORAL REEF ECOSYSTEMS

Coral reefs are imperiled throughout many areas (Bryant et al 1998; Wilkenson 2000; Turgeon et al 2002). Threatened by a growing number suite of natural and anthropogenic stresses, including nutrient over-enrichment, sedimentation, over-fishing, climate change, bleaching, disease and habitat destruction, coral reef ecosystems are deteriorating worldwide at alarming rates. The origin and impacts of these threats range from very localized and potentially manageable events, such as resource extraction or coastal development, to poorly understood global phenomena affecting entire ocean basins (e.g. climate change, bleaching and disease)(Best et al 2002). The challenge of interpreting, predicting and responding to such stressors on coral reefs is further exacerbated by the complexity and variability of reef ecosystems in space and time. Adjacent reefs on the same coastline may be inexplicably different, while a single reef may cycle through significant changes in composition and health in response to unknown events.

Ultimately, our success – or failure – in conserving these highly complex and valuable ecosystems will depend on how well we can develop and apply proactive, precautionary management measures. To do this requires a much more sophisticated level of understanding about their fundamental ecology and response to environmental stressors. As this knowledge base evolves, it will provide invaluable support for management actions such as the siting of new marine protected areas or the development of more effective pollution standards.

To achieve this level of management will require a coordinated effort to determine the status of coral reefs, the causes of coral reef decline, or the impact of natural and anthropogenic stress on coral reef and associated ecosystems (Best et al 2002). To meet these needs, this portion of the strategy builds on the same four goals adopted by the U.S. Coral Reef Task Force in its National Action Plan to increase understanding coral reef ecosystems to implement long-term conservation measures:

- Goal 1: Map All U.S. Coral Reefs;
- Goal 2: Assess, Monitor and Forecast Coral Reef Health;
- Goal 3: Conduct Strategic Research; and
- Goal 4: Understand Social and Economic Factors.

GOAL 1: MAP ALL U.S. CORAL REEF ECOSYSTEMS

KEY THREATS ADDRESSED:

Mapping coral reefs will help address and reduce a number of key threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in reducing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global Warming/ Climate Change	Diseases	Hurricanes/ Typhoons	Extreme Biotic Events	Overfishing	Destructive Fishing Practices	Habitat Destruction	Invasive Species	Coastal Development	Coastal Pollution	Sedimentation & Runoff	Marine Debris	Overuse from Tourism	Vessel Groundings	Vessel Discharges
Map All U.S. Coral Reef Ecosystems	M	M	L	L	H	M	H	L	H	H	M	L	M	M	L

RATIONALE FOR ACTION:

Accurate geo-referenced information on the exact location of specific natural resources and habitat types is essential for effective management of any marine habitat. This need is particularly acute for coral reef ecosystems where reef-dwelling communities may be very different over short distances and where the consequences of misinformed management decisions, such as the placement of potentially harmful human activities, can have devastating and lasting ecological consequences. Comprehensive maps and habitat assessments form the foundation for a variety of reef conservation measures including: creating accurate baselines for long-term monitoring; identifying and protecting essential fish habitat; illustrating important community-scale trends in coral reef ecosystem conditions over time; characterizing habitats for place-based conservation measures such as marine protected areas (MPAs); and enabling scientific understanding of the large-scale oceanographic and ecological processes affecting reef

health. Habitat maps will also help managers predict the impacts of natural and anthropogenic stresses such as disease outbreaks, hurricanes, harmful algal blooms, oil spills, vessel groundings, and coastal pollution, run-off, and development. Thus recent, accurate, and carefully designed mapping products are a cornerstone of most coral reef ecosystem conservation and management efforts.

MAPPING STRATEGY:

The strategy to achieve this goal is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the Mapping and Information working group of the U.S. Coral Reef Task Force. For more detailed information see <http://coralreef.gov/>. The mapping strategy outlines four major objectives to (1) produce comprehensive digital maps of all shallow (< 30 meters) coral reefs and (2) characterize priority deep water (> 30 meter) reef systems in the U.S. and Trust Territories by 2009.

- Objective 1: Develop high-resolution benthic maps and coastline surveys of local and regional coral reef ecosystems using satellites, aircraft, and *in situ* surveys, with particular emphasis on MPAs, reefs at risk of degradation due to human activities, and other priority sites identified by the U.S. Islands representatives.
- Objective 2: Develop large-scale, low-resolution maps of broad coral reef ecosystems throughout U.S. waters using satellites and other remote sensing assets for use in characterizing habitats, designing monitoring programs, and planning regional conservation measures such as MPAs.
- Objective 3: Develop and adapt new technologies and data sources to enhance coral reef ecosystem mapping, survey, and assessment capabilities to detect important ecological changes and trends.
- Objective 4: Characterize priority deep water reefs and associated habitats.

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments to achieve the objectives. The information was provided by the Mapping and Information Working Group of the U.S. Coral Reef Task Force. Efforts to map and characterize shallow coral reef ecosystems (< 30 m) have been implemented by multiple partners using a range of technologies based on the Mapping and Information working group implementation plan (see <http://coralreef.gov>). Some

characterization of deep coral reef areas (> 30 m) has also been initiated, although a comprehensive implementation plan has not been developed for characterizing deep reef areas.

General Accomplishments:

- Published *A Strategy to Map State, Commonwealth, Territory, and Freely Associated State Coral Reef Ecosystems in the U.S.* (see <http://coralreef.gov>). (Mapping and Information Working Group)
- Published the *Coral Reef Mapping Implementation Plan: Mapping and Information Synthesis Working Group of the U.S. Coral Reef Task Force* (see <http://coralreef.gov>). (Mapping and Information Working Group)

Objective 1 Accomplishments:

- Completed mapping and produced and distributed Geographic Information System (GIS) maps and associated metadata of the shallow-water coral reef ecosystems of the U.S. Virgin Islands and for Puerto Rico. (NOAA and partners)
- Collected ship-based sidescan and multibeam data for selected areas under consideration for inclusion in the Tortugas Ecological Reserve (Florida Keys coral reef ecosystem). These data are currently being processed into digital map products. (NOAA and partners)
- Conducted geological research and related site specific mapping of coral reefs in the Florida Keys. (DOI)
- Obtained high-resolution satellite imagery and high-altitude hyperspectral data over portions of the Northwestern Hawaiian Islands (NWHI) and determined the location of land areas in the NWHI. (NOAA, NASA)
- Gathered over 1,100 site-specific seabed characterizations, including Geographic Positioning System, (GPS) water depth, and seabed habitat information, and Remotely Operated Vehicle (ROV) imagery, for the shallow-water coral reef ecosystems and bank areas in the NWHI. (NOAA, DOI, University of Hawaii)
- Developed and tested computer-based analyses of high-resolution satellite imagery to generate estimated shallow-water bathymetry. (NOAA)
- Obtained high-resolution satellite imagery for islands of American Samoa, Guam, all of the islands of the Commonwealth of the Northern Marianas, and Howland Island, Baker Island, and Jarvis Islands. Imagery has been ordered for Palmyra Atoll. (NOAA, DOI and partners)
- Initiated the processing of the high-resolution and moderate-resolution satellite imagery of U.S. flag and freely associated states in the Pacific. This processing will be completed in 2002-2003. (NOAA and partners)
- Conducted multi-beam mapping of the seafloor at 5 locations in American Samoa. (NOAA and partners)

Goal 1: Map all shallow U.S. reefs

- Completed first phase of updating coastal atlas in Guam. (Guam)
- Conducted baseline assessment and mapping of coral reefs on the eastern end of Vieques, Puerto Rico. (DOD)

Objective 2 Accomplishments:

- Developed the first generation of a global, low-resolution, global ocean color map using SeaWiFS satellite imagery. This map depicts areas where ocean color may be indicative of shallow-water habitats, including sand and water containing chlorophyll. These data are available online by visiting (<http://seawifs.gsfc.nasa.gov/reefs>). (NASA)
- Acquired aerial photographs, digital hyperspectral images, and high-altitude AVIRIS hyperspectral data for portions of the eight main Hawaiian Islands. Established cooperative programs with the university and private sector to conduct the in-situ data gathering efforts and develop the draft coral reef maps for portions these areas. (multiple partners)
- Analyzed comparative advantages of aerial photography and hyperspectral imagery for mapping shallow-water coral reefs in Hawaii (see accomplishment report for results). (multiple partners)
- Obtained moderate-resolution satellite imagery of Guam, Commonwealth of the Northern Mariana Islands (CNMI), portions of American Samoa, Palmyra Atoll, and Wake Island. (NOAA, DOI)
- Obtained moderate-resolution satellite imagery of portions of the Republic of the Marshall Islands, Federated States of Micronesia, and the Republic of Palau. (multiple partners)

Objective 3 Accomplishments:

- Developed a web-based tool for accessing digital aerial photography of USVI and Puerto Rico coral reefs (see <http://biogeo.nos.noaa.gov/benthicmap/caribbean>). (NOAA and partners)
- Developed classification schemes for identifying seabed habitats visible in digital imagery in the Caribbean, main Hawaiian Islands, the Northwestern Hawaiian Islands and portions of American Samoa (Fagatele Bay National Marine Sanctuary). (NOAA and partners)

Objective 4 Accomplishments:

- Completed multi-beam sonar mapping of major areas of the Northeastern Gulf of Mexico, including the new Madison-Swanson and Steamboat Lumps Marine Protected Areas. These areas were recently protected as important habitats for commercial reef fishes and contain some deep reefs that may rival those found in the Flower Gardens National Marine Sanctuary. (NOAA and partners)

IMPLEMENTATION PLAN 2002-2003

The Mapping and Information Synthesis working group of the U.S. Coral Reef Task Force is continuing to coordinate efforts to map all shallow U.S. coral reef ecosystems by 2007. A detailed implementation plan is available at <http://coralreef.gov/>. Successful implementation of the plan will require the continued support, commitment and collaboration of federal, state, and territorial agencies. The following is a partial summary of key actions needed from government and non-governmental entities in FY 2002 –2003 to help fulfill the goal and objectives.

To address Objective 1.

- Distribute a CDROM-based digital data product containing GIS maps and associated metadata of the shallow-water coral reef ecosystems of the USVI and Puerto Rico.
- Expand the existing web-based tool for the coral reefs ecosystems of the USVI and Puerto Rico to include downloadable coral reef maps and photo-mosaics.
- Complete coral reef ecosystem maps for 30 percent of the coast of the eight main Hawaiian Islands and initiate map production for the remaining areas.
- Initiate a project to produce coral reef maps for all shallow-water coral reefs of the eight main Hawaiian Islands.
- Process high-resolution and moderate-resolution satellite imagery for coral reef mapping activities in the NWHI and other Pacific areas.
- Improve the computer-based analysis of high-resolution and moderate-resolution satellite imagery to generate coral reef ecosystem maps and estimated shallow-water bathymetry.
- Acquire high-resolution satellite imagery of a portion of the Republic of Palau and make geo-referenced coral reef ecosystems maps and imagery and maps available to the government of the Republic of Palau and its partners.
- Develop a plan for acquiring shallow to moderate depth bathymetric data for priority areas in the NWHI.
- Assess the usefulness of manta-tow video imagery from the Northwestern Hawaiian Islands for shallow-water coral reef mapping efforts.

To address Objective 2:

- Update and reprint the nautical charts of the NWHI.
- Acquire additional moderate-resolution satellite imagery of U.S. Pacific islands and freely-associated states in the Pacific.

Goal 1: Map all shallow U.S. reefs

- Acquire satellite imagery of other U.S. flag islands, such as Wake Atoll, Johnston Atoll, and Kingman Reef in the Pacific, and Navassa in the Caribbean.

To address Objective 3:

- Develop a plan to revise and update the coral reef ecosystem maps of the Florida Keys using new technologies to improve detail and accuracy.
- Conduct research to determine the ability to map using hyperspectral and Ikonos sensors for mapping and characterizing reefs.

To address Objective 4:

- Identify, prioritize key sites and complete a 3 year plan for mapping U.S. deep-water coral reef ecosystems.
- Launch deep-water coral reef mapping efforts in the NWHI and USVI.
- Complete priority deepwater reef mapping projects: *Oculina* Research Reserve in Federal waters off the East Coast of Florida; Madisson Swanson Reserve off the West Florida Shelf, and Hind Bank Reserve off the USVI.

GOAL 2: ASSESS AND MONITOR CORAL REEF HEALTH

KEY THREATS ADDRESSED

Assessing and monitoring coral reef conditions is important to understanding and reducing many threats to these ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global warming/ climate change	Diseases	Hurricanes/ Typhoons	Extreme biologic Events	Overfishing	Destructive Fishing Practices	Habitat Destruction	Invasive Species	Coastal Development	Coastal Pollution	Sedimentation/ Runoff	Marine Debris	Overuse From Tourism	Vessel Groundings	Vessel Discharges
Assess & Monitor Reef Health	H	H	L	M	H	H	H	H	H	H	H	M	H	M	M

RATIONALE FOR ACTION

Successful coral reef ecosystem conservation requires adaptive management that responds quickly to changing environmental conditions. This, in turn, depends on monitoring programs that track trends in coral reef ecosystem health and reveal patterns in their condition – before irreparable harm occurs. Monitoring can also play a vital role in guiding and supporting the establishment of complex or potentially controversial management strategies such as no-take ecological reserves, fishing gear restrictions, or habitat restoration, by documenting the impacts of gaps in existing management schemes and illustrating the effectiveness of new measures over time. Long-term monitoring is also required to determine the effectiveness of various

management strategies to conserve and enhance our coral reef ecosystems. A rigorous monitoring and assessment program will contribute to and improve coral reef conservation efforts by:

- Documenting the status of ecologically and economically important reef species.
- Assessing and tracking changes in reef communities in response to environmental stressors or specific human activities and uses.
- Evaluating the effectiveness of specific management strategies and identify actions for future adaptive responses.
- Evaluating the natural recovery and/or restoration of injured or degraded reefs.
- Enabling informed decisions about the location of potentially harmful activities by providing baseline data on community composition and predicted ecosystem response.
- Providing baselines for assessing catastrophic damage from natural or anthropogenic events such as storms, diseases, climate change, coral bleaching, vessel groundings, and toxic spills.
- Serving as an early warning system for identifying declines in coral reef ecosystem health.

The Task Force National Action Plan calls for a coordinated national program to assess, inventory and monitor the health of U.S. coral reef ecosystems. This monitoring-based goal is directly linked to the goal to map all U.S. coral reefs as the digital benthic habitat maps aid in designing and implementing local, regional, and national monitoring programs. Many of the research-based activities also complement or are directly linked to on going monitoring programs within the states, territories, commonwealths, and the Federal Government. As government and non-governmental partners continue to integrate coral mapping, research, and monitoring studies into a national monitoring effort, the nation's ability to assess coral reef conditions will continue to increase.

ASSESSMENT AND MONITORING STRATEGY

The strategy to achieve this goal is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the Monitoring subgroup of the U.S. Coral Reef Task Force. For more information see <http://coralreef.gov/>. The strategy includes the following three major objectives:

- Objective 1: Working closely with partners and stakeholders, develop and implement a nationally coordinated, long-term program to inventory, assess and monitor U.S. coral reef ecosystems.
- Objective 2: Develop a web-enabled data management and information system for U.S. reef monitoring and mapping data, with user-friendly GIS-based mapping and

querying capability to present complex information in usable formats to all potential users, while ensuring the security of sensitive place-based biological or cultural resource data.

Objective 3: Develop and produce a biennial report on the State of U.S. Coral Reef Ecosystems.

SUMMARY OF ACCOMPLISHMENTS (2001)

In 1999, 50 of the Nation's coral reef managers and scientists drafted a detailed implementation plan for *A National Program to Assess and Monitor Coral Reef Ecosystems* (National Program) in FY 1999. In FY2000, NOAA facilitated a workshop for 60 coral reef managers to evaluate the relative importance of environmental threats impacting local reefs and prioritize management needs (e.g., biotic inventories monitoring, research, mapping, and assessments of the sources and extent of reef degradation). These managers endorsed the National Program plan. The following is a partial summary of recent accomplishments to begin implementing the plan and achieving the objectives.

Objective 1 Accomplishments:

- Developed standardized monitoring techniques for National Parks with coral reefs, including bilingual monitoring manuals, fish survey methods, video transect techniques and water quality assessment protocols. (DOI)
- Characterized reef fish distribution and abundance in USVI National Monuments to develop baseline data to track condition of the reef fish community. (NOAA, DOI)
- Continued grant support to U.S. Islands monitoring programs that fill nationwide monitoring gaps, helped build capacity for long-term coral reef monitoring, and supported the formation of a coordinated nationwide monitoring network. (NOAA, DOI)
- Completed a comprehensive survey of projects/programs monitoring coral reef ecosystems and related habitats (i.e. seagrass beds and mangrove forests) in the US Caribbean and Pacific. (NOAA and partners)
- Added new monitoring stations to NOAA's "early warning" coral reef monitoring program to provide real-time *in situ* meteorological and oceanographic data on coral reef bleaching and other coral reef conditions by installing buoys in the Caribbean and NWHI. (NOAA and partners)
- Improved the resolution and accuracy of satellite-based near-real-time coral reef bleaching products and augmented existing products with sea surface time-series charts for select locations. (NOAA and partners)

Goal 2: Assess, Monitor and Forecast Reef Health

- Completed an “Ecosystem Report Card” on the coral reef ecosystem of the Florida Keys National Marine Sanctuary. (NOAA, EPA, DOI, Florida, academic and other partners).
- Continued assessment and monitoring in the NWHI and Line & Phoenix Islands and collected initial survey data to assess the impact of bottomfishing on the Raita and West St. Rogatien Reserve Preservation Areas (RPAs) in the NWHI Coral Reef Ecosystem Reserve. (NOAA, DOI and partners)
- Continued monitoring of coral reef ecosystems in the Pacific Remote Islands National Wildlife Refuges (Howland, Baker, Jarvis, Palmyra Atoll and Kingman Reef). (DOI)
- Developed assessment techniques for the NWHI as part of the overall effort to inventory the biodiversity of shallow-water reef biota around each of the 10 NWHI and to map the coral reef habitats in this remote area. (NOAA, DOI and partners).
- Supported rapid assessments and coral reef inventories with community based monitoring effort Reef Check in Guam. (NOAA and partners)
- Developed Guam State of the Reef report. (Guam)
- Developed and implemented a long-term coral reef inventory, assessment and monitoring program, and development of State of the Reef report, in Commonwealth of the Northern Marianas Islands. (CNMI)
- Implemented monitoring survey of reefs in the Southern Islands (Siapan). (CNMI)
- Conducted fish and benthic habitat assessments and monitoring in the Florida Keys, the USVI, Puerto Rico and live bottom habitats in the Gulf and Atlantic. (NOAA, EPA and partners)
- Continued comprehensive monitoring of the Florida Keys National Marine Sanctuary and conducted four cruises to perform baseline surveys of the Tortugas Ecological Reserve to determine the influence of the Reserve status on fish communities, food web and habitat structure and function. The Baseline Multi-species Coral Reef Fish Stock Assessments revealed that 40 percent of the individual stocks are overfished. (NOAA and partners)
- Monitored and evaluated the recovery of West Atlantic reef species that are candidates for listing under the Endangered Species Act. (NOAA and partners)
- Established 10 new monitoring sites and began fish census work in USVI. (NOAA and partners)
- Continued support and provided technical assistance to volunteer monitoring programs designed to assess the biodiversity, abundance, and condition of coral, algae, and fish, detect anthropogenic impacts to reefs, and provide early warning of bleaching, disease, and other extreme biotic events. (multiple partners)
- Conducted annual coral reef monitoring at Farallon de Medinilla, CNMI, and provided assistance to the U.S. Navy to monitor impacts of training activities. (DOI)

Objective 2 Accomplishments:

- Developed prototype Coral Reef Information System (CoRIS) to provide a single web portal for public access to all NOAA (and other) information on coral reefs including reef assessments, inventories, monitoring and mapping data. (NOAA)

Objective 3 Accomplishments:

- Drafted the first-biennial report on The Health of U.S. Coral Reef Ecosystems. (NOAA and partners)

IMPLEMENTATION PLAN 2002-2003

The following is a partial summary of key actions needed from government and non-governmental entities in FY 2002-2003 to help fulfill the goal and objectives. More detailed information is available from the monitoring subgroup (Ecosystem Science and Conservation Working Group) or member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>). The plan is to continue development of the national program to assess, inventory, and monitor US coral reef ecosystems in 2002-2003. A major activity over the next year is to work with partners to better define a set of data standards and common monitoring protocols to develop a nation-wide ability to track and assess reef condition over time, between sites, and even among regions on a nation-wide scale. The partnership-based program is also attempting to develop a suite of metrics that can be relatively easily monitored and reported on in a national biennial report on the state of U.S. coral reefs.

To address Objective 1:

- Develop information for the collection of nation-wide monitoring data and expand monitoring capacity of U.S. and territories through competitive, cooperative monitoring grants.
- Continue status and trend monitoring of water quality, coral reefs, and seagrasses in the Florida Keys coral reef ecosystem.
- Finalize the U.S. Coral Reef Ecosystem Monitoring GIS database.
- Continue to monitor resource changes in protected areas over time to evaluate effectiveness of the management (e.g., monitoring of protected zones in the Florida Keys National Marine Sanctuary).
- Enhance satellite-based coral bleaching monitoring and prediction capabilities by improving accuracy and resolution of existing products and incorporating satellite derived ocean wind and color information in the derivation of bleaching indices.

Goal 2: Assess, Monitor and Forecast Reef Health

- Initiate a program to use high resolution satellite data to quantify sea surface temperature induced coral reef bleaching recovery rates and mortality.
- Expand “early warning” *in situ* coral reef bleaching and health monitoring system by establishing additional water-based monitoring systems in the Virgin Islands and American Samoa, adding pollution sensors to existing monitoring platforms, and developing additional satellite-based health indices.
- Revise management regimes and develop a coral reef GIS database for the NWHI using Hawaii Coral Reef Initiative (HCRI) research and assessment data, and coordinate this database with CoRIS.
- Assess bottomfish populations at two bottomfishing reserves in NWHI and begin monitoring the impacts of bottom fishing on coral reef ecosystems.
- Conduct major assessment and monitoring cruises to American Samoa in 2002 and Guam and CNMI in 2003.
- Continue reef fish ecology program in the Caribbean to increase understanding of linkages between coral health and fisheries productivity. Initiate similar studies in Hawaii to support marine protected area evaluation.
- Compile ongoing Caribbean fisheries research in a comprehensive report on the status and trends of Caribbean fish populations.
- Continue status and trends monitoring of water quality, corals, fishes and seagrasses and zone monitoring in the Florida Keys NMS.
- Publish the National Coral Reef Initiative (NCRI) Proceedings of the International Conference on Scientific Aspects of Coral Reef Assessment, Monitoring, and Restoration that identifies major monitoring gaps and reports on the effectiveness of restoration techniques.
- Collect historical paleoclimate records of past coral conditions at the same locations as near-real-time monitoring system sites to provide long-term perspective on observed changes in coral health.

To Address Objective 2:

- Launch the first version of NOAA’s CoRIS in FY2002 and merge existing and new coral reef data, including library documents, into this system, while ensuring the security of sensitive place-based biological or cultural resource data.
- Support use and development of systems to provide access to coral reef data and information from variety of government and non-governmental sources.

To Address Objective 3:

- Publish the first biennial report on the “Status of U.S. Coral Reefs 2001”.

Goal 2: Assess, Monitor and Forecast Reef Health

- Work with government and non-governmental partners to develop status report on United States coral reefs 2003.

GOAL 3: CONDUCT STRATEGIC RESEARCH

KEY THREATS ADDRESSED

Conducting strategic research provides information critical to reducing key threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global warming/ climate change	Diseases	Hurricanes/ typhoons	Extreme biologic events	Overfishing	Destructive fishing practices	Habitat destruction	Invasive species	Coastal Development	Coastal pollution	Sedimentation & runoff	Marine debris	Overuse from tourism	Vessel groundings	Vessel discharges
Conduct Strategic Research	H	H	M	H	H	M	M	M	H	H	H	L	M	L	L

RATIONALE FOR ACTION

The underlying causes of reef decline are diverse and include over-exploitation, pollution and sedimentation, habitat destruction, invasive species, increasingly severe bleaching events, disease outbreaks and global climate change. These and other key processes remain only partially understood, and this paucity of knowledge hampers effective management actions needed to conserve and sustainably manage coral reef ecosystems. For instance, it is clear that new diseases are emerging at an accelerated rate, and mortality from disease has modified the structure and composition of coral reefs across the Caribbean by removing common and locally abundant species. However, most diseases have not been critically or thoroughly characterized, disease etiologies remain largely unknown, and most cause and effect relationships are not well documented.

The policy and decision-making processes necessary for effective conservation of reef ecosystems are influenced by equally complex socioeconomic and political systems. Important decisions such as the establishment of MPAs, implementation of fishery regulations, or regulation of coastal development usually cover large spatial scales and may be in effect for long time periods. They involve the integration of a wide range of interlinked considerations, but are often based on limited biophysical and socioeconomic information. The science in support of these decisions is often conducted on much smaller spatial and temporal scales. In many cases the science is highly specialized with results that are difficult to apply directly to policy decisions, or the science may be completely lacking. The ability to halt and reverse degradation of coral reef ecosystems depends on developing a better understanding of the structure and function of coral reef ecosystems, how human activities influence coral reefs, and then using this understanding in making management decisions that sustain and restore coral reef ecosystems.

RESEARCH STRATEGY

The strategy to achieve this goal is outlined in the U.S. National Action Plan to Conserve Coral Reefs and associated documents of the Ecosystem Science and Conservation working group of the U.S. Coral Reef Task Force. This strategy relies on coordinating research among agencies, academia, industry, and NGOs to address the priority research and management needs. The goal is to develop a nationally coordinated research program by fulfilling the following three objectives:

- Objective 1: Conduct a long-term regional and ecosystem-based research program to improve our understanding of processes that govern the structure, function, and health of coral reef ecosystems.
- Objective 2: Build capabilities to address ecosystem-scale threats such as disease, bleaching and other sources of mass mortalities.
- Objective 3: Develop and transfer technology for faster and more accurate mapping, assessment, monitoring, and restoration.

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by members of the U.S. Coral Reef Task Force and other partners to achieve the Strategic Research goal and objectives. Information was provided by the Ecosystem Science and Conservation working group and members of the U.S. Coral Reef Task Force. For more detailed information on accomplishments

Goal 3: Conduct Strategy Research

in this area please see <http://coralreef.gov/> or contact specific members of the U.S. Coral Reef Task Force.

Objective 1 Accomplishments:

- Sponsored \$8 million of new coral reef projects and continued 25 ongoing studies. (NSF)
- Dedicated over \$4M million to support coral reef-related research projects through NOAA's Sea Grant Program and National Undersea Research Program. (NOAA)
- Continued to support the Hawaii Coral Reef Initiative Research Program and the National Coral Reef Institute, programs that bring the scientific community together to focus on critical coral issues. (NOAA)
- Developed and refined a model to track and predict the effects of biotic and physical changes in the (MHI) and the (NWHI) (NOAA, DOI, Hawaii and partners).
- Examined natural processes regulating coral survival and mortality in no-take MPAs and reference areas in the Florida Keys; focused on the effects of predators and disease on juvenile and adult corals (NOAA, DOI).
- Studied movement patterns of commercially important grouper species and provided managers information on juvenile goliath grouper home range, activity areas, habitat and micro-habitat utilization, and seasonal movements (NOAA).
- Deployed current tracking devices to assess how protected areas in the (NWHI) coral reef ecosystem contributes to larval fish transport and recruitment throughout Hawaii (multiple partners).

Objective 2 Accomplishments:

- Developed a pilot Coral Health and Disease Consortium (CHDC) to help coordinate and lead efforts to organize scientific resources to investigate diseases and bleaching of coral reef ecosystems, the effect of anthropogenic, climatic, and natural factors on the transmission of coral diseases and the emergence of new diseases, and the identification of the biotic and abiotic agents responsible for the diseases (NOAA, EPA, DOI, academic and private sector partners).
- Initiated development and testing of a novel environmental biotechnology approach to diagnose cellular and physiological responses of indicator species to environmental stressors (NOAA, academic and private sector partners).
- Continued examining coral disease dynamics and the natural and environmental factors affecting coral defense mechanisms (NOAA, EPA, DOI, industry and academic partners).

- Continued assessing the prevalence of disease and bleaching in the Florida Keys and the effects of various water quality parameters and climate change indices (EPA, NOAA, and academic partners).
- Initiated development of an Index for Biological Integrity to evaluate the condition of coral reef ecosystems (NOAA, NPS, EPA, academic and private sector partners).
- Characterized responses of corals and symbiotic algal cultures to climate change through exposure to altered UV and elevated temperatures (NOAA, EPA, academic and private sector partners).
- Began testing an integrated molecular biomarker system to assess the health of coral reef ecosystems in the Florida Keys (NOAA and partners).

Objective 3 Accomplishments:

- *See accomplishments listed under the following goal areas: Map all U.S. Coral Reefs (p 20), Assess and Monitor Reef Health (p 27); and Reduce Pollution (p 62).*

IMPLEMENTATION PLAN 2002-2003

The Ecosystem Science and Conservation working group of the U.S. Coral Reef Task Force is identifying priority actions to address research needs for effective coral reef conservation and management, working with many partners. The following is a partial summary of key actions to be implemented by a variety of partners in 2002-2003 to help fulfill the goal and objectives. Additional recommendations are outlined in several recent meetings on research priorities in coral reef conservation (International NCORE workshop <http://www.ncoremiami.org/documents.html>, 9th International Coral Reef Symposium). More detailed information is available from the working group or member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>).

To Address Objective 1:

- Increase research on coral reef ecosystem function by initiating a Coral Reef Ecosystem Studies (CRES) program to support management-oriented research to improve understanding of the interactions between human activities and coral health with emphasis on U.S. reefs affected by significant anthropogenic and natural stresses.
- Develop a whole-ecosystem, hypothesis-based approach to rank and monitor the causes of coral reef declines within regions and provide management strategies to reverse or mitigate further degradation.
- Evaluate the reef status and function at little known reef areas such as Navassa Island.
- Increase research on fisheries and coral reefs:
 - Map spatial distribution of trap fishing efforts in the U.S. Caribbean, assess gear techniques of local fishers, and evaluate trap and fishing effects on coral habitat.

Goal 3: Conduct Strategy Research

- Expand and refine Ecopath and similar ecosystem modeling to evaluate options and specific implications of management plans for coral reef resources.
- Improve our understanding of larval pathways, trophic interactions and their ecosystem impacts associated with fishing, as well as habitat impacts associated with certain types of fishing gear and practices.
- Quantify and model the ecosystem effects of fishing, and increase biophysical and socioeconomic knowledge for effective reef fisheries management.
- Increase research to define sustainable yields of larger coral reef fishes and invertebrates.
- Increase research on use of no-take reserves (reserves) and other types of MPAS in coral reef systems:
 - Evaluate herbivory processes on reefs in the FKNMS, including a comparison of no-take reserves and reference sites.
 - Assess the role that existing marine reserves serve as a source of reef fish adults and larvae to repopulate other reef habitats. Assess how reserve size and connectivity affects reserve function.
- Continue evaluation of the ecological health of deep reefs and habitat requirements for deep-water groupers, including recently identified spawning aggregation sites, to guide management efforts to protect habitat utilized by grouper species listed as Candidates for the Environmental Protection Agency (EPA).
- Conduct ecological research on deep water coral assemblages and the surrounding communities, including potential natural products and resources.
- Increase research to understand how reef systems are connected on local to regional scales:
 - Complete a genetic assessment of Caribbean Acroporid populations to determine the genetic relatedness (connectivity) among reef areas for the evaluation the potential of dispersal to and re-population of areas of extirpation.
 - Identify and quantify chemical contaminants transported in African dust events and linkages to coral health.
 - Improve understanding of reef processes such as larval recruitment and retention, reef connectivity, and patterns of biodiversity and reef structure.
- Increase research on interactions between land-based activities (including run-off, sedimentation, nutrient loading, etc.) and coral reef ecosystem health by conducting regional assessments of large-scale phenomenon to better understand the impacts of human activities and reefs.
- Strengthen research on the taxonomy, systematics, and phylogeny of coral reef ecosystem species.
- Examine the nature of, and relationships between, local and large-scale oceanographic processes by developing predictive models of regional oceanographic processes at a variety of time and space scales.

To Address Objective 2:

- Provide support and partnerships to establish the Coral Health and Disease Consortium (CHDC).
- Host the First Annual CHDC Workshop and develop a National Action Plan for Coral Disease Research to promote effective detection, identification and management of coral reef diseases, identify key impediments and recommend strategic research priorities.
- Develop a web-based, user-friendly coral disease identification system linked to the existing Coral Health and Monitoring Program (CHAMP) and other coral information Web sites.
- Expand the Global Coral Disease Database to provide access to unpublished reports from monitoring programs, a coral disease identification Compact Disk for volunteer divers, and a volunteer-diver reporting system to improve our ability to identify disease outbreaks.
- Host a training workshop for Puerto Rico on disease identification and monitoring.
- Develop and field-test innovative tools for assessing, monitoring, restoring and managing coral reef ecosystems.
- Develop models and/or data syntheses to assist resource managers in assessing alternative management strategies to understand and improve the conditions of reefs and to protect healthy reef areas.

To Address Objective 3:

- *See actions listed under the following goal areas: Map all U.S. Coral Reefs(p 22), Assess and Monitor Reef Health (p 27); Reduce Pollution (p 64).*

GOAL 4: **UNDERSTAND SOCIAL AND ECONOMIC FACTORS**

KEY THREATS ADDRESSED

Understanding the value and human use of coral reefs (i.e. social and economic factors) is critical to reducing threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts of key threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global Warming/ Climate Change	Diseases	Hurricanes/ Typhoons	Extreme Biotic Events	Overfishing	Destructive Fishing Practices	Habitat Destruction	Invasive Species	Coastal Development	Coastal Pollution	Sedimentation & Runoff	Marine Debris	Overuse from Tourism	Vessel Groundings	Vessel Discharges
Understand Social and Economic Factors	H	L	L	L	H	H	H	M	H	H	H	L	M	L	L

RATIONALE FOR ACTION

Coral reef ecosystem managers must balance sustainable use and conservation; therefore, understanding the relations between human behavior and reef ecosystems is critical. Coral reef ecosystems in nearshore waters are particularly vulnerable to the effects and impacts of human activities, both through direct exploitation of reef resources, and through the indirect impacts of adjacent land-based activities such as polluted runoff from coastal development. The converse is also true – the livelihoods and prosperity of people living in coastal tropical areas depend on, and influence, the condition of the marine resources. Therefore, coral reef ecosystem uses, management, and ecology can not be considered in isolation. Coastal activities and their eventual impacts on reefs, are inextricably woven into the social, cultural, and economic fabric of regional coastal communities. Consequently, meaningful reductions in human impacts on reefs will require a greater understanding of, and management attention to, the underlying motivations

and beliefs that influence our commitment to conserving healthy coral reef ecosystems.

Understanding the socioeconomic context of the reef stakeholders is essential for assessing, predicting, and managing reef use. To balance sustainable use and protection, the reef manager needs to know the people that use and affect the reef, including their use patterns, perceptions of reef management, and characteristics. This human dimension, which is crucial to the long-term success of management strategies, is often overlooked. It is particularly important among many of the U.S. Islands, in which traditional uses of coral reef resources, including subsistence fishing, have been an integral part of locally managed sustainable use for generations.

SOCIOECONOMIC STRATEGY

The strategy to achieve this goal is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the Social and Economic Subgroup of the U.S. Coral Reef Task Force. For more detailed information see <http://coralreef.gov/>. In recognition of the fundamental importance of the human dimension to successful coral reef conservation, the social, economic and cultural dimensions of coral reef issues are also integrated into other goal areas. The strategy outlines three objectives to meet the goal of increasing understanding the social and economic factors necessary for effective coral reef conservation:

- Objective 1: Assess the social and economic uses of coral reef systems, and monitor human communities that use/depend on coral reef ecosystems.
- Objective 2: Assess the social and economic impacts of reef management on human communities.
- Objective 3: Assess the social, economic and cultural value of reef resources.

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by federal and non-federal members of the U.S. Coral Reef Task Force to achieve the goal and objectives. For more detailed information see <http://coralreef.gov/>.

Objective 1 Accomplishments:

- Began a survey of commercial trap fishermen, collecting socioeconomic information to assist in decisions on whether to limit the number of traps in reef fisheries in the U.S. Caribbean. (NOAA and Partners)
- Implemented monitoring program for artificial reef use in Florida. (Florida)

Goal 4: Understand Social and Economic Factors

- Conducted socioeconomic assessment surveys with community groups in USVI. (USVI)

Objective 2 Accomplishments:

- Supported the Global Coral Reef Monitoring Network in its effort to provide critical information and data on socioeconomic aspects of coral reef ecosystems.

Objective 3 Accomplishments:

- Conducted reef valuation study in Guam. (Guam)
- Incorporated socioeconomic materials into draft “toolbox” for use in developing/reviewing National Environmental Policy Act (NEPA) documents. (NOAA)
- Initiated literature review and developed format for centralized socioeconomic database.
- Published the *Socioeconomic Manual for Coral Reef Managers*, a major new resource to help managers and communities assess social and economic value and other aspects of coral reef ecosystems. Made the manual available via the Web at <http://wcpa.iucn.org/biome/marine/socioecon.html> (NOAA and Partners)
- Develop regional economic valuations of coral reef ecosystems and incorporated findings into regional management strategies, priorities and decisions. (NOAA)

Implementation Plan 2002-2003

The Social and Economic subgroup of the U.S. Coral Reef Task Force, working with many partners, has identified some priority actions in FY 2002 and 2003 to achieve the goal and objectives outlined in this strategy. Successful implementation of the strategy is contingent on funding and other factors and relies on efforts by a variety of partners. The following is a partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the objectives. More detailed information is available from the subgroup and member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>).

To Address Objective 1:

- Incorporate socioeconomic mapping into existing biophysical mapping projects to strengthen coral reef management and ensure effective decision-making.
- Evaluate examples of traditional and community-based coral reef conservation efforts on coral reefs, particularly in the U.S. Islands, and transfer the lessons learned to other management programs.

To Address Objective 2:

Goal 4: Understand Social and Economic Factors

- Continue monitoring and comparisons of artificial reef habitats vs. natural habitats and user values in Florida.
- Continue research on social and economic costs and benefits of coral reef marine protected areas (e.g., Florida Keys coral reef ecosystem and others).

To Address Objective 3:

- Continue regional assessments and economic valuation work in Florida and other areas.
- Complete database of socioeconomic information and start to implement use of database in regional management decisions.
- Complete socioeconomic portion of pilot “toolbox” for federal agency use in developing/reviewing (NEPA) documents related to coral reefs.

E. ACTION THEME 2: REDUCING HUMAN IMPACTS

The most severe of the growing number of threats to coral reefs stem directly from human activities. Human impacts on reefs range from direct exploitation of specific natural resources (e.g. fishing, coral and live rock extraction, and sand mining), to more diffuse degradation of large reef tracts caused by runoff of sediment or polluted waters from urban areas, mangrove deforestation, coastal development or other upland activities. These impacts are exacerbated by degradation of the overall marine environment due to global climate change.

While the nature and magnitude of human impacts vary tremendously among reefs domestically and internationally, in the U.S., many of the underlying activities are authorized and regulated under law and therefore can be managed or mitigated using existing federal and state authorities and programs tailored to local needs. In addition, human impacts stemming from lands under private ownership can be minimized through voluntary implementation of various model conservation measures. On a broader scale, consumer and life style choices made every day by Americans and others around the world contribute to global warming, pollution, overexploitation and other stresses on coral reefs worldwide.

To a very real extent, the future of U.S. coral reefs depends on our capacity to reduce or eliminate avoidable human impacts, both domestically and internationally. To that end, this portion of the strategy focuses on reducing human impacts on coral reef ecosystems. It builds on 9 of the critical conservation goals adopted by the U.S. Coral Reef Task Force in its National Action Plan. This strategy is designed to reduce or eliminate the most significant and tractable threats to coral reefs through the action towards the following goals:

- Goal 5: Improve the Use of coral reef marine protected areas;
- Goal 6: Reduce Impacts of Fishing and Other Extractive Uses;
- Goal 7: Reduce Impacts of Coastal Uses;
- Goal 8: Reduce Pollution;
- Goal 9: Restore Damaged Reefs;
- Goal 10: Improve Outreach and Education;
- Goal 11: Reduce Threats To International Coral Reefs;
- Goal 12: Reduce Impacts From International Trade; and
- Goal 13: Improve Coordination and Accountability.

GOAL 5: **IMPROVE THE USE OF MARINE PROTECTED AREAS IN CORAL REEF ECOSYSTEMS**

KEY THREATS ADDRESSED:

Improving the use of marine protected areas as management tools can help reduce key threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global warming/ Climate change	Diseases	Hurricanes/ Typhoons	Extreme biologic events	Overfishing	Destructive fishing practices	Habitat destruction	Invasive species	Coastal development	Coastal pollution	Sedimentation/ runoff	Marine debris	Overuse from tourism	Vessel groundings	Vessel discharges
Improve use of MPAs	H	L	L	L	H	H	H	M	M	M	M	L	H	H	H

RATIONALE FOR ACTION:

The most powerful tool for conservation of coral reef and other marine ecosystems is the establishment and effective management of a representative network of Marine Protected Areas (MPAs) for coral reefs. Widely accepted in the terrestrial environment, the principle of setting aside fully representative examples of all ecosystem and habitat types to ensure conservation of biodiversity has been adopted only recently for the marine environment.

MPAs constitute a broad spectrum of areas that are afforded some level of protection for the purpose of managing resources for sustainable use, safeguarding ecosystem function and biodiversity, and/or providing a framework for supporting uses of resources and space with a

Goal 5: Improve Use of Marine Protected Areas

minimum of conflict. They can range from small to very large, and may protect a specific resource or habitat type, to extensive areas that integrate the management of many species, habitats, and uses in a single, comprehensive plan. The level of protection can range from multiple use areas to no-take ecological reserves¹ that are closed to all extractive uses. Like their terrestrial counterparts, today's MPAs can provide for the protection of critical habitats and endangered species, enhance tourism and recreation, and serve important roles in public education and outreach on the social, economic and ecological benefits of marine ecosystems and their protection. By employing a framework for the application of "adaptive management," MPAs can establish and maintain feedback loops between science and policy. Finally, multiple-use MPAs address the differing objectives of a wide variety of stakeholders, thereby providing a framework for resolving conflict marine and coastal ecosystem services users, while providing conservation benefits to coral reef ecosystems.

MPAs in the U.S. are administered at the local, territorial, state, regional and federal levels of government. This fragmented set of MPAs often results in under-representation of types of reefs and other habitats within biogeographic regions, inadequate protection of reef resources, competing or conflicting resource objectives, and lack of coordination among management agencies. Under the current system, long-term conservation and sustainable use of coral reef resources are difficult to achieve. A coordinated network of MPAs encompassing representative coral reef ecosystems could be designated to limit fragmentation and build a robust network for sustainable use and conservation of coral reef ecosystems.

Central to the success of an MPA network is the meaningful and sustained public participation by key stakeholder groups in all phases of the design, implementation and evaluation of this system. This will help ensure that MPAs, including replenishment zones, will be developed consistent with, and supportive of, local practices and traditions. Stakeholders include: (a) resource managers from governmental agencies with jurisdiction or expertise relevant to coral reef resources and habitats; (b) commercial and recreational users and stakeholders, including Regional Fishery Management Councils; (c) non-governmental organizations; and (d) coral reef scientists and other subject matter experts. Moreover, the development of an integrated network of coral reef MPAs will necessarily take into account appropriate legislative and regulatory authorities at all levels of government, with particular emphasis on involving the island states and territories in the evaluation, design, establishment and implementation of component sites.

¹ No-take reserves, also called ecological reserves, harvest refugia, and fully -protected MPAs, are one type of marine protected area where all extractive uses are prohibited. Many studies have shown that no-take reserves are particularly effective in maintaining biodiversity, productivity and ecological integrity of coral reefs. No-take reserves may also serve as fishery "replenishment zones" and help sustain fisheries outside of the protected area. No-take reserves can complement other fishery management approaches such as gear restrictions and temporary or seasonal closures.

This issue is of particular importance in the Pacific Islands, where traditional, community-based and subsistence uses of nearshore coral reef habitats, including protected areas, are intimately linked to cultural values and practices.

CORAL REEF MPA STRATEGY

The strategy to achieve this goal is outlined in the U.S. National Action Plan to Conserve Coral Reefs and associated documents of the Ecosystem Science and Conservation working group of the U.S. Coral Reef Task Force. For more detailed information see <http://coralreef.gov/>. The goal is to build a nationally linked and coordinated network of MPAs, including but not limited to no-take reserves, representing a functionally viable proportion of all coral reefs and associated habitats under the jurisdiction of the U.S.. The U.S. will also encourage steps in this direction in the Freely Associated States (FAS) of the Republic of Palau, Federated States of Micronesia and the Republic of the Marshall Islands.

An explanation of the scientific basis for the U.S. Coral Reef Task Force's Objective concerning no-take reserves is found in the Task Force Ecosystem Science and Conservation Working Group report "*Building a National System of Marine Protected Areas for Coral Reefs*" (available at <http://coralreef.gov>), based on numerous scientific papers (e.g., Lauck et al., 1998; Johnson et al., 1999; Murray et al., 1999; Sladek-Nowlis et al., 1999; Watson et al., 2000), and summarized in Bohnsack et al. entitled "*A rationale for minimum 20-30 percent no-take protection*" (in press in Coral Reefs). Bibliographic references are found in both documents. The goal of 20 percent by 2010 is based on the best available science and is supported from a number of scientific fields including reproductive theory, knowledge about the vulnerability of reef species to exploitation, analysis of fishery failures, and empirical and modeling studies of reserves.

The strategy outlines five key objectives to achieve this goal:

- Objective 1: Conduct and support nation-wide, state and territory assessments of the effectiveness and gaps in the existing system of U.S. coral reef MPAs.
- Objective 2: Develop proposals for establishing new MPAs and enhancing effectiveness of existing areas as appropriate through existing authorities and involvement of all constituencies.
- Objective 3: Strengthen capabilities of existing MPAs to protect coral reef resources through review and revision of existing sites, applicable management plans, programs, policies and authorities.

Goal 5: Improve Use of Marine Protected Areas

- Objective 4: Establish additional coral reef MPAs where needed. This includes establishing additional “no take” ecological reserves in a balanced suite of representative U.S. coral reefs and associated habitats, with the goal of protecting at least 5 percent of all coral reefs and associated habitat types in each major island group and Florida as ecological reserves by 2002; at least 10 percent by 2005, and at least 20 percent by 2010.
- Objective 5: Strengthen and support cooperation with and among the Freely Associated States and international partners to establish networks of MPAs to protect and conserve reef ecosystems.²

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by federal and non-federal members of the U.S. Coral Reef Task Force to achieve the goal and objectives. For more detailed information see <http://coralreef.gov/>.

Objective 1 Accomplishments:

- Developed initial inventory of U.S. coral reef MPAs (DOI, NOAA, state and territory partners).
- Began inventory and assessment of MPA system for development of a marine gap analysis pilot project in Hawaii (Hawaii, NOAA and partners)

Objective 2 Accomplishments:

- Began development of a marine park management plan for the proposed East End Marine Park on St. Croix, the first Marine Park proposed under USVI jurisdiction (USVI and many partners). (see <http://rps.uvi.edu/VIMarinePark.html>.)

Objective 3 Accomplishments:

- Reviewed and updated the National Park Service’s General Management Plans (GMPs) for parks with coral reefs. The Dry Tortugas National Park GMP has been completed; Biscayne National Park (NP) is underway; and funding has been approved for Virgin Islands NP and Buck Island National Monument (DOI).

² See also International Goal for broader cooperation with other countries on MPAs.

Goal 5: Improve Use of Marine Protected Areas

- Improved management of (NP) by instituting long-term inventory and monitoring programs for the National Parks with coral reefs; added coral reef coordinators for the parks; and obtained administrative jurisdiction over authorized park boundaries (DOI).
- Hawaii hired a state-wide MPA coordinator and began redesign of management regimes for the state's existing and future MPAs (includes recommendations for reaching 20 percent no-take reserve goal). (Hawaii)
- Implemented assessment surveys in four Hawaii MPAs. (Hawaii)
- American Samoa Power Authority contracted to relocate landfill on Ofu Island away from American Samoa National Park MPA. (American Samoa)
- Began enforcement of Guam's five new no-take reserves, which cover 11 percent of the island's coastline, equivalent to more than 20 percent of the area of Guam's coral reef ecosystems. (Guam)
- Surveyed areas of CNMI, including reefs of the Northern Islands, for potential designation by the Commonwealth as MPAs; and drafted regulations and final draft site rules for management of Managaha Marine Conservation Area. (CNMI)
- Provided enforcement and monitoring assistance in many U.S. coral reef MPAs; worked with government partners to help improve and coordinate enforcement. (USCG and partners)

Objective 4 Accomplishments:

- Established 10 new coral reef MPAs including the Managaha Marine Conservation Area in Saipan and the Virgin Islands Coral Reef National Monument in USVI. (DOI and CNMI; USVI; others)
- Established 10 coral reef reserve areas (no take areas) within existing or new protected areas. (DOI; others)
- Expanded Buck Island National Monument to increase protection for coral reef ecosystem in USVI. (DOI)
- Established 2 new National Wildlife Refuges to protect coral reefs in the U.S. Pacific region: Palmyra Atoll National Wildlife Refuge (515,232 acres of coral reefs) and Kingman Reef National Wildlife Refuge (483,702 acres of coral reefs). (DOI and partners)
- Established the Tortugas Ecological Reserve in joint effort among the Florida Keys National Marine Sanctuary, the Tortugas National Park, the State of Florida and the National Marine Fisheries Service (Gulf of Mexico and South Atlantic Regional Fishery Management Councils).³ (NOAA, DOI and partners)
- Established the (NHI) Coral Reef Ecosystem Reserve, creating the largest protected area in the U.S. (339,900-km² of coral reef ecosystem) and including some no-take reserve provisions. NOAA began the public process to develop a management plan for the area. (NOAA, DOI, Hawaii and other partners)

³ See also "Reduce Adverse Impacts of Fishing and other Extractive Uses."

Goal 5: Improve Use of Marine Protected Areas

- Passed new laws to established 2 new coral reef reserves (Bird Island and the Tinian Marine Sanctuary in CNMI).
- Designated two reserves on the West Florida Shelf – Madison-Swanson and Steamboat Lumps Marine Protected Areas with the Gulf of Mexico Fishery Management Council and began assessing their resources and contribution to reef and other fisheries.³ (NOAA)
- Designated three new coral reef MPAs in Puerto Rico (Culebra, Desecheo, and Tourmaline). (Puerto Rico)

Objective 5 Accomplishments:

- Developed a portfolio of marine and terrestrial conservation areas within the Federated States Micronesia that represents the full array of ecological communities, plants and animals, that when conserved will effectively protect the nation’s natural heritage for this and future generations. (DOI)

IMPLEMENTATION PLAN 2002-2003

Successful implementation of the strategy is contingent on funding and other factors, including effort by a variety of partners. The Ecosystem Science and Conservation working group of the U.S. Coral Reef Task Force provided the following partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the goal and objectives. More detailed information is available from the working group or member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>).

To Address Objective 1:

- Complete inventory of reef areas currently in designated protected status including descriptions of reef types, activities occurring, socio-economic conditions, management capabilities, legislated authorities and level of protection provided.
- Conduct assessment of strengths and weaknesses of existing system of coral reef MPAs, and formulate recommendations for additional protection and use appropriate for sustainable management in regional networks.
- Conduct a gap analysis to determine important representative or unique coral reef habitat types, species, and features missing from current MPA protected status.
- Work with government and non-governmental partners to evaluate the role of MPAs as possible sources and reservoirs to reduce the threats of global warming, coral reef bleaching and other climate driven impacts.
- Identify priorities in federal waters (through existing statutory processes) or state waters for establishing additional new MPAs in the gaps identified, and for improving existing

Goal 5: Improve Use of Marine Protected Areas

management policies.

- Develop an initial inventory of all coral reef habitats in the U.S. in a geo-spatially referenced database (see CRTF Mapping and Information Synthesis Working Group report). Hold workshop to assess needs and opportunities for possible new MPAs in American Samoa.
- Assess any immediate opportunities to establish new coral reef no-take zones and strengthen existing areas in sensitive areas (e.g. spawning sites). To help fill gaps and meet management needs.

To Address Objective 2:

- Develop specific proposals for additional protection or changes in management regulations at existing MPAs.
- Develop specific proposals for establishing (through existing statutory processes) new MPAs where needed to eliminate gaps and ensure conservation of biodiversity or other reef resources, and improve management of coral reef ecosystem.
- Conduct public consultation through existing statutory processes as appropriate for establishing new MPAs and improving the effectiveness of existing MPAs.

To Address Objective 3:

- Continue public process to develop final management plan for the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve.
- Develop and implement assessments of effectiveness of existing coral reef MPAs (e.g., monitoring, health indicators, fisheries stocks, etc.) to help managers meet their goals
- Develop assessment of effectiveness of the U.S. system of coral reef MPAs.

To Address Objective 4: ⁴

- Support ongoing processes by Regional Fishery Management Councils and the National Marine Fisheries Service to identify coral reef MPAs and no-take reserves in federal waters. Identify key sensitive coral reef areas in Florida and the U.S. Caribbean such as spawning aggregation sites.

To Address Objective 5:²

⁴ *Note: It appears likely that the U.S. overall will not meet the Task Force National Action Plan goal for 2002 of 5 percent of coral reefs in no-take ecological reserves in each major island group and Florida. Only Guam and the NWHI have reached (and indeed exceeded) this 2002 goal. Guam has exceeded the 2010 goal of 20 percent of representative habitats in no-take ecological reserves. A status report on this goal and the area of U.S. coral reefs in protected area status is included in the 2002 State of U.S. Coral Reef Ecosystems report (Turgeon et al 2002).*

Goal 5: Improve Use of Marine Protected Areas

- Work with the Freely Associated States (FAS) to determine their needs and priorities in establishing MPAs in their nations.
- Develop cooperative agreements between the U.S. and FAS to assist in establishing new MPAs based on needs and priorities assessment and coordinating management strategies for new MPAs through a regional network.

GOAL 6: **REDUCE ADVERSE IMPACTS OF FISHING AND OTHER EXTRACTIVE USES**

KEY THREATS ADDRESSED:

Reducing the adverse impacts of fishing and other extractive uses is critical to reducing key threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

GOAL	Global Warming/ Climate Change	Diseases	Hurricanes/ Typhoons	Extreme Biotic Events	Overfishing	Destructive Fishing Practices	Habitat Destruction	Invasive Species	Coastal Development	Coastal Pollution	Sedimentation & Runoff	Marine Debris	Overuse from Tourism	Vessel Groundings	Vessel Discharges
Reduce Extractive Impacts	L	M	L	L	H	H	L	L	L	L	L	H	M	L	L

RATIONALE FOR ACTION:

Coral reefs and associated habitats provide important commercial, recreational and subsistence fishery resources in the U.S. and around the world, and represent a critical source of food for many developing countries. Fishing plays a central social and cultural role in many island communities. The rich biodiversity of reefs also supports a valuable marine aquarium industry and promises rich genetic resources for pharmaceuticals or other natural products. However, these fishery resources and the ecosystems that support them are under increasing threat from overfishing and fishing-associated impacts on habitats and ecosystems. Potential threats of fishing include: 1) direct over-exploitation of fish, invertebrates and algae for food and the

aquarium trade; 2) physical impacts to reef environments associated with fishing techniques and fishing gear; 3) impacts that occur over a wide range of trophic levels as a result of the removal of a species or group of species; and 4) by-catch of non-target species.

Overfishing of high value species, resources such as groupers, snappers, sharks, and certain crustaceans and mollusks, has been documented on nearly all U.S. inshore reefs near populated islands (*Health of U.S. Coral reef Ecosystems 2001*). These species are becoming depleted in more remote offshore reefs and in deep reef environments, and fisheries catches are shifting to smaller and less desirable species. Giant clams and large groupers have become commercially extinct in several areas. In the western Atlantic, four species of groupers are now listed as candidates for protection under the Endangered Species Act (ESA). Furthermore, the abundance of the top ten aquarium fish in Hawaii decreased by 59 percent over two decades at Honaunau, Hawaii (Clark & Gulko 1999).

In addition to changes in the abundance, composition and demography of targeted reef fish populations, dramatic changes in the structure of coral reefs have also been documented. For instance, the removal of predatory fishes may result in accelerated bioerosion of corals by the invertebrate prey that these fishes formerly held in check, while overfishing of herbivorous fishes has resulted in overgrowth of coral reefs by algae. Certain fishing techniques and gear are causing considerable habitat damage and/or entanglement of benthic reef flora and fauna. Fish traps and large gill nets are of particular concern in Florida, Puerto Rico, USVI and coral banks in the Gulf of Mexico. Other impacts associated with fisheries include anchor damage, trawling in deep reef environments, and grounding of fishing vessels.

Fishing pressure and fisheries impacts represent one of the largest, most widespread, and most difficult to address threats to coral reef ecosystems. Most reef fisheries in U.S. waters are small-scale, multispecies, and inadequately monitored, managed, and enforced. Improved management of coral reef fisheries requires better scientific information, increased coordination, better enforcement of existing regulations and new management approaches that protect biodiversity and ecosystem functions while regulating fishing and other extractive uses.

STRATEGY TO REDUCE ADVERSE IMPACTS

The goal of this strategy is reduce the adverse impacts of coral reef fisheries in order to ensure their sustainable management and the conservation of the ecosystems on which they depend to benefit local communities and the Nation. The strategy is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the Coastal Uses working group of the U.S. Coral Reef Task Force. For more detailed information see <http://coralreef.gov/>. This strategy outlines seven key objectives to achieve this goal:

Goal 6: Reduce Impacts of Fishing

- Objective 1: Identify, monitor and protect critically important U.S. coral reef fisheries habitats and spawning populations through an expanded network of no-take ecological reserves.⁵ Ensure effective enforcement of existing no-take fishery reserves, monitor reef fish stocks in no-take marine reserves and reference sites to evaluate the effectiveness of reserves, and identify and protect new areas necessary to ensure the integrity of fisheries and ecosystems.
- Objective 2: Reduce overfishing by monitoring coral reef fisheries, assessing the adequacy of current fishing regulations, revising regulations as needed (in the case of Federal regulations this will be conducted utilizing existing statutory processes), and providing enhanced enforcement and education.
- Objective 3: Enhance coordination on coral reef fishery issues with the U.S. territories in the Caribbean and Western Pacific.
- Objective 4: Reduce adverse environmental impacts of fishing⁶ by assessing essential fish habitat; identifying effects of fishing and fishing gear, and implementing actions or additional gear and fishing vessel anchoring restrictions to reduce habitat damage; eliminating destructive fishing practices; and assessing and mapping deeper coral reefs, banks and beds, and developing strategies to conserve these deeper ecosystems.
- Objective 5: Incorporate ecosystem-scale considerations into coral reef fishery management. This will require targeted research, including the development of models, to understand ecosystem effects of fishing and socioeconomic studies on the impacts of different options. It will require work with state and territory resource management agencies, Fishery Management Councils and other interested entities

⁵ No-take reserves are areas protected from all fishing and other extractive use. As a habitat and ecosystem-based protection measure, such reserves potentially offer a high level of protection for coral reef structure, and ecosystem function and complement other fishery management tools such as gear restrictions or seasonal closures. An explanation of the scientific basis for the U.S. Coral Reef Task Force's goals for no-take reserves on U.S. coral reef ecosystems is found in the Report of the CRT Working Group on Ecosystem Science and Conservation: "*Building a National System of Marine Protected Areas for Coral Reefs*" (<http://coralreef.gov/>) and in Bohnsack *et al.* (in press). Work to achieve this objective related to federally managed fisheries will be one through existing statutory processes.

⁶ The *National Action Plan to Conserve Coral Reefs* also included removal of derelict fishing gear from this item as well as in "Reduce Pollution." As the great concentrations of derelict fishing gear found on Pacific reefs come from distant water fisheries rather than coral reef fisheries, this item is dealt with under the "pollution" section.

to incorporate this understanding into ecosystem-level local fishery management and Federal Fishery Management Plans for coral reef areas.

Objective 6: Reduce the overexploitation of reef organisms for the aquarium trade ⁷ by: banning the commercial domestic collection of coral and “live rock” and monitoring the collection of other species; developing new management measures or ecologically sound alternatives to wild collection; evaluating the effectiveness of existing legal authorities and policies governing the collection and importation of coral and other reef-dwelling species; and addressing inconsistencies among federal and state/territorial regulations on collection and trade of ornamental coral reef species.

Objective 7: Develop a process to evaluate issues and possibly develop guidance related to coral reef aquaculture in conjunction with stakeholders and relevant interagency groups including the Aquatic Nuisance Species Task Force and the Invasive Species Council.

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by federal and non-federal members of the U.S. Coral Reef Task Force to achieve the goal and objectives. For more detailed information see <http://coralreef.gov/>.

Objective 1 Accomplishments: ⁸

- Began enforcement of Guam’s five new no-take reserves, which include more than 20 percent of the island’s coral reef ecosystems. (Guam)
- Designated two reserves on the West Florida Shelf – Madison-Swanson and Steamboat Lumps Marine Protected Areas with the Gulf of Mexico Fishery Management Council and began assessing their resources and contribution to fisheries. (NOAA)
- Established the Tortugas Ecological Reserve and conducted baseline fish stock assessments showing that 40 percent of the stocks analyzed in the Dry Tortugas National Park were overfished. NOAA began expanding the surveillance radar coverage to enhance enforcement in the Reserve. (NOAA, DOI, Florida)

⁷ The *National Action Plan* also recommended taking appropriate actions to ensure that international trade in coral reef species for use in U.S. aquariums does not threaten the sustainability of coral reef species and ecosystems. This issue is dealt with in the section on trade in coral reef species.

⁸ See also Marine Protected Area goal.

Goal 6: Reduce Impacts of Fishing

- Worked with partners to develop vessel management systems to help improve enforcement capabilities in coral reef areas. (USCG, NOAA)
- Purchased Vessel Monitoring Systems for installation on commercial bottomfishing vessels operating in the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve to enhance fishery enforcement. (NOAA and partners).

Objective 2 Accomplishments:

- America Samoa prohibited fishing with scuba, hired two new fishery biologists, and worked with two villages that created short-term community MPAs. (AS)
- CNMI prohibited fishing using scuba or hookah within the lagoon or reef and 1000 feet outside the lagoon or reef. (CNMI)

Objective 3 Accomplishments:

- Established a coral reef officer and office in Puerto Rico to enhance coordination with Puerto Rico, USVI and the Caribbean Fishery Management Council. (NOAA)

Objective 4 Accomplishments:

- Conducted submersible dives to investigate fishing impacts on selected deep banks in the NWHI. (NOAA)
- Provided baselines and documented significant habitat destruction and reduced reef fish abundance for previously unexplored areas in the Florida Keys. (NOAA)
- Examined biological impacts of fisheries in the (NWHI) by investigating trophic interactions using ECOSIM food web model simulations and targeted field studies. (NOAA)
- Passed laws prohibiting destructive fishing techniques. (CNMI)

Objective 5 Accomplishments:

- Examined biological impacts of fisheries in the (NWHI) by investigating trophic interactions using ECOSIM food web model simulations and targeted field studies. (NOAA)

Objective 6 Accomplishments:

- Began an evaluation of the ornamental reef fisheries in Puerto Rico and Hawaii and enhanced trade management in Hawaii. (NOAA, Hawaii)

IMPLEMENTATION PLAN 2002-2003

Successful implementation of the strategy is contingent on funding and other factors, including effort by a variety of federal and non-federal organizations. The fisheries subgroup (Coastal Uses Working Group) of the U.S. Coral Reef Task Force, working with many partners, provided the following partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the objectives. More detailed information is available from the subgroup and member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>).

To Address Objective 1:

- Continue monitoring and evaluation of the effectiveness of the marine reserves in protecting and conserving reef fish populations, and expand assessments to recently established no-take areas using traditional visual censuses and innovative techniques.
- Assess the role of existing marine reserves as a source of reef fish larvae to repopulate other reef habitats.
- Identify, in concert with Regional Fishery Management Councils and stakeholders, under-represented habitats and geographic areas that may be candidates for new no-take areas.
- Provide education and enhanced enforcement for existing coral reef reserves, particularly in remote areas (e.g., Tortugas Ecological Reserve, (NWHI) Coral Reef Ecosystem Reserve, and others).

To Address Objective 2:

- Enhance the reef fisheries management capacity of states and territories through a series of regional workshops and capacity-building grants through the Coral Reef Conservation Program.

To Address Objective 3:

Continue to enhance fisheries outreach through the new National Marine Fisheries Service (NMFS) regional presence in Puerto Rico and increase federal coral reef fisheries outreach in the Pacific.

To Address Objective 4:

- Expand efforts to identify and reduce the adverse impacts of fishing on coral reefs, especially the effects of specific gear types and inappropriate fishing techniques, and assess the need for

Goal 6: Reduce Impacts of Fishing

additional gear restrictions. In the case of Federal regulations this will be conducted utilizing existing statutory processes.

- Test the feasibility of using artificial refugia to shift fishing impacts away from natural coral reef areas.
- Map grouper spawning aggregation sites in the Western Atlantic and the distribution and status of fish biomass in deep reef environments.

To Address Objective 5:

- Complete development of the Western Pacific Regional Fishery Management Council *Coral Reef Ecosystem Fishery Management Plan* in a manner consistent with existing authorities and regulations. Begin to apply ecosystem management principles in Fishery Management Plans (FMPs) in coral reefs found in the U.S. Exclusive Economic Zone (EEZ) of the Gulf, Atlantic and Caribbean.
- Expand and refine ECOPATH and ECOSIM modeling to evaluate specific management implications of Fishery Management Plans, and test the model using information on exploited bottomfish species and other reef fish to predict the magnitude and timing of changes in abundance and size of reef fish within no-take marine reserves.

To Address Objective 6:

- Complete an evaluation of the ornamental reef fishery in U.S. territorial waters, and develop recommendations for sustainable collection.
- Explore the potential use of artificial reefs for sustainable collection of ornamental fish species in pilot studies.

To Address Objective 7:

- Develop guidance beginning in 2003.

GOAL 7: REDUCE IMPACTS OF COASTAL USES

KEY THREATS ADDRESSED:

Reducing the impacts of vessel groundings, development and other coastal uses is important to reducing threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global Warming/ Climate Change	Diseases	Hurricanes/ Typhoons	Extreme Biotic Events	Overfishing	Destructive Fishing Practices	Habitat Destruction	Invasive Species	Coastal Development	Coastal Pollution	Sedimentation & Runoff	Marine Debris	Overuse from Tourism	Vessel Groundings	Vessel Discharges
Reduce Impacts of Coastal Uses	M	L	L	L	L	L	H	L	H	H	H	L	H	H	M

RATIONALE FOR ACTION:

Coral reef ecosystems are being continually, and in some cases irreparably, damaged by a number of potentially avoidable human activities. Coastal activities like dredging for navigation or marinas, construction of breakwaters and other hardened shoreline protection measures, beach renourishment, sand mining, pipelines and cable installation, and land-use practices (e.g. road construction, mangrove deforestation, and land reclamation for agricultural and urban development) decrease water quality around reefs. Increased coastal tourism has led to increased pressure on coral reef resources, either through direct impacts on the reefs or indirectly through increased levels of coastal development, sewage discharge, vessel traffic, etc. Other activities

also have the potential to adversely impact coral reef ecosystems (e.g., security training exercises).

As the number of people using and transiting coral reefs increases annually, so too has the frequency of vessel groundings on reefs. In the Florida Keys National Marine Sanctuary alone, an average of 574 small vessel groundings have been reported within the coral reef ecosystem over the last four years, and hundreds more go unreported. Vessels striking shallow coral reefs can cause profound damage to the habitat by dislodging, crushing and fracturing the benthic community, displacing resident fishes, and eliminating critically important topographic complexity and habitat structure that is the result of hundreds of years of growth. In addition, propeller scarring, anchoring and other physical impacts are of growing concern in nearshore habitats. Some impacted habitats cannot recover without direct, and often expensive, human intervention in the form of immediate clean up of debris, emergency triage of injured animals, stabilization of unconsolidated surfaces and reinforcement of the reef framework, and long-term restoration of habitats and benthic communities.

These growing pressures are signs of the rapid growth in coastal populations and tourism over the past few decades, and of current resource limitations in programs responsible for implementation and enforcement of existing conservation authorities. Many of the adverse habitat impacts of coastal development, shoreline modification and vessel groundings can be prevented through consistent and proactive application of existing federal and state authorities and programs. While vessel groundings are unlikely to be completely avoided, prompt and careful removal of the vessel and evaluation of the injuries, followed by a rapid implementation of remedial actions can significantly reduce collateral damage and enhance survivorship of corals and other reef species.

STRATEGY TO REDUCE IMPACTS OF COASTAL USES

The goal of this strategy is to reduce the impact of human coastal activities on coral reef ecosystems. The strategy is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the Coastal Uses Working Group of the U.S. Coral Reef Task Force. For more detailed information see <http://coralreef.gov/>. The strategy includes six broad objectives to minimize impacts from coastal uses:

- Objective 1: Develop informal guidance, protocols and technical assistance programs to reduce the risks of damage to coral reefs resulting from activities conducted, funded or approved by federal agencies.
- Objective 2: Strengthen, improve, and integrate federal and state permitting and management programs for coastal development activities impacting coral reef habitats by developing technical

Goal 7: Reduce Impacts of Coastal Uses

guidance, impact thresholds, and policy directives that minimize or prevent adverse impacts to coral reef ecosystems.

- Objective 3: Initiate actions at the national and international levels to prevent vessel groundings and other vessel-related impacts by improving seamanship, strengthening aids to navigation, enhancing vessel traffic management measures; installing and maintaining mooring buoys in areas where anchor damage is likely.
- Objective 4: Develop standard vessel grounding response, enforcement and injury assessment guidance and improve our ability to remove grounded and abandoned vessels and restore damaged habitat by enhancing local and regional emergency response capabilities, strengthening and standardizing enforcement and damage assessment actions, and identifying gaps in existing legal authorities
- Objective 5: Strengthen existing and develop new resource management programs and protected areas to address the broad range of coastal activities. This may include developing new programs, policies, and regulations to address resource protection threats.
- Objective 6: Develop mitigation guidelines for coastal development projects that are deemed essential by federal state and territory agencies.

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by members of the U.S. Coral Reef Task Force to achieve this goal and its objectives. For more detailed information see <http://coralreef.gov/>.

Objective 1 Accomplishments:

- Implemented prohibitions of vessels, including jet skis, in sensitive areas in Puerto Rico to help protect reefs (part of revised Coastal Zone Management Program (CZMP) Federal Consistency Guidelines). (PR)

Objective 2 Accomplishments:

- Minimized impacts to corals of Clean Water Act (CWA) Section 404 permitted projects, U.S. Army Corps of Engineer planning projects, and proposed activities under other federal resource management programs. Prohibited or restricted the use of CWA Section 404 Nationwide Permits for activities directly impacting coral reefs. (EPA, COE)

Objective 3 Accomplishments:

- Developed a prototype recreational nautical chart to educate recreational boaters and reduce recreational boating damage. (NOAA)
- Installed permanent moorings for recreational boats near coral reefs at Johnston Atoll to help prevent anchor damage. (DOD)
- Installed buoy markers to establish a boat-free zone over a popular coral reef dive site at Guantanamo Bay, Cuba. (DOD)
- Worked with the International Maritime Organization (IMO) to create a provision for international no-anchoring areas. (NOAA, USCG, DOS and partners)
- Based on U.S. proposals, the (IMO) designated the Flower Garden Banks National Marine Sanctuary (FGBNMS) No-Anchoring Area, initially approval of 5 No-Anchoring Areas in the Florida Keys National Marine Sanctuary (FKNMS), and designated the FKNMS a Particularly Sensitive Seas Area (PSSA). (NOAA, USCG, DOS and partners)
- Submitted a proposal for establishing universal coral and Particularly Sensitive Sea Areas (PSSA) symbols to the International Hydrographic Organization to more easily identify these areas on navigational charts. (NOAA and partners)

Objective 4 Accomplishments:

- Obtained cooperative settlements and restorations in several coral cases including the M/T Igloo Moon case in Biscayne National Park for \$1 million, a Puerto Rico Barge grounding for \$83.5 million, and a Puerto Rico Beach resort was sentenced for violation of the (CWA). Over 20 cases under the National Marine Sanctuary Act are currently in negotiation and litigation. (DOJ, DOI, NOAA).
- Initiated the Restoration and Assessment of Coral Reef Ecosystems (RACE) program to enhance recovery of natural resource damages for smaller seagrass and coral injuries to FKNMS sanctuary resources caused by vessel groundings. (NOAA)
- Initiated development of Programmatic Environmental Impact Statements for Coral and Seagrass Restoration in the Florida Keys National Marine Sanctuary (FKNMS), to improve the analysis and decision process required under the National Environmental Protection Act (NEPA) and expedite the restoration of injured coral and seagrass sanctuary resources. (NOAA)
- Created an abandoned vessel inventory GIS database and developed a draft abandoned vessel white paper evaluating legal authorities, prioritization of threats posed by the vessels, and a response/removal plan for “high risk” vessels. (NOAA)
- Developed workshops to provide technical assistance and develop national goals for managing impacts from grounded and abandoned vessels. (NOAA)

Goal 7: Reduce Impacts of Coastal Uses

- Maintained 3 regional U.S. Coast Guard Strike Teams, ready to respond to all groundings, oil spill and hazardous material incidents that could impact coral habitats. (USCG)

Objective 5 Accomplishments:

- Installed radar reflecting buoys in the Flower Garden Bank National Marine Sanctuary (FGBNMS) and acquired mooring buoys, channel markers, light facility and other aids to navigation and signage for physical delimitation of protected areas. (NOAA)

IMPLEMENTATION PLAN 2002-2003

Successful implementation of the strategy is contingent on funding and other factors, including effort by a variety of federal and non-federal organizations. The Coastal Uses working group of the U.S. Coral Reef Task Force, working with many partners, provided the following partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the goal and objectives. For more information contact the working group or member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>).

To Address Objective 1:

- Increase capacity of states and territorial partners to address coral reef conservation and coastal management issues, including enforcement, assessment and mitigation.
- Install mooring buoys, navigational aids and signage for physical delimitation of coral reef protected areas including Canal Luis Peña Natural Reserve, Culebra, Desecheo Marine Reserve, Mona Natural Reserve and Caja De Muertos Natural Reserve.
- Assess and plan for the removal of abandoned vessels from coral reefs in the Hawaiian Archipelago and Puerto Rico.

To Address Objective 2:

- Identify key areas for action to reduce impacts to coral reef ecosystems.

To Address Objective 3:

- Seek IMO approval for additional no-anchoring areas in the FKNMS, and designate FKNMS as an internationally recognized Particularly Sensitive Sea Area (PSSA).
- Implement additional no-anchoring areas in the FKNMS.

Goal 7: Reduce Impacts of Coastal Uses

To Address Objective 4:

- Recover natural resource damages through Rapid Assessment of Coral Ecosystems (RACE) program and use funds to restore FKNMS resources injured by vessel groundings.
- Develop innovative assessment and restoration techniques.
- Inventory abandoned vessels, finish abandoned vessel white paper, and develop preliminary removal plan, develop legislative initiatives as appropriate.
- Continue to maintain 3 regional U.S. Coast Guard Strike Teams, ready to respond to all groundings, oil spill and hazardous material incidents that could impact coral habitats.

To Address Objective 5:

- Develop protected area management effectiveness protocols and performance indicators as well as initiate pilot projects in states and territories.

To Address Objective 6:

- Develop best management practices and associated guides for use in coastal construction projects to reduce impacts to coral reef ecosystems.

GOAL 8: REDUCE POLLUTION

KEY THREATS ADDRESSED:

Reducing pollution from sources on land and at sea is critical to conserving and restoring coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing specific threats to coral reefs. A higher ranking suggests that activities to reduce pollution are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal in addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global warming/ Climate change	Diseases	Hurricanes/ Typhoons	Extreme biologic events	Overfishing	Destructive Fishing Practices	Habitat Destruction	Invasive Species	Coastal Development	Coastal Pollution	Sedimentation & Runoff	Marine Debris	Overuse From Tourism	Vessel Groundings	Vessel Discharges
Reduce Pollution	H	M	L	L	L	L	L	H	M	H	H	H	L	L	H

RATIONALE FOR ACTION:

Land-based pollution is the major cause of coral reef loss and degradation in many coral reef ecosystems world-wide (Bryant et al., 1998). Coral reef ecosystems need clean, clear water and healthy habitats, both of which can be imperiled by pollution.

Many coral reef ecosystems are currently impacted by a variety of pollutants, including sedimentation, nutrients, chemical contaminants, marine debris, and invasive, non-native species (biological pollutants). Pollution enters reef ecosystems in many ways, ranging from specific point sources such as sewage pipes and vessel discharges, to more diffuse runoff from land-based sources such as agriculture, coastal development, road construction, and on-site waste water management systems, to airborne sources such as emissions from automobiles and power

plants. Reef degradation is even greater in areas where the loss of wetlands or other habitats has reduced nature's ability to filter nutrients and other pollutants before they reach the reefs.

Conserving the Nation's coral reef ecosystems requires reductions in the concentrations and cumulative impacts of pollution from a variety of sources. Land use practices such as deforestation, coastal infrastructure and road construction, logging, and agriculture in coastal watersheds can produce large amounts of sediment being carried in runoff, streams and rivers to coral reefs. Sediments smother corals and decrease water clarity, leading to a variety of impacts on the reef ecosystem including reduced coral cover, diversity, and recruitment. Excess nutrient loading from inadequate treatment and disposal of human and animal waste, and surface runoff from urban and agricultural lands, can also lead to significant changes and damage to the reef community. Discharges of oil, garbage, and ballast water from vessels can also impact coral reef species. Marine debris from fishing or other sources also has impacts on some reef ecosystems. Introductions of invasive species are also of serious concern in some areas, particularly through the discharge of ballast water from visiting vessels that can transport alien species from one region to another.

POLLUTION REDUCTION STRATEGY

The goal is to reduce the quantity and impacts of sediment, nutrient, marine debris, and biological pollutants (e.g., invasive species) on coral reef ecosystems. The U.S. National Action Plan to Conserve Coral Reefs and related documents of the Water and Air Quality Working Group of the U.S. Coral Reef Task Force outline the strategy to achieve this goal. For more detailed information see <http://coralreef.gov/>. The strategy has two main parts divided into seven objectives: (1) developing tools to assess the biological, chemical, and physical conditions of coral reef ecosystems, and (2) reducing the major types of pollution impacting coral reef ecosystems. The first part (development of tools to assess and reduce the impacts of pollution) is also discussed in the Assessing and Monitoring Reef Health, and Conducting Strategic Research sections of the strategy.

- Objective 1: Reduce sedimentation and other land-based sources of pollution by improving land-use and management practices in coastal watersheds through public-private partnerships, incentive-based measures, technical and financial assistance, habitat restoration and other activities.

- Objective 2: Reduce nutrient pollution by establishing comprehensive waste management systems to reduce discharges of harmful pollutants from wastewater treatment facilities, vessels, industrial sources, agricultural sources and air deposition.

- Objective 3: Reduce chemical pollution (e.g., oil, toxics, hazardous materials) from land-based sources and vessel discharges.
- Objective 4: Reduce the flow of marine debris pollution from land-based sources and vessels, and remove existing marine debris from reef ecosystems.
- Objective 5: Prevent and control the spread of invasive (e.g., non-native) species in coral reef ecosystems from ballast water and other mechanisms.
- Objective 6: Develop tools to assess and address the impacts of pollutants on coral reefs.
- Objective 7: Increase awareness and understanding of the ecological, health and socioeconomic impacts of land-based and marine pollution on reef ecosystems.

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by federal and non-federal members of the U.S. Coral Reef Task Force to achieve the goal and objectives. For more detailed information see <http://coralreef.gov/>.

Objective 1 Accomplishments:

- Provided technical and limited financial assistance to private landowners and land users to implement the conservation practices that reduce sediment and nutrient runoff from crop and pastureland, thereby providing secondary benefits to nearshore coral reef ecosystems. (USDA)
- Provided technical and limited financial assistance to state, territory and commonwealth agencies to reduce flow of sediments and other pollutants to reefs from coastal watersheds. (NOAA, EPA and partners)
- Published Storm water Phase II regulations to help reduce the impacts of storm water discharges on reefs and other sensitive coastal resources. (EPA)

Objective 2 Accomplishments:

- Implemented the Water Quality Protection Program Action Plan for the FKNMS focusing on sea grasses and water quality, upgrading inadequate wastewater and storm water infrastructure, and conducting public education and outreach activities to improve local stewardship. (EPA, NOAA, Florida)

Goal 8: Reduce Pollution

- Published a brochure on the impacts of untreated sewage discharged from boats on coral reefs and other sensitive aquatic resources and drafted guidelines on voluntary management measures for on-site waste water treatment systems. (EPA)
- Established a no-discharge zone in coastal waters of Monroe County, Florida, to help reduce pollution and reef impacts. (Florida and partners)
- Monitored for air deposition of nitrogen in the Florida Keys. (EPA)
- Began developing a phosphorus risk assessment tool for field use in the Hawaiian Islands. (USDA)

Objective 3 Accomplishments:

- Provided technical assistance to government and non-governmental entities to reduce the flow of chemical pollutants to reefs from land and vessel sources. (NOAA and partners)
- Produced resource guide on “Coral Reefs and Oil Spills: Planning and Response Considerations” to help prevent and respond to oil spill events. (NOAA)
- Updated Environmental Sensitivity Indices for key coral reef ecosystems for use in identifying sensitive resources before hazardous material spills, and establishing protection priorities and cleanup strategies. (NOAA and partners)
- Conducted biological assessment to evaluate potential effects of ship construction/repair activities on coral reefs near Diego Garcia. (DOD)
- Implemented biomonitoring program using reef fish to detect impacts of human activities on coral reefs of Johnston Atoll. (DOD)

Objective 4 Accomplishments:

- Established monitoring sites in Hawaii as part of the National Marine Debris Monitoring Program. (EPA and partners)
- Expanded interagency debris removal efforts in a major effort to clean up existing concentrations of marine debris in the (NWHI) within 3 years. Three charter vessels and the R/V TOWNSEND CROMWELL collected nearly 70 tons of debris, primarily at Pearl and Hermes and Kure Atolls - more than had been collected in all previous years combined. Reefs at Kure Atoll were essentially cleared of all major debris. (NOAA, DOI, USCG, Hawaii and other partners)
- Coordinated the first large-scale reef cleanup in the main Hawaiian Islands, on the shoreline around Kauai. The work is being done by Tesoro Oil Company as compensation for an oil spill from their offshore moorings off the east coast of Kauai. (Hawaii, NOAA and other partners).

- Working with State of Hawaii and community volunteers since 1998, removed over 5,000 pounds of net debris each year in Kane’ohe Bay as part of the reef cleanup at Marine Corps Base Hawaii (MCBH). (DOD and partners)

Objective 5 Accomplishments:

- Worked with the Aquatic Nuisance Species Task Force, National Invasive Species Council and other partners to investigate ballast water management and pathways of introduction of alien species. (USCG, NOAA, DOI and partners)
- Produced a Guidebook of Introduced Marine Species in Hawaii and hosted two workshops to explore pathways of introduction and impacts of invasive species on coral reefs. (FWS, Hawaii and partners)
- Supported research on factors related to observed phase shifts in coral reef system from spread of alien macroalgae (Hawaii and partners).
- Sponsored workshop on “Reef Aliens: Marine Invasive Species in Hawaii” to increase awareness among educators and help promote integration of this topic into education efforts. (DOI and partners).
- Supported survey of marine alien species in portions of the (NWHI) coral reef ecosystem (DOI and partners).

Objective 6 Accomplishments:

- Continued review of coral ecosystem indicators, developed a research strategy for creating coral reef indexes of biological integrity and started developing bio-assessment tools for coral reef ecosystems. (EPA).
- Published *Nutrient Criteria Technical Guidance Manual for Estuarine and Coastal Marine Waters* to help states, tribes and others establish scientifically sound nutrient criteria for coastal and estuarine waters (including coral reef areas). (EPA).
- Completed an assessment and “Ecosystem Report Card” of the coral reef ecosystem of the (FKNMS). (NOAA, EPA, DOI, Florida, academic and other partners).

Objective 7 Accomplishments:

- Implemented the Water Quality Protection Program Action Plan for the FKNMS focusing on sea grasses and water quality, upgrading inadequate wastewater and storm water infrastructure, and conducting public education and outreach activities to improve local stewardship. (EPA, NOAA, Florida)

IMPLEMENTATION PLAN 2002-2003

Successful implementation of the strategy is contingent on funding and other factors, including effort by a variety of federal and non-federal organizations. The Water and Air Quality working group of the U.S. Coral Reef Task Force, working with many partners, provided the following partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the objectives. More detailed information is available from the working group or member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>).

To Address Objective 1:

- Reduce on-site erosion and nutrient runoff in surface waters through incentive-based measures and by increasing technical and financial assistance to private landowners and land users.
- Increase efforts to evaluate the success of land use and best management practices to reduce sediment and nutrient runoff from agriculture and other land use practices.
- Conduct assessment of sediment and other pollution issues in reef-associated coastal watersheds to help identify priorities and strategy of action in each region.
- Increase technical and financial assistance to state, territory and commonwealth agencies to reduce flow of sediments and other pollutants to reefs from coastal watersheds.
- Evaluate the performance of existing storm water discharge practices on reefs and other sensitive coastal resources.

To Address Objective 2:

- Increase technical and financial assistance to private landowners and land users to reduce on-site erosion and nutrient runoff in surface waters.
- Increase efforts to evaluate the success of land use and best management practices to reduce nutrient runoff from agriculture and other land use practices.
- Conduct assessment of nutrient pollution issues in reef-associated coastal watersheds to help identify priorities and strategy of action in each region.
- Increase technical and financial assistance to state, territory and commonwealth agencies to reduce flow of nutrient pollutants to reefs from coastal watersheds.
- Evaluate the impacts of existing vessel discharge practices on reefs and other sensitive coastal resources in six high-use regions.
- Identify, increase monitoring, and develop action strategies for three reef regions at high risk from air deposition of nutrients.
- Support implementation of the Water Quality Protection Program Action Plan for the Florida Keys coral reefs.

Goal 8: Reduce Pollution

- Support implementation of the South Florida Comprehensive Ecosystem Restoration Program to help restore South Florida’s coral reef ecosystem.
- Work with the shipping industry to identify and reduce impacts from vessel discharges.

To Address Objective 3:

- Increase technical and financial assistance to government and non-governmental entities to reduce the flow of chemical pollutants to reefs from land and vessel sources.
- Produce technical information and resource guides for U.S. and international use to help prevent and respond to hazardous material spills in coral reef ecosystems.
- Continue to update Environmental Sensitivity Indices for key coral reef ecosystems for use in identifying sensitive resources before hazardous material spills, and establishing protection priorities and cleanup strategies.
- Identify priority areas for additional action to reduce impacts to coral reefs from vessel discharges.
- Support pre-event response planning with federal, state and local partners.

To Address Objective 4:

- Establish additional monitoring sites on the Main Hawaiian Islands of Hawaii, Molokai and Lanai as part of the National Marine Debris Monitoring Program.
- Continue 2nd and 3rd years of major effort to remove marine debris from the coral reef ecosystem of the (NWHI).
- Identify sources and paths of marine debris to coral reef ecosystems of the Hawaiian islands.
- Design and implement measures to stop the flow of marine debris to the coral reef ecosystem of the Hawaiian Islands.

To Address Objective 5:

- Support development of methods to reduce introduction of invasive species in vessel ballast water.
- Research primary pathways of introduction and impacts of invasive species on coral reefs.
- Develop and implement an early warning and response system for invasive species in Hawaii and other coral reef ecosystems.

To Address Objective 6:

- Continue development of indexes of coral reef biological integrity and bio-assessment tools for coral reef ecosystems.

Goal 8: Reduce Pollution

- Support development of local to regional coral reef monitoring systems to allow regular assessments and tracking of coral reef conditions and effects of management actions.

To Address Objective 7:

- Design Manual for Onsite Sewage Treatment Systems and the Voluntary Guidelines for Onsite Sewage System Management, and develop a guidance manual on implementing the voluntary guidelines.

GOAL 9: RESTORE DAMAGED REEFS

KEY THREATS ADDRESSED:

Restoring damaged coral reef ecosystems is an important part of reducing key threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global Warming/ Climate Change	Diseases	Hurricanes/ Typhoons	Extreme Biotic Events	Overfishing	Destructive Fishing Practices	Habitat Destruction	Invasive Species	Coastal Development	Coastal Pollution	Sedimentation & Runoff	Marine Debris	Overuse from Tourism	Vessel Groundings	Vessel Discharges
Restore Damaged Reefs	L	L	M	M	L	H	H	L	L	L	L	L	L	H	L

RATIONALE FOR ACTION:

A well-developed coral reef can represent thousands of years of slow incremental growth by resident stony corals, and consequently, many corals living today are centuries old. In spite of the longevity and apparent natural resilience of corals and the reefs they construct, both are extremely vulnerable to destruction by human activities – either gradually through degraded habitat quality, or suddenly through catastrophic damage from vessel groundings, toxic spills, or habitat destruction. Damaged coral reef communities recover slowly – if at all – particularly when the underlying habitat structure is destroyed, or when the prevailing environmental conditions have been chronically degraded over time. In such cases, full recovery of pre-existing ecological communities, and the full range of services they provide, may require tens to hundreds or thousands of years.

While it is clearly preferable to *prevent* the loss of coral reef habitat through the kinds of proactive conservation measures presented in other sections of this strategy, sometimes active restoration of coral reefs is needed to help prevent further degradation or possibly advance the natural restoration process in injured or damaged reef habitats. Executive Order 13058 charges federal agencies with ensuring, to the extent permitted by law, that any actions they authorize, fund, or carry out will not degrade the conditions of coral reef ecosystems (with limited exceptions such as in time of war, or when necessary for reasons of national security). Consequently, coral reef restoration is not usually considered a legitimate means to mitigate federal actions or projects that are expected to adversely impact reef habitats. The goal of restoration efforts are to help repair damage caused by human impacts and natural disturbances, and restore the normal function, structure and diversity of coral reef ecosystems.

To that end, this restoration strategy describes avenues to strengthen restoration science and methods ranging from eliminating anthropogenic stressors that impede recovery, to more direct restoration of damaged habitats or depleted populations.

RESTORATION STRATEGY

The goal of this strategy is to increase the capability of federal and non-federal managers to efficiently and effectively restore injured or degraded coral reefs where appropriate. The strategy is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the Coastal Uses Working Group of the U.S. Coral Reef Task Force. For more detailed information see <http://coralreef.gov/>. The strategy includes research, monitoring, pilot studies and technology transfer outlined in six objectives to achieve this goal:

- Objective 1: Review and evaluate existing reef restoration projects to quantify the benefits gained by the effort and expenditure of the restoration, compared to scenarios in which no restoration efforts were undertaken, and make recommendations for improvements.
- Objective 2: Develop and test innovative methods and techniques to expedite reef restoration for all major categories of coral reef injury, using a hypothesis-driven approach that involves rigorous, quantitative evaluation.
- Objective 3: Develop regional restoration plans that identify significant restoration alternatives, and weigh the costs and benefits of natural recovery compared with restoration alternatives.
- Objective 4: Promote cost-effective restoration projects on selected degraded U.S. reefs, focusing on habitats of high ecological, economic, and social or conservation value.

Objective 5: Rehabilitate degraded fish habitat through the deployment of artificial structures and rapid inexpensive transplant methods, where appropriate.

Objective 6: Transfer proven restoration tools, techniques and lessons learned to domestic and international partners.

SUMMARY OF ACCOMPLISHMENTS (2001)

Some progress has been made in the science and implementation of coral reef restoration, but much remains unknown and coral reef restoration remains a difficult process in many respects. Progress has been made in the development and implementation of a range of new programs, in the support and training in effective response procedures following damage events, and in techniques for damage assessment and restoration activities to allow the reef system to recover. Restoration of reef systems can take tens to hundreds of years depending on the conditions. The following is a partial summary of recent accomplishments by members of the U.S. Coral Reef Task Force to achieve the goal and objectives. For more detailed information see <http://coralreef.gov/>.

Objective 1 Accomplishments:

- Evaluated coral recruitment onto different structures used in the FKNMS reef restoration projects to identify optimal surfaces to enhance natural recruitment. (NOAA and partners)
- Began a national scale compilation and assessment of restoration techniques and projects. (NOAA and partners).
- Completed a review of restoration experience in the Pacific. (NOAA & University of Hawaii)

Objective 2 Accomplishments:

- Deployed artificial structures with attached deepwater *Oculina* coral fragments in the Experimental *Oculina* Research Reserve off the east coast of Florida. (NOAA and partners)
- Conducted two pilot studies to re-introduce *Diadema antillarum* into fore-reef environments in the Florida Keys to enhance grazing and reduce macroalgal biomass. (DOI)
- Conducted initial experiments in culturing of spawned gametes of important reef-building corals to improve settlement and recruitment potential. (multiple partners)
- Employed new mapping technology and developed a spatial recovery model for seagrass damage assessment work in the FKNMS. (NOAA and partners)
- Developed a coral fragment holding and propagation facility at the Florida Aquarium and completed two experimental coral nursery/restoration research projects in the Florida Keys. (NOAA and partners)

Goal 9: Restore Damaged Reefs

- Conducted coral transplants at various times throughout the year to study the role of genetics and physiology in survival of staghorn and elkhorn coral for possible use in reef restoration. (NOAA and partners)

Objective 3 Accomplishments:

- Drafted a Programmatic Environmental Impact Statement for coral and seagrass restoration in the FKNMS that will facilitate future restoration work. (NOAA and partners).
- Completed Environmental Sensitivity Index maps for the Caribbean, and main Hawaiian Islands. (NOAA and partners).

Objective 4 Accomplishments:

- Stabilized damaged reef habitat, recreated high relief topography, and transplanted corals in response to the *Columbus Iselin*, *Jacquelyn L*, *Bateau Duhe* and *Connected* groundings in the FKNMS. (NOAA and partners)
- Continued restoration of reefs damaged by grounding of nine long-liner ships in American Samoa; moved and transplanted corals during this restoration effort. (USCG, NOAA and partners)
- Restored over 1,000 acres of mangroves in the Los Machos and Red Mangrove Forests of Puerto Rico, through the Department of Defense Legacy project to support the recovery and protection of nearby coral reefs. (DOD)

Objective 6 Accomplishments:

- Produced technical information and resource guides for U.S. and international use to help respond to, and assess, damage from oil spill events in coral reef ecosystems (NOAA).
- Began developing database on current literature regarding assessment of the economic value of coral reef ecosystems for use in assessments following damage events
- Established “Reef Medics” volunteer restoration program in the FKNMS (NOAA and partners).
- Conducted artificial reef training workshops in Florida and Puerto Rico, planned for two workshops in the Pacific. (NOAA and partners).

IMPLEMENTATION PLAN 2002-2003

Successful implementation of the strategy is contingent on funding and other factors, including effort by a variety of federal and non-federal organizations. The Coastal Uses Working Group of the U.S. Coral Reef Task Force, working with many partners, provided the following partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the objectives. More

Goal 9: Restore Damaged Reefs

detailed information is available from the working group or member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>).

To Address Objective 1:

- Complete the inventory of coral reef restoration projects and techniques for use by managers, scientists and others.
- Compile a manual on coral reef restoration/mitigation techniques recommended for various Pacific island marine habitats and environmental conditions.
- Evaluate recovery of coral and fish communities at the *Fortuna Reefer* ship grounding site, as well as the *Columbus Iselin*, *Houston*, *Wellwood*, *Elpis*, *Maitland*, *Bateau Duhe*, and *Connected* restoration sites.

To Address Objective 2:

- Develop an aquaculture facility at the Tampa Aquarium to grow coral colonies for use in reef restoration.
- Continue work on *Diadema* culture and re-introduction in the Florida Keys, applying lessons learned in 2001.

To Address Objective 3:

- Begin development of regional restoration plans in two regions to identify priorities and alternatives.

To Address Objective 4:

- Remove a high priority abandoned vessel from coral reefs in the Hawaiian Islands.
- Complete development of a programmatic Environmental Impact Statement (EIS) for coral reef and seagrass restoration projects in the FKNMS.

To Address Objective 5:

- Rehabilitate degraded fish habitat within impacted areas.
- Evaluate effects of artificial reefs and their role in fisheries management.

To Address Objective 6:

Goal 9: Restore Damaged Reefs

- Produce technical information and resource guides for U.S. and international use to help prevent, respond to and restore damage events in coral reef ecosystems.
- Complete and make available database on current literature regarding assessment of the economic value of coral reef ecosystems for use in assessments following damage events.

GOAL 10: **IMPROVE OUTREACH AND EDUCATION**

KEY THREATS ADDRESSED:

Improving outreach and education is critical to helping people understand the value of coral reef ecosystems and how to avoid damaging them. Outreach and education are an essential part of fulfilling all the other goals in this strategy, and therefore address a number of key threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal area (outreach and education) in addressing the impacts from these threats. A higher ranking suggests that outreach and education activities are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global warming/ climate change	Diseases	Hurricanes/ Typhoons	Extreme biologic events	Overfishing	Destructive fishing practices	Habitat destruction	Invasive species	Coastal development	Coastal pollution	Sedimentation & runoff	Marine debris	Overuse from tourism	Vessel groundings	Vessel discharges
Improve Outreach and Education	H	L	L	L	H	H	H	H	H	H	H	H	H	H	H

RATIONALE FOR ACTION:

Reducing human impacts to coral reef ecosystems often requires changing our collective behavior, beliefs, values, and decision making-criteria about when, how, and whether to conserve these vital ecosystem. An informed, engaged public, including policy makers, industry representatives, non-governmental organizations, and other stakeholders, is fundamental to successfully achieving the goals of this strategy. People will be more likely to alter their actions and support efforts to conserve coral reefs if they are knowledgeable about why coral reefs are important to their lives, understand how their actions affect the condition of the reef, and are aware of what individually and collectively can be done to contribute to coral reef protection.

Goal 10: Improve Outreach and Education

By building on existing education efforts and working collaboratively, we can increase awareness of coral reef conservation issues and inform specific target audiences about how they can help protect coral reef ecosystems.

Education efforts will be most effective in addressing overfishing and destructive fishing practices, habitat destruction, coastal development and pollution, overuse from tourism, and vessel groundings. An informed public will be more likely to understand the need for and abide by fishing regulations. Habitat destruction caused by unplanned coastal development, pollution, and sedimentation runoff may decrease as the public becomes informed of the implications of land-based actions on coral reef ecosystems and learn cost-effective ways to mitigate their impacts. The millions of divers and snorkelers who visit coral reef ecosystems every year physically damage reefs in areas where their activities are heavily concentrated. The tourism industry has realized the need to insure that visitors use natural resources responsibly and is looking for programs to raise awareness of this problem among divers and snorkelers. Finally, hundreds of vessel groundings on coral reefs could be avoided if accurate marine maps were distributed to boaters educated in both boat operation and map reading.

OUTREACH AND EDUCATION STRATEGY

The goal of this strategy is to increase awareness and understanding of the ecological, cultural and socio-economic importance of coral reef ecosystems among the widest possible audience. The strategy is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the Outreach and Education working group of the U.S. Coral Reef Task Force. For more detailed information see <http://coralreef.gov/>. The strategy includes the following objectives to achieve the goal:

- Objective 1: Raise public awareness and appreciation for coral reef ecosystems through targeted and focused communications campaigns.
- Objective 2: Incorporate coral reef ecosystem issues in education programs to promote understanding of marine conservation.
- Objective 3: Inform the public and policy-makers about accomplishments and recommendations of the U.S. Coral Reef Task Force.
- Objective 4: Increase understanding of coral reef ecosystems through conducting comprehensive assessments of monitoring and coral reef habitats.

Objective 5: Support outreach and education initiatives in the states and territories and initiate grants to local community groups.

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by members and partners of the U.S. Coral Reef Task Force to achieve the goal and objectives. For more detailed information see <http://coralreef.gov/>.

Objective 1 Accomplishments:

- Prevented approximately 398,000 tons of soil from being eroded from agricultural land and damaging Caribbean coral reefs by providing over 6,400 customers with conservation education assistance in developing sound conservation plans. (USDA and partners)
- Developed an outreach marketing strategy based on state-wide focus groups and market survey of conservation issues in Hawaii. Began implementing outreach strategy. (Hawaii)
- Coordinated a multi-island community event for coral spawning and produced information brochure on spawning events in Hawaii. (Hawaii)
- Included coral reef protection information in materials to over 116,000 people through Sea Partners, the Coast Guard's marine environmental protection outreach and education program. (USCG)

Objective 2 Accomplishments:

- Distributed 30,000 Coral Reef Teacher guides throughout the U.S., Mexico and Belize hosted virtual Teacher Workshops on Coral Reefs for 1,000 teachers including a session in Spanish. (multiple partners)
- Provided over 120 books on coral reefs to the public library in American Samoa. (AS)

Objective 3 Accomplishments:

- Publicized the accomplishments and work of the Task Force and the All Islands Coral Reef Initiative in brochures distributed to stakeholders, governments, non-governmental organizations (NGOs), and industry. (multiple partners)

Objective 4 Accomplishments:

- Developed *Protect the Living Reef* a training program teaching low-impact diving or snorkeling techniques and incorporated the videos and guides in a new Coral Reef

Goal 10: Improve Outreach and Education

Conservation Specialty Course (certified by the Professional Association of Dive Instructors (PADI)) and the Reef Condition (RECON) Monitoring Program. (multiple partners)

- Developed and field-tested a rapid-assessment protocol for recreational divers and students to survey the condition of stony corals, the presence of key indicator organisms, and conspicuous human-induced damage to reef systems in the wider Caribbean. Trained instructors and divers in the Florida Keys, USVI, and Puerto Rico. (multiple partners)

Objective 5 Accomplishments:

- Established a grants program with the National Fish and Wildlife Foundation (NFWF) that provided support through public-private partnerships for education and outreach on coral reefs. (NOAA)
- Reduced waste contamination to reefs from pig farming and assisted American Samoan farmers in upgrading their swine management skills. (AS)
- Funded three community-based reef monitoring and assessment projects in Hawaii (HI, NOAA and partners).

IMPLEMENTATION PLAN 2002-2003

Successful implementation of the strategy is contingent on funding and other factors, including effort by a variety of federal and non-federal organizations. The International working group of the U.S. Coral Reef Task Force, working with many partners, provided the following partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the goal and objectives. More detailed information is available from the working group or member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>).

To Address Objective 1:

- Continue dissemination of newly developed coral reef videos and educational materials to resource managers and tourism industry.
- Develop partnerships with the cruise industry (e.g., Florida-Caribbean Cruise Association).
- Conduct a targeted domestic and international marketing, information and dissemination campaign, focused on key sectors such as travel and tourism, land use (developers/agriculture), policy makers and fishing (commercial/recreational).
- Educate divers on low-impact diving through continued collaborations with NOAA, National Park Service, Project AWARE, community NGOs and state and territorial agencies.
- Continue providing conservation education assistance to private landowners and land users and help them develop and implement conservation plans.

Goal 10: Improve Outreach and Education

- Continue educating reef users through Team OCEAN's volunteer program, and expand program to two new areas of the Keys – Islamorada and Marathon.
- Implement Hawaii outreach and education strategy developed in FY2001.

To Address Objective 2:

- Develop curriculum for and teach Coral Reef Classroom to Monroe County students and teachers.
- Provide Web site access to educational materials for teachers and students.
- Provide coral reef related books to all high schools in American Samoa.

To Address Objective 3:

- Upgrade and coordinate the Task Force web-page and ensure linkages with all other initiatives.
- Produce annual Task Force accomplishments report.

To Address Objective 4:

- Develop and implement coral reef observing and forecast systems (see Goal 2: Assess, Monitor and Forecast Coral Reef Health).
- Provide information from coral reef monitoring and assessment efforts to stakeholders, managers and policy makers for effective use and management decisions.

To Address Objective 5:

- Support additional coral reef ecosystem outreach coordinator positions at national, regional and local levels.
- Increase support for small grants programs that build public-private partnerships for outreach and education on coral reefs worldwide.
- Train local stakeholders in monitoring techniques, data collection/processing, and public education/outreach in select locations within the wider Caribbean Region (e.g. USVI, Puerto Rico, Bahamas).
- Develop partnerships to train local tour operators in sound reef practices.

GOAL 11: REDUCE THREATS TO INTERNATIONAL CORAL REEFS

KEY THREATS ADDRESSED:

Reducing international threats to coral reefs requires addressing a number of issues critical to the long-term protection of coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global Warming/ Climate Change	Diseases	Hurricanes/ Typhoons	Extreme Biotic Events	Overfishing	Destructive Fishing Practices	Habitat Destruction	Invasive Species	Coastal Development	Coastal Pollution	Sedimentation & Runoff	Marine Debris	Overuse from Tourism	Vessel Groundings	Vessel Discharges
Reduce Threats to International Reefs	H	L	L	M	H	H	H	M	H	H	H	M	H	H	H

RATIONALE FOR ACTION:

The U.S. has strong political and economic interests in protecting international coral reef ecosystems. Healthy marine ecosystems are critical to U.S. diplomatic and development strategies to promote economic and food security, social stability, democratic governance, improved human health, disaster and climate change mitigation, and biodiversity conservation in many countries. Coral reef ecosystems have great economic, social and cultural importance to many nations and entire regions. These extremely valuable ecosystems constitute the economic

base and future hope for sustained development in many countries, particularly small island Nations.

Coral reefs around the world are seriously threatened by direct and indirect human actions (Best et al 2002). The 1998 *Reefs at Risk* study found that almost 60 percent of the world's coral reefs are potentially threatened by human activity - ranging from coastal development and destructive and over-fishing practices to overexploitation of resources, marine pollution, and land-based sources of pollution (Bryant et al 1998). Runoff from inland deforestation, farming, sewage and municipal discharge decrease coastal water quality and increase sedimentation and excess nutrients on reefs. Global surveys by Reef Check and other organizations have found that most reefs are severely over-fished, with most organisms of high commercial value missing. In addition, the recent global impacts of catastrophic events, such as widespread coral bleaching and mortality and increased storm intensity, compound the more localized human impacts that place reefs at risk (Schuttenberg 2001).

Six billion people now inhabit our planet, twice as many as 40 years ago, and an additional 3 billion are expected in the next 40 years. Population pressures are particularly acute in coastal areas. Presently, almost half a billion people are estimated to live within 100 kilometers of a coral reef, deriving great benefits from reef resources while placing increasing demands on these complex and fragile ecosystems that can no longer sustain such pressures.

STRATEGY TO REDUCE INTERNATIONAL THREATS

The strategy to achieve this goal is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the International working group of the U.S. Coral Reef Task Force. To accomplish this goal, the U.S. Government will forge and support strategic partnerships with international organizations and conventions, the International Coral Reef Initiative, other governments, non-governmental groups, and the public and private sectors to address international threats and encourage broad stakeholder involvement. Collaboration with our domestic and international partners will strive to conserve international coral reefs, mangrove forests, seagrass meadows, and global biodiversity, while sustaining the human communities that depend on them.

Development and technical assistance efforts will focus on building human and institutional capacity for integrated coastal management, marine park and protected area management, reduction of land-based sources of pollution, sustainable tourism, and sustainable fisheries in coral reef nations. In many cases, these capacity-building efforts will provide the foundation for a governance system based upon the principles of transparent, participatory governance and

Goal 11: Reduce Threats To International Reefs

adaptive management. For more detailed information, see www.coralreef.gov. The strategy includes six broad objectives to reduce threats to international reefs from human activities:

- Objective 1: Exercise global leadership in the international arena in shaping and developing environmentally sound and comprehensive ocean and coral reef policy.
- Objective 2: Build human and institutional capacity to manage and conserve reef ecosystems and coastal watersheds through integrated coastal management.
- Objective 3: Promote efforts to prevent, reduce and control land-based sources of pollution and their effects on coral reef ecosystems, including beaches, lagoons, seagrass beds, mangrove forests, shallow reefs, deep reefs and submerged bank reefs.
- Objective 4: Support the creation and effective management of coral reef marine protected areas, particularly those that contain substantial ecological (*i.e.* no-take) reserves.
- Objective 5: Address the impact of global change, coral bleaching, and coral health on reefs and people.
- Objective 6: Address unsustainable and destructive fishing practices and the U.S. role in and impact on international trade in coral reef species. (See goal on International Trade.)

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by members of the U.S. Coral Reef Task Force to achieve the goal and objectives. For more detailed information see <http://coralreef.gov/>.

Objective 1 Accomplishments:

- Promoted sound coral reef conservation and policy issues in various international and regional fora -- including the International Coral Reef Initiative (ICRI), Convention on International Trade in Endangered Species of Fauna and Flora (CITES), Convention on Biological Diversity (CBD), Ramsar and the 9th International Coral Reef Symposium. (DOS, USAID, NOAA, DOI, EPA)
- Worked with the International Maritime Organization (IMO) to create a provision for nations to establish international no-anchoring areas under IMO authorities. (NOAA, USCG, DOS and partners)

Goal 11: Reduce Threats To International Reefs

- Based on U.S. proposals, the IMO designated the Flower Garden Banks National Marine Sanctuary (FGBNMS) as a no-anchoring area, initially approved 5 no-anchoring areas in the Florida Keys National Marine Sanctuary (FKNMS), and designated the FKNMS a Particularly Sensitive Seas Area (PSSA). (NOAA, USCG, DOS and partners)
- Submitted a proposal for establishing universal coral and PSSA symbols to the International Hydrographic Organization (IHO) to more easily identify these areas on navigational charts. (NOAA and partners)

Objective 2 Accomplishments:

- Improved international capacity for sustainable management and conservation in 25 countries within the Wider Caribbean, Central America, South East Asia, South Pacific, East Africa and Middle East regions. (USAID, NOAA, DOI, EPA, Peace Corps)

Objective 3 Accomplishments

- Strengthened efforts to reduce coastal pollution in at least 20 countries. (USAID, NOAA, USDA, EPA)
- Initiated the “Ridge to Reef” project in Jamaica, which integrates land-based management practices for agriculture, forestry and urban planning with coastal activities, such as improving coastal water quality to protect the reefs. (USAID)

Objective 4 Accomplishments:

- Strengthened site-based and park management, including education and enforcement, in 15 parks of national and international importance. (USAID, NOAA)

Objective 5 Accomplishments:

- Promoted and supported the Global Coral Reef Monitoring Network and the publication of *Status of Coral Reef of the World: 2000* and the *Socioeconomic Manual for Coral Reef Managers*. (DOS, NOAA, USAID)
- Continued providing data on sea surface temperatures and forecasting/tracking coral bleaching events worldwide through the Coral Watch Program. (NOAA and partners)
- Established U.S. - Australia bilateral partnership to develop improved tools for remote sensing of coral reef bleaching and other conditions. (NOAA, Great Barrier Reef Marine Park Authority, Australian Institute for Marine Sciences)

Objective 6 Accomplishments:

- Addressed destructive fishing practices and adverse impacts of international trade in coral reef species through the East Asia and Pacific Environmental Initiative. (DOS, USAID)
- Promoted the adoption of APEC's Destructive Fishing Resolution to address destructive fishing practices associated with the live reef fish trades. (NOAA, DOS, USAID)

IMPLEMENTATION PLAN 2002-2003

Successful implementation of the strategy is contingent on funding and other factors, including effort by a variety of federal and non-federal organizations. The International working group of the U.S. Coral Reef Task Force, working with many partners, provided the following partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the objectives. More detailed information is available from the working group or member organizations of the U.S. Coral Reef Task Force (<http://coralreef.gov/>).

To Address Objective 1:

- Promote sound coral reef conservation and policy issues in various international and regional fora -- including the International Coral Reef Initiative, CITES, CBD, Ramsar.
- Promote mutually supportive international trade and environmental policies.

To Address Objective 2:

- Promote best practices to protect coastal watersheds, coastal wetlands and reef resources and reduce coastal pollution through integrated coastal management.
- Develop and disseminate effective management tools.
- Promote understanding of the socio-economic costs and benefits of management measures.

To Address Objective 3:

- Promote coordination with United Nations Environment Program (UNEP) Global Program of Action and Regional Seas Programs to reduce soil erosion and agrochemical runoff, prevent industrial and municipal pollution, and reduce urban solid waste and wastewater.
- Improve coastal water quality through environmentally sound business practices, such as hotel Environmental Management Systems and hotel and beach certification schemes
- Promote long-term economic and community benefits of healthy coral reef ecosystems to tourism, one of the fastest global growth sectors and engage tourists and the private sector in protecting coastal resources.

To Address Objective 4:

- Enhance effective management and establishment of MPA networks by promoting sustainable financing mechanisms and by enhancing sustainable fisheries through ecological no-take areas.

To Address Objective 5:

- Strengthen the Global Coral Reef Monitoring Network and its collaborators
- Expand climate related coral reef observing systems such as Coral Reef Watch early warning system.
- Enhance management strategies as a mitigation strategy for coral bleaching, such as criteria for MPA selection.
- Identify regional bleaching risks based on recent (last 20 years) trends.
- Reduce vulnerability of coastal communities to global change – sea level rise, food insecurity, and coastal storms.

To Address Objective 6:

- Promote effective governance and sustainable management practices for artisan and commercial uses that address over-exploitation, destructive fishing practices, harmful fishing gear and loss of critical fish nursery habitat.
- Incorporate coral reef fisheries into food security considerations at local and global levels.
- Promote mutually supportive international trade and environmental policies.

GOAL 12:

REDUCE IMPACTS FROM INTERNATIONAL TRADE IN CORAL REEF RESOURCES

KEY THREATS ADDRESSED:

Reducing impacts from international trade is important to reducing a number of key threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

THREATS	Global warming/ climate change	Diseases	Hurricanes/ typhoons	Extreme biologic events	Overfishing	Destructive fishing practices	Habitat destruction	Invasive species	Coastal development	Coastal pollution	Sediment-ton & runoff	Marine debris	Overuse from tourism	Vessel groundings	Vessel discharges
Reduce Impacts of Trade	L	L	L	L	H	H	M	M	L	L	L	L	M	L	L

RATIONALE FOR ACTION:

Many coral reef species and resources are harvested globally for commercial purposes, including food, the aquarium trade, live fish markets, construction materials, curios, jewelry, pharmaceuticals and traditional medicines. Some of this commercial collection involves destructive fishing practices, such as the use of poisons to capture live reef fish for aquaria and live fish markets. In many cases, the local and regional intensity of collection appears to be occurring at unsustainable levels. Surveys suggest that almost all reefs have been affected by over-collecting, and that there may be almost no pristine reefs left in the world (Hodgeson 1999).

Unsustainable and destructive fishing practices are altering the ecosystem functions of reefs and greatly diminishing long-term benefits to local communities, who depend upon reef resources for food, livelihoods, coastal protection and cultural activities (Johannes and Riepen, 1995). Unsafe diving practices associated with collection of some species for trade is also leading to a high incidence of illness, paralysis and death of collectors in some regions.

Executive Order 13089 on coral reef conservation charges the U.S. Coral Reef Task Force with analyzing and addressing the U.S. role in the international trade of coral reef species. The Task Force International Working Group has taken a number of actions to fulfill this task (see <http://coralreef.gov/> for Working Group reports). A recent symposium on coral trade summarizes many of the findings to date (Best and Bornbusch 2001).

During the 1990's, the U.S. was consistently the world's largest importer of coral. The U.S. imports 60- 80 percent of the live coral, over 50 percent of the curio coral, and 95 percent of the live rock and reef substrate in international trade each year, and the global trade is increasing annually by 10-30 percent (Bruckner 2001). In addition, the U.S. is estimated to import about 8 million of the 14-30 million marine aquarium fishes in trade. The aquarium trade includes over 1,000 species, with approximately two-thirds originating in the Indo-Pacific and a large proportion caught using cyanide. Coral reef fishes are also being overexploited for the live reef food fish trade, which supplies Asian restaurant markets with groupers, large wrasses and other low productivity species that are particularly vulnerable to overfishing.

As the world's largest importer of ornamental coral reef species, the U.S. has a critical responsibility to address degradation of coral reef ecosystems that may arise from destructive collection practices and unsustainable trade. The U.S. has banned the use of most destructive fishing practices, and collection of stony corals and live rock are prohibited in most federal, state and territorial waters. However, many coral reef products and species continue to be imported into the U.S. that were captured using harmful extraction methods or were overexploited. In the last several years, there have been efforts by the aquarium industry and non-governmental organizations to develop new procedures and guidelines for sustainable collection and transport of coral reef organisms for the industry (e.g., Marine Aquarium Council Certification Program).

Furthermore, survivorship of animals from reef to consumer is often low due to stresses associated with cyanide fishing and poor handling and transport. In light of the global decline in coral reef ecosystem health, and because of the prominent role of the U.S. as a consumer of coral reef species, it is in the national interest of the U.S. to ensure the environmental sustainability of collection and trade as well as the long-term environmental and economic benefits to local communities dependent on coral reef ecosystems.

STRATEGY TO REDUCE IMPACTS OF GLOBAL TRADE

The goal of this strategy is to reduce the adverse impacts of collection and trade in coral reef animals, encourage more responsible trade, and encourage the conservation and management of coral reef ecosystems both domestically and internationally. The strategy is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the International working group of the U.S. Coral Reef Task Force. For more detailed information see <http://coralreef.gov/>. The strategy includes two broad objectives to achieve the goal:

Objective 1: Assess the nature and extent of the trade in coral reef species, and both positive and negative impacts associated with the trade.

Objective 2: Evaluate and implement approaches to mitigate negative environmental impacts associated with the trade.

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by members of the U.S. Coral Reef Task Force to achieve the goal and objectives. For more detailed information see <http://coralreef.gov/>.

Objective 1 Accomplishments:

- Assessed the trade in stony corals and the U.S. role as a major consumer. (NOAA, DOI, DOS and partners)
- Assessed the domestic harvest of ornamentals from Florida. (NOAA and partners)

Objective 2 Accomplishments:

- Exercised global leadership and raised awareness in international and regional fora such as the International Coral Reef Initiative (ICRI), Convention on International Trade in Endangered Species (CITES), Asia Pacific Economic Cooperation (APEC) and other opportunities (e.g., Special Protected Areas Wildlife (SPAW)). (DOS, USAID, NOAA, EPA, DOI)
- Developed a comprehensive trade strategy to reduce adverse impacts of trade. (DOS, USTR, DOI, NOAA, USAID, DOJ, EPA)
- Worked with the Marine Aquarium Council and other groups in development of sustainable practices and certification programs for trade in coral reef species for the aquarium industry. (NOAA, DOI, DOS, USAID, DOJ, EPA)
- Increased human and institutional capacity in developing countries to address adverse

impacts and promote sustainable management. (DOS, USAID, NOAA)

- Supported programs under the East Asia and Pacific Environmental Initiative to address destructive fishing practices and negative aspects of international trade. (USAID, DOS).
- Established precedent-setting criminal convictions for illegal imports of protected corals and Caribbean lobsters, and illegal harvest and commerce in Hawaiian corals and live rock. (DOI, DOJ, NOAA).
- Led the successful initiative by the APEC forum to adopt the Destructive Fishing Resolution and begin implementation. (DOS, NOAA, USAID).
- Provided financial and technical support to the Pacific Regional Workshop “Sustainable Management of the Marine Ornamental Trade” in Fiji. (DOS, USAID, NOAA).
- Sponsored and organized the “International Coral Trade Workshop; Development of Sustainable Management Guidelines” in Jakarta, Indonesia. (NOAA, DOS)

IMPLEMENTATION PLAN 2002-2003

Successful implementation of the strategy is contingent on funding and other factors, including effort by a variety of federal and non-federal organizations. The International working group of the U.S. Coral Reef Task Force, working with many partners, provided the following partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the objectives. For more detailed information see <http://coralreef.gov/>.

To Address Objective 1:

- Continue consultations with coral exporting countries and other stakeholders to assess the nature and extent of the impacts associated with trade in coral reef species.
- Assess the nature and extent of the impacts associated with the trade in coral reef species, especially the marine curio, ornamental and food trades, and assess the adverse impacts on the health of collectors.
- Assess U.S. ornamental reef fish and curio imports through analysis of customs declaration forms and develop a web-based database for compiling import data.
- Evaluate the ornamental fishery in U.S. waters, including the extent of trade and status of resource, and develop recommendations for sustainable management.

To Address Objective 2:

- Exercise global leadership in shaping and developing mutually supportive environmental and trade policies.

Goal 12: Reduce Impacts From International Trade

- Participate in international and regional fora, including CITES, APEC and ICRI, to address concerns relating to coral reef species trade and to raise global and regional awareness of the issues and solutions.
- Work with various stakeholders to develop public education and awareness materials aimed at reducing unsustainable harvest practices and responsible consumer behaviors.
- Expand human and institutional capacity-building efforts in countries with coral reefs to develop and implement sustainable management plans, enforce relevant laws and regulations, develop environmentally sound collection practices and alternatives, and implement other measures that protect and conserve coral reef ecosystem.
- Work with stakeholders to encourage sustainable, environmentally sound captive-breeding or artificial culture programs in host countries that ensure benefits to local communities and to reduce the introduction of exotic and invasive species.
- Promote effective governance and sustainable management practices for artisan and commercial uses, including the use of marine protected areas.
- Improve domestic law enforcement of illegal coral reef species trade.
- Work with the marine aquarium industry and various stakeholders to eliminate destructive collection practices, reduce mortality during handling and transport, and promote industry-led certification schemes that are rigorous, environmentally sustainable and include equitable distribution of profits to local communities.
- Work with stakeholders, APEC members, and non-governmental organizations to develop industry standards for the live reef fish food trade.

Develop and implement additional measures as appropriate to ensure that consumer demand for marine aquarium organisms does not threaten the health and sustainability of coral reef species and ecosystems.

GOAL 13: **IMPROVE COORDINATION AND ACCOUNTABILITY**

KEY THREATS ADDRESSED:

Improving coordination and accountability will help ensure effective action to reduce key threats to coral reef ecosystems. The figure below is a general summary of the relative importance (H = high, M = medium, L = low) of this goal in addressing the impacts from these threats. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. The rankings are a summary of input shown in Table 2. The actual importance of this goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

	Global Warming/ Climate Change	Diseases	Hurricanes/ Typhoons	Extreme Biotic Events	Overfishing	Destructive Fishing Practices	Habitat Destruction	Invasive Species	Coastal Development	Coastal Pollution	Sedimentation & Runoff	Marine Debris	Overuse from Tourism	Vessel Groundings	Vessel Discharges
Improve Coordination and Accountability	H	M	L	L	H	H	H	H	H	H	H	M	L	H	H

RATIONALE FOR ACTION:

Given the broad and overlapping aspects of many coral reef conservation issues, coordination among government agencies is essential for implementing effective and efficient actions. Collaboration among government and non-governmental entities is also critical to addressing many threats to coral reefs. Setting goals and objectives, tracking progress to achieve these goals, and regularly assessing the status of current or new threats is a key part of effective stewardship of these valuable resources. In addition, Executive Order (E.O.) 13058 on Coral Reefs directs U.S. Government agencies to avoid actions and decisions that may harm coral reefs. Specifically, federal agencies are required “to the extent permitted by law, to ensure that actions they authorize, fund or carry out will not degrade the conditions of such ecosystems.”

Communication, collaboration and accountability are essential part of a successful strategy to implement the National Action Plan and achieve the purposes of the CRCA.

STRATEGY

The goal of this strategy is to increase coordination and accountability among federal, state and territorial partners of U.S. Coral Reef Task Force to ensure efficient and successful implementation of the National Action Plan and other coral reef conservation efforts. The strategy is outlined in the U.S. National Action Plan to Conserve Coral Reefs and related documents of the U.S. Coral Reef Task Force. For more detailed information see <http://coralreef.gov/>. The strategy includes the following objectives to achieve the goal:

- Objective 1: Coordinate the submission of Coral Reef Protection Implementation Plans, annual reports and other documents by Task Force member agencies
- Objective 2: Coordinate planning and development of crosscutting initiatives, promote exchange of information on activities, needs and concerns, and facilitate resolution of issues related to coral reef conservation.
- Objective 3: Coordinate the annual submission of agency reports of programs, policies and actions.
- Objective 4: Coordinate the process for the public inquiry about, and agency response to issues or concerns relating to federal agency actions and coral reef protection.
- Objective 5: Work with the Council on Environmental Quality, federal agencies and other interested entities, to develop guidance and tools assessing alternatives and potential impacts of actions through the National Environmental Policy Act (NEPA) and Executive Order 12114.

SUMMARY OF ACCOMPLISHMENTS (2001)

The following is a partial summary of recent accomplishments by members of the U.S. Coral Reef Task Force to achieve the goal and objectives. For more detailed information see www.coralreef.gov.

Objective 1 Accomplishments:

- Revised reporting process concerning member implementation plans and other reports as outlined in the Task Force Oversight Policy (for Task Force review and possible adoption).

(Task Force)

- Drafted Task Force Charter outlining mission and objectives (for review and possible adoption by the Task Force). (Task Force)

Objective 2 Accomplishments:

- Developed multiple joint initiatives among government and non-governmental partners on coral reef conservation (see Summary of Accomplishments (2001) of other goal sections for more information). (multiple partners)
- Promoted information exchange and resolution of issues through two meetings of the U.S. Coral Reef Task Force. (Task Force)

Objective 3 Accomplishments:

- Drafted revised reporting process outlined in the Task Force Oversight Policy and other sources for Task Force review. (Task Force)
- Provided agency reports of programs, policies and actions at two Task Force meetings (and meeting summaries). (Task Force)

Objective 4 Accomplishments:

- Drafted revisions to the Task Force Oversight Policy to clarify and streamline process for public inquiry concerning federal actions (under Task Force review). (Task Force)
- Provided opportunity for public input at all Task Force meetings (two held in 2001). (Task Force)

Objective 5 Accomplishments:

- Developed agency guidance and other resources to help guide review and development of alternatives, documents associated with the National Environmental Policy Act (NEPA) and Executive Order 12114 (NOAA, DOD). (NOAA and other agencies)

IMPLEMENTATION PLAN 2002-2003

Successful implementation of the strategy is contingent on continued cooperation, collaboration and other factors. The following is a partial summary of key actions needed from government and non-governmental entities in 2002-2003 to help fulfill the goal and objectives. This information was developed in consultation with the U.S. Coral Reef Task Force. For more detailed information see www.coralreef.gov.

To address Objective 1:

- Update and adopt revised process to better track and report accomplishments and progress to implement the Task Force National Action Plan (as outlined in the Task Force Oversight Policy and other sources, as appropriate).
- Adopt a Task Force Charter outlining mission and objectives of the Task Force.

To address Objective 2:

- Identify key areas for joint planning and develop specific action initiatives for 2002, 2003 and 2004.
- Increase information exchange among Task Force members and interested parties through Task Force meetings, workshops, upgraded Task Force Web site and other mechanisms as appropriate.

To address Objective 3:

- Update and adopt revised reporting process outlined in the Task Force Oversight Policy and other sources, as appropriate.

To address Objective 4:

- Update, as appropriate, the existing process outlined in the Task Force Oversight Policy.

To address Objective 5:

- Complete, review and adopt pilot “toolbox” and other guidance as appropriate for federal agency use in developing and reviewing National Environmental Policy Act (NEPA) documents related to coral reefs.

FEDERAL FUNDING FOR CORAL REEF CONSERVATION



FEDERAL AGENCY FUNDING FOR CORAL REEF CONSERVATION

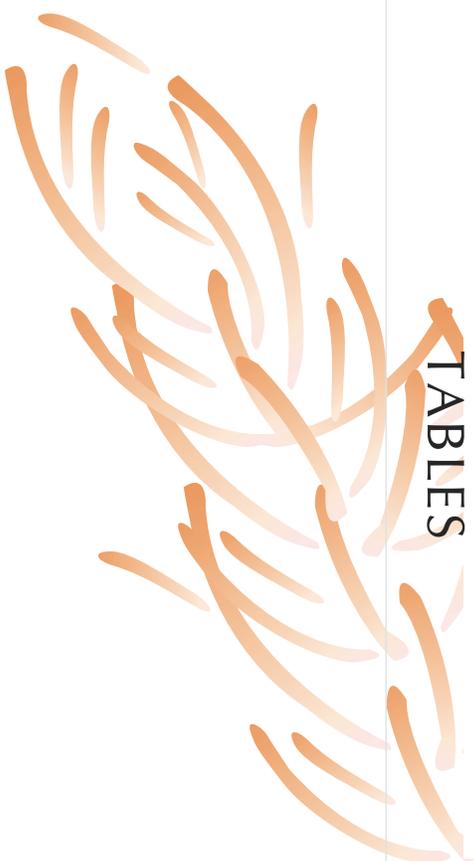
The Coral Reef Conservation Act of 2000 requires NOAA to submit to the Congress a National Action strategy that includes a statement of goals and objectives, an implementation plan, and a description of the funds obligated each fiscal year to advance coral reef conservation. Federal agencies provide funding for a wide variety of activities that directly, or indirectly, advance coral reef conservation. Federal agencies were asked to provide information on their funding that directly supported coral reef conservation activities in fiscal years 1999-2002.

The information provided by each agency for use in this report is shown in Tables 5 and 6. Tables 5 and 6 only include funding directly related to coral reef conservation activities as determined by each agency, and do not include funding for activities indirectly related to coral reef conservation. Note that these Tables will not include indirect support from federal agencies for activities related to coral reef conservation.

Table 5 shows estimates of federal funding directly related to coral reef conservation by each agency during fiscal years 1999-2002. The data suggest that from 1999-2001, overall federal funding directly related to coral reef conservation activities increased by approximately \$30 million to a total of \$90 million. Complete data were not available for 2002 from some agencies.

Table 6 shows estimates of federal funding for coral reef conservation by each of the 13 major goal areas of the strategy during fiscal years 1999-2001 (values for 2002 were not available). Table 6 allows comparison and tracking of funding levels for different goal areas over time. Total funding increased in the period from 1999 to 2001, and funding increased for some goal areas more than others (e.g., mapping, monitoring, research, marine protected areas, reducing fishing impacts). Funding for other goal areas remained about the same (e.g. understanding social/economic factors, reduce pollution, restoration, education/outreach, international activities, impacts of trade, improve coordination), or declined (reduce impacts of coastal uses).

TABLES



TABLES

Table 1. Ranking of Major Threats to Coral Reef Ecosystems By Region.

This table is a general summary of the relative impact (H = high, M = medium, L = low) of natural and human-related threats to United States and international coral reefs by region. Rankings were provided by scientists, managers, and representatives of the United States Coral Reef Task Force for use in this document. The actual impacts of each threat will vary within and between regions depending on conditions, location, and other factors.

THREATS	REGIONS													
	Atlantic/Caribbean				Polynesia				Micronesia				U.S. Remote Insular Reefs	International Coral Reefs
	Florida	Puerto Rico	U.S. Virgin Islands	Flower Gardens	Main Hawaiian Islands	Northwestern Hawaiian Islands	American Samoa	Guam	Northern Mariana Islands	Federated States of Micronesia	Marshall Islands	Palau		
Global warming and bleaching	H	M	M	L	L	L	M	L	M	M	H	H	M	H
Diseases	H	H	H	L	L	L	L	L	L	L	L	L	L	M
Tropical storms	M	L	H	L	L	L	M	M	M	L	M	L	L	L
Coastal development and runoff	H	H	H	L	H	L	H	H	H	H	M	H	L	H
Coastal pollution	H	H	H	L	H	L	H	H	H	M	L	H	L	H
Tourism and recreation	M	M	M	L	H	M	L	M	M	L	L	M	L	M
Fishing	H	H	H	L	H	M	H	M	M	H	M	M	M	H
Trade in coral and live reef species	M	H	L	L	H	M	M	L	L	L	H	L	L	H
Ships, boats, and groundings	H	M	H	M	H	H	M	M	M	H	L	M	M	M
Marine debris	M	M	L	L	M	H	L	L	M	H	L	M	M	M
Alien species	M	L	L	M	H	H	M	L	L	L	H	M	M	M
Security training activities	L	H	L	L	M	L	L	L	H	L	L	L	L	L
Offshore oil and gas exploration	L	L	L	M	L	L	L	L	L	L	L	L	L	M

H = High priority threat
M = Medium priority threat
L = Low priority threat

Table 2. Key Actions to Reduce Threats to Coral Reefs

This table summarizes the relative importance (H = high, M = medium, L = low) of the 13 major goal areas outlined in the Strategy and National Action Plan in addressing key threats to coral reef ecosystems. A higher ranking suggests that activities under this goal are considered more important to addressing the threat. Lower rankings suggest that although activities under this goal may make significant contributions, they may currently be less important to addressing the threat. Rankings were provided by the United States Coral Reef Task Force Working Groups and other sources for use in this document. The actual importance of each goal to addressing threats to reefs will depend on location and other factors (see Tables 3 and 4 for regional comparisons).

KEY THREATS	GOALS												
	Understand Coral Reef Ecosystems				Reduce the Adverse Impacts of Human Activities on Reefs								
	Map All U.S. Coral Reefs	Assess and Monitor Reef Health	Conduct Strategic Research	Understand Social and Economic Factors	Improve Use of Marine Protected Areas	Reduce Impacts of Fishing	Reduce Impacts of Coastal Uses	Reduce Pollution	Restore Damaged Reefs	Improve Education and Outreach	Reduce Threats to International Reefs	Reduce Impacts from International Trade	Improve Coordination and Accountability
Global Warming/ Climate Change	M	H	H	H	M	L	M	H	L	H	H	L	H
Diseases	M	H	H	L	L	M	L	M	L	L	L	L	M
Hurricanes/ Typhoons	L	L	M	L	L	L	L	L	M	L	L	L	L
Extreme Biotic Events	L	M	H	H	L	L	L	L	M	L	M	L	L
Overfishing	H	H	H	H	H	H	L	L	L	H	H	H	H
Destructive Fishing Practices	M	H	M	H	H	H	L	L	H	H	H	H	H
Habitat Destruction	H	H	M	H	H	H	H	L	H	H	H	M	H
Invasive Species	L	H	M	M	M	L	L	H	L	H	M	M	H
Coastal Development	H	H	H	H	M	L	H	M	L	H	H	L	H
Coastal Pollution	H	H	H	H	M	L	H	H	L	H	H	L	H
Sedimentation/ Runoff	M	H	H	H	M	L	H	H	L	H	H	L	H
Marine Debris	L	M	L	L	L	H	L	H	L	H	M	L	M
Overuse from Tourism or Recreation	M	H	M	H	H	M	H	L	L	H	H	M	L
Vessel Groundings	M	M	L	L	H	L	H	L	H	H	H	L	H
Vessel Discharges	L	M	L	M	H	L	M	H	L	H	H	L	H

H = High priority action needed to address threat
M = Medium priority action to address threat
L = Low priority action to address threat

Table 3. Ranking of Actions Needed To Address Threats To U.S. Coral Reefs

This table summarizes the relative importance (H = high, M = medium, L = low) of the objectives under each goal outlined in the Strategy and National Action Plan to addressing key threats to United States coral reef ecosystems by region. Rankings were provided by official state, territory, or commonwealth representatives to the United States Coral Reef Task Force in each region for use in this document. A higher ranking suggests that conducting the objective is considered more important to addressing current threats to coral reefs in the region. Lower rankings suggest that although implementing the objective may make significant contributions, it is currently less important to addressing the major threats to coral reefs in the region. The actual importance of each objective in addressing threats to reefs will vary within and between regions depending on conditions, location, and other factors.

GOALS	OBJECTIVES	REGIONS							
		Atlantic/Carribbean			Polynesia			Micronesia	
		Florida	Puerto Rico	US Virgin Islands	Main Hawaiian Islands	NW Hawaiian Islands	American Samoa	Guam	N. Mariana Islands
Map U.S. coral reefs	Map all shallow reefs (<30 m)	H	H	H	H	H	H	M	H
	Map selected deep reefs (>30 m)+B8	M	L	H	L	L	M	L	L
Assess & Monitor Reef Health	Conduct rapid assessments & inventories	H	M	H	H	H	M	M	H
	Monitor coral, fish, and other living resources	H	H	H	H	H	H	H	H
	Assess water & substrate quality	H	H	H	M	L	H	H	H
	Assess global warming & bleaching	H	M	M	L	L	M	L	M
Conduct Strategic Research	Understand reef processes	H	M	H	M	L	L	M	M
	Understand reef diseases and bleaching	H	H	H	L	L	L	L	M
	Understand impacts of management actions	M	H	M	H	H	H	M	H
Understand Social and Economic Factors	Assess Human Uses of Reefs	H	H	H	H	M	M	H	H
	Assess Social/Economic impacts of reef management	L	H	H	H	M	L	H	M
	Assess value of reef resources	M	H	M	H	M	M	H	H
Improve Use of marine protected areas (MPAs)	Strengthen existing MPAs	H	H	H	H	H	H	H	H
	Identify gaps in MPA system	M	H	H	H	H	H	L	H
	Establish new MPAs	L	H	H	H	M	H	L	H
Reduce adverse impacts of fishing	Reduce Overfishing	H	H	H	H	M	H	L	H
	Reduce habitat destruction and other indirect impacts	M	H	M	H	H	M	M	H
Reduce impacts of coastal uses	Reduce dredging and other habitat impacts	H	H	M	L	L	M	L	H
	Reduce Impacts from Ocean Recreation	L	H	H	H	L	L	H	H
	Improve Vessel management	M	H	M	H	H	L	H	M
Reduce pollution	Reduce Sediment Pollution	M	H	H	H	L	H	H	H
	Reduce Nutrient Pollution	H	H	M	H	L	M	H	H
	Reduce Chemical Pollution	M	M	M	M	M	H	H	H
	Reduce Marine Debris	M	M	M	M	H	M	L	L
	Prevent and Control Invasive Species	M	L	L	H	H	L	L	L
Restore damaged reefs	Improve Response Capabilities	H	H	M	H	H	M	L	M
	Improve Restoration Techniques	M	H	M	M	L	L	M	M
	Restore Damaged Reefs	M	H	L	L	L	L	L	M
Improve Education & Outreach	Increase awareness	H	H	H	H	M	H	H	H
Reduce International Threats to Reefs	Increase Capability for Resource Management	L	H	H	H	H	H	L	H
	Support International Organizations and Institutions	L	L	M	L	L	M	H	M
	Support Project Development and Implementation	L	L	M	L	L	L	L	H
	Provide Technical Assistance	L	L	M	L	L	L	L	H
Reduce Impacts from International Trade	Reduce Destructive Fishing Practices	L	M	H	L	L	L	L	L
	Increase International Awareness	L	L	L	L	L	L	L	L
Improve Coordination and accountability	Improve coordination and accountability	H	M	M	H	H	H	L	H

H = High priority action needed to address threats
M = Medium priority action to address threats
L = Low priority action to address threats

Table 4. Ranking of Actions Needed To Reduce Threats To International Coral Reefs

This table summarizes the relative importance (H = high, M = medium, L = low) of the objectives under each goal outlined in the Strategy and National Action Plan to addressing key threats to international coral reef ecosystems by region. Rankings were provided by official representatives to the International Working Group of the United States Coral Reef Task Force for use in this document. A higher ranking suggests that conducting the objective is considered more important to addressing current threats to coral reefs in the region. Lower rankings suggest that although implementing the objective may make significant contributions, it is currently less important to addressing the major threats to coral reefs in the region. The actual importance of each objective in addressing threats to reefs will vary within and between regions depending on conditions, location, and other factors.

GOALS	OBJECTIVES	REGIONS				
		Wider Caribbean	East Asia	Pacific	East Africa / Indian Ocean	Middel East
Map coral reefs	Map shallow reefs (<30 m)	M	L	L	L	M
	Map deep reefs (>30 m)	L	L	L	L	L
Assess & Monitor reef health	Conduct rapid assessments & inventories	L	L	M	M	L
	Monitor coral, fish, and other living resources	H	H	H	H	H
	Assess water & substrate quality	M	M	L	L	M
	Assess global warming & bleaching	H	H	H	H	H
Conduct strategic research	Understand reef processes	M	L	M	L	H
	Understand reef diseases and bleaching	H	L	L	M	L
	Understand impacts and management solutions	M	L	M	M	M
Understand Social and Economic Factors	Assess human uses of reefs	H	M	M	M	M
	Assess social and economic impacts of reef management	M	M	M	M	M
	Assess the value of reefs	M	M	M	M	L
Increase use of marine protected areas (MPAs)	Strengthen existing MPAs	H	H	H	H	H
	Identify gaps in MPA system	M	M	M	M	M
	Establish new MPAs	H	H	M	M	M
Reduce adverse impacts of fishing	Reduce Overfishing	H	H	H	H	H
	Reduce habitat destruction and other indirect impacts	M	H	M	H	M
Reduce impacts of coastal development	Reduce dredging and other habitat impacts	L	L	M	H	L
	Reduce Impacts from Ocean Recreation	M	L	L	L	M
	Improve Vessel management	M	L	L	L	H
	Increase Coastal Management/ Land planning and zoning	H	H	H	H	H
Reduce Pollution	Reduce Sediment Pollution	H	H	H	H	H
	Reduce Nutrient Pollution	H	H	H	H	H
	Reduce Chemical Pollution	M	M	L	L	H
	Reduce Marine Debris	L	L	L	L	L
	Prevent and Control Invasive Species	L	L	M	L	L
Restore damaged reefs	Improve Response Capabilities	L	L	L	L	M
	Improve Restoration Techniques	L	L	L	L	L
	Restore Damaged Reefs	L	L	L	L	L
Increase education & outreach	Increase awareness	H	H	M	H	M
Reduce Threats to International Reefs	Increase Management Capacity / Support Project Development	H	H	H	H	H
	Support International Partnerships, Institutions, Conventions	H	H	H	H	H
Reduce Impacts from International Trade	Reduce Destructive Fishing Practices / Overfishing	H	H	H	H	M
	Increase International Awareness	M	H	H	M	M
	Work with International Conventions, Regional Organizations	H	H	H	M	M
Improve Coordination	Improve Coordination with Partners	H	H	H	H	H

H = High priority action needed to address threats

M = Medium priority action to address threats

L = Low priority action to address threats

Table 5. Federal Agency Funding Directly Related to Coral Reef Conservation By Agency (1999-2002).

This Table shows estimates of federal agency funding directly related to coral reef conservation activities for fiscal years 1999 – 2002 by agency. Figures in the table include funding directly related to major categories of coral reef conservation activities defined by the U.S. Coral Reef Task Force in the National Action Plan. In general, estimates do not include: (1) funding for activities indirectly related to coral reefs; and, (2) funding to fulfill basic mission functions of some agencies. Some estimates were not available for FY 2002. Funding estimates were provided by federal agency representatives to the United States Coral Reef Task Force for use in this report.

AGENCY	ESTIMATED FUNDING (\$ MILLIONS)			
	FY 1999	FY 2000	FY 2001	FY 2002 (preliminary)
DOC*	12.7	18.0	44.3	47.0
DOI**	1.6	8.3	17.6	8.3
USDA ***	0.0	0.0	0.0	0.0
EPA	8.3	3.8	4.8	2.7
DOJ ****	0.0	0.0	0.0	0.0
DOT	14.3	3.3	1.5	not available
DOS	1.1	2.5	2.3	2.0
USAID	17.2	22.3	18.0	not available
DoD *****	0.0	0.8	1.6	1.4
NSF	5.7	6.9	8.2	8.2
NASA	0.0	0.3	0.3	0.3
Total	60.9	66.3	98.5	69.9

* The Department of Commerce (DOC) budget figures reflect funding for NOAA's Coral Reef Conservation Program and other NOAA programs if directly related to coral reef conservation activities.

** The Department of the Interior (DOI) budget figures reflect only coral reef line-item or project identified funds. Figures do not include all DOI base fund expenditures related to coral reef conservation.

*** The United States Department of Agriculture (USDA) programs and activities are generally not authorized for the sole purpose of providing direct beneficial impacts to coral reef ecosystems. There are an extraordinary number of activities taking place by USDA agencies that do provide benefits to aquatic ecosystems through nonpoint source, nutrient, and sediment reduction from land based sources. These activities take place in watersheds that outlet into estuaries linked to coral reef ecosystems or into waters where coral reefs are directly located.

**** The Department of Justice (DOJ) engages in actions in this area as part of the normal course of its work, but does not specifically allocate funds for coral reef habitats.

***** The Department of Defense (DOD) does not have any explicit line items in its budget for coral reef activities. Figures in this table represent funds expended or projected to be expended by various DOD components.

Table 6. Federal Agency Funding Directly Related to Coral Reef Conservation By Goal Area (1999-2002).

This Table shows estimates of federal agency funding directly related to coral reef conservation activities for fiscal years 1999 – 2002. The data is organized by the major goal or coral reef conservation activity areas defined by the U.S. Coral Reef Task Force in the National Action Plan. Agency funding estimates are shown under each goal or activity area. In general, estimates do not include: (1) funding for activities indirectly related to coral reefs; and, (2) funding to fulfill basic mission functions of some agencies. Some estimates were not available for FY 2002. Funding estimates were provided by federal agency representatives to the United States Coral Reef Task Force for use in this report.

GOAL	ESTIMATED FUNDING (\$ MILLIONS)			
	FY 1999	FY 2000	FY 2001	FY 2002 * (preliminary)
1. Map All U.S. Coral Reefs				
DOC	0.30	1.24	6.34	5.19
DOI	0.10	1.23	1.23	1.23
USDA				
EPA				
DOJ				
DOT				not available
DOS				
USAID				
DOD			0.04	
NSF				
NASA		0.25	0.16	0.16
Sub-total	0.40	2.71	7.76	6.58
2. Assess and Monitor Reef Health				
DOC	2.24	1.92	6.54	8.62
DOI	0.30	2.72	2.72	2.72
USDA				
EPA	2.50	1.70	1.60	1.50
DOJ				
DOT				
DOS				
USAID				
DOD		0.04	0.95	0.94
NSF				
NASA	0.00	0.00	0.10	0.10
Sub-total	5.04	6.37	11.91	13.88
3. Conduct Strategic Research				
DOC	4.23	3.69	6.66	10.46
DOI	0.10	1.38	1.38	1.38
USDA				
EPA	1.20	1.60	2.80	0.73
DOJ				
DOT				
DOS				
USAID				
DOD		0.50	0.50	0.45
NSF	5.30	6.50	7.77	7.77
NASA		0.02	0.04	0.05
Sub-total	10.83	13.69	19.14	20.84

4. Understand Social and Economic Factors				
DOC		0.42	0.87	1.24
DOI				
USDA				
EPA				
DOJ				
DOT				
DOS				
USAID				
DOD				
NSF				
NASA				
Sub-total	0.00	0.42	0.87	1.24
5. Improve Use of Marine Protected Areas				
DOC	3.30	4.27	9.91	9.67
DOI	0.30	0.63	9.88	0.63
USDA				
EPA				
DOJ				
DOT				not available
DOS				
USAID				
DoD				
NSF				
NASA				
Sub-total	3.60	4.90	19.79	10.30
6. Reduce Impacts of Fishing and Other Extractive Uses				
DOC	2.50	2.64	5.27	5.24
DOI	0.20	0.48	0.48	0.48
USDA				
EPA				
DOJ				
DOT	0.50	0.72	0.42	not available
DOS				
USAID				
DOD				
NSF				
NASA				
Sub-total	3.20	3.84	6.17	5.73
7. Reduce Impacts of Coastal Uses				
DOC	0.00	0.00	0.54	0.06
DOI	0.20	0.48	0.48	0.48
USDA				
EPA				
DOJ				
DOT	13.83	1.90		not available
DOS				
USAID				
DOD		0.22	0.01	0.01
NSF				
NASA				
Sub-total	14.03	2.61	1.02	0.55

8. Reduce Pollution				
DOC	0.09	2.12	3.85	3.90
DOI	0.00	0.20	0.20	0.20
USDA				
EPA	4.50	0.32	0.26	0.25
DOJ				
DOT		0.72	1.09	not available
DOS				
USAID				
DoD		0.03	0.04	0.03
NSF				
NASA				
Sub-total	4.59	3.40	5.44	4.37
9. Restore Damaged Reefs				
DOC	0.05	0.17	0.89	0.59
DOI	0.10	0.33	0.33	0.33
USDA			---	
EPA			0.02	0.12
DOJ				
DOT				not available
DOS				
USAID				
DOD		0.01	0.03	
NSF				
NASA				
Sub-total	0.15	0.52	1.28	1.04
10. Improve Education and Outreach				
DOC		0.23	0.35	0.35
DOI	0.30	0.81	0.81	0.81
USDA				
EPA	0.10	0.15	0.07	0.05
DOJ				
DOT				not available
DOS				
USAID				
DOD			0.01	0.01
NSF	0.40	0.40	0.40	0.40
NASA				
Sub-total	0.80	1.59	1.64	1.61
11. Reduce Threats to International Coral Reefs				
DOC		0.19	0.70	1.16
DOI				
USDA				
EPA				
DOJ				
DOT				
DOS	1.12	2.54	2.29	2.00
USAID	16.67	21.86	17.28	not available
DOD				
NSF				
NASA				
Sub-total	17.79	24.59	20.27	3.17

12. Reduce Impacts from International Trade				
DOC	0.02	0.07	0.08	0.03
DOI				
USDA				
EPA				
DOJ				
DOT				
DOS				
USAID	0.51	0.46	0.76	not available
DOD				
NSF				
NASA				
Sub-total	0.52	0.52	0.83	0.03
13. Improve Coordination and Accountability				
DOC		0.07	0.10	
DOI	0.00	0.07	0.07	0.07
USDA				
EPA				
DOJ				
DOT				
DOS				
USAID				
DOD				
NSF				
NASA				
Sub-total	0.00	0.14	0.17	0.07
14. Other				
DOC		1.00	2.19	0.50
DOI				
USDA				
EPA				
DOJ				
DOT				
DOS				
USAID				
DOD				
NSF				
NASA				
Sub-total	0.00	1.00	2.19	0.50
TOTAL	60.95	66.29	98.47	69.88

* Information on FY 2002 funding was not available from all agencies. Totals and subtotals are incomplete estimates.

NOTES:

1. The Department of Commerce (DOC) budget figures reflect funding for NOAA's Coral Reef Conservation Program and other NOAA programs if directly related to coral reef conservation activities.

2. The Department of the Interior (DOI) budget figures reflect only coral reef line-item or project identified funds. Figures do not include all DOI base fund expenditures related to coral reef conservation.

3. The United States Department of Agriculture (USDA) programs and activities are generally not authorized for the sole purpose of providing direct beneficial impacts to coral reef ecosystems. There are an extraordinary number of activities taking place by USDA agencies that do provide benefits to aquatic ecosystems through nonpoint source, nutrient, and sediment reduction from land based sources. These activities take place in watersheds that outlet into estuaries linked to coral reef ecosystems or into waters where coral reefs are directly located.

4. The Department of Justice (DOJ) engages in actions in this area as part of the normal course of its work, but does not specifically allocate funds for coral reef habitats.

5. The Department of Defense (DOD) does not have any explicit line items in its budget for coral reef activities. Figures in this table represent funds expended or projected to be expended by various DOD components.

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CORAL REEF CONSERVATION ACT of 2000



APPENDIX A

CORAL REEF CONSERVATION ACT OF 2000 [P.L. 106-562; 16 U.S.C. 6401 et seq; December 23, 2000]

TITLE II--CORAL REEF CONSERVATION

SEC. 201. SHORT TITLE.

This title may be cited as the 'Coral Reef Conservation Act of 2000'.

SEC. 202. PURPOSES.

The purposes of this title are--

- (1) to preserve, sustain, and restore the condition of coral reef ecosystems;
- (2) to promote the wise management and sustainable use of coral reef ecosystems to benefit local communities and the Nation;
- (3) to develop sound scientific information on the condition of coral reef ecosystems and the threats to such ecosystems;
- (4) to assist in the preservation of coral reefs by supporting conservation programs, including projects that involve affected local communities and nongovernmental organizations;
- (5) to provide financial resources for those programs and projects; and
- (6) to establish a formal mechanism for collecting and allocating monetary donations from the private sector to be used for coral reef conservation projects.

SEC. 203. NATIONAL CORAL REEF ACTION STRATEGY.

(a) **IN GENERAL-** Not later than 180 days after the date of the enactment of this Act, the Administrator shall submit to the Committee on Commerce, Science, and Transportation of the Senate and to the Committee on Resources of the House of Representatives and publish in the Federal Register a national coral reef action strategy, consistent with the purposes of this title. The Administrator shall periodically review and revise the strategy as necessary. In

developing this national strategy, the Secretary may consult with the Coral Reef Task Force established under Executive Order 13089 (June 11, 1998).

(b) GOALS AND OBJECTIVES- The action strategy shall include a statement of goals and objectives as well as an implementation plan, including a description of the funds obligated each fiscal year to advance coral reef conservation. The action strategy and implementation plan shall include discussion of-

- (1) coastal uses and management;
- (2) water and air quality;
- (3) mapping and information management;
- (4) research, monitoring, and assessment;
- (5) international and regional issues;
- (6) outreach and education;
- (7) local strategies developed by the States or Federal agencies, including regional fishery management councils; and
- (8) conservation, including how the use of marine protected areas to serve as replenishment zones will be developed consistent with local practices and traditions.

SEC. 204. CORAL REEF CONSERVATION PROGRAM.

(a) GRANTS- The Secretary, through the Administrator and subject to the availability of funds, shall provide grants of financial assistance for projects for the conservation of coral reefs (hereafter in this title referred to as 'coral conservation projects'), for proposals approved by the Administrator in accordance with this section.

(b) MATCHING REQUIREMENTS-

(1) Fifty percent- Except as provided in paragraph (2), Federal funds for any coral conservation project under this section may not exceed 50 percent of the total cost of such project. For purposes of this paragraph, the non-Federal share of project costs may be provided by in-kind contributions and other noncash support.

(2) WAIVER- The Administrator may waive all or part of the matching requirement under paragraph (1) if the Administrator determines that no reasonable means are available through which applicants can meet the matching requirement and the probable benefit of such project outweighs the public interest in such matching requirement.

(c) **ELIGIBILITY-** Any natural resource management authority of a State or other government authority with jurisdiction over coral reefs or whose activities directly or indirectly affect coral reefs, or coral reef ecosystems, or educational or nongovernmental institutions with demonstrated expertise in the conservation of coral reefs, may submit to the Administrator a coral conservation proposal under subsection (e).

(d) **GEOGRAPHIC AND BIOLOGICAL DIVERSITY-** The Administrator shall ensure that funding for grants awarded under subsection (b) during a fiscal year are distributed in the following manner:

(1) No less than 40 percent of funds available shall be awarded for coral conservation projects in the Pacific Ocean within the maritime areas and zones subject to the jurisdiction or control of the U.S..

(2) No less than 40 percent of the funds available shall be awarded for coral conservation projects in the Atlantic Ocean, the Gulf of Mexico, and the Caribbean Sea within the maritime areas and zones subject to the jurisdiction or control of the U.S..

(3) Remaining funds shall be awarded for projects that address emerging priorities or threats, including international priorities or threats, identified by the Administrator. When identifying emerging threats or priorities, the Administrator may consult with the Coral Reef Task Force.

(e) **PROJECT PROPOSALS-** Each proposal for a grant under this section shall include the following:

(1) The name of the individual or entity responsible for conducting the project.

(2) A description of the qualifications of the individuals who will conduct the project.

(3) A succinct statement of the purposes of the project.

(4) An estimate of the funds and time required to complete the project.

(5) Evidence of support for the project by appropriate representatives of States or other government jurisdictions in which the project will be conducted.

(6) Information regarding the source and amount of matching funding available to the applicant.

(7) A description of how the project meets one or more of the criteria in subsection (g).

(8) Any other information the Administrator considers to be necessary for evaluating the eligibility of the project for funding under this title.

(f) **PROJECT REVIEW AND APPROVAL-**

(1) IN GENERAL- The Administrator shall review each coral conservation project proposal to determine if it meets the criteria set forth in subsection (g).

(2) REVIEW; APPROVAL OR DISAPPROVAL- Not later than 6 months after receiving a project proposal under this section, the Administrator shall--

(A) request and consider written comments on the proposal from each Federal agency, State government, or other government jurisdiction, including the relevant regional fishery management councils established under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.), or any National Marine Sanctuary, with jurisdiction or management authority over coral reef ecosystems in the area where the project is to be conducted, including the extent to which the project is consistent with locally-established priorities;

(B) provide for the merit-based peer review of the proposal and require standardized documentation of that peer review;

(C) after considering any written comments and recommendations based on the reviews under subparagraphs (A) and (B), approve or disapprove the proposal; and

(D) provide written notification of that approval or disapproval to the person who submitted the proposal, and each of those States and other government jurisdictions that provided comments under subparagraph (A).

(g) CRITERIA FOR APPROVAL- The Administrator may not approve a project proposal under this section unless the project is consistent with the coral reef action strategy under section 203 and will enhance the conservation of coral reefs by--

(1) implementing coral conservation programs which promote sustainable development and ensure effective, long-term conservation of coral reefs;

(2) addressing the conflicts arising from the use of environments near coral reefs or from the use of corals, species associated with coral reefs, and coral products;

(3) enhancing compliance with laws that prohibit or regulate the taking of coral products or species associated with coral reefs or regulate the use and management of coral reef ecosystems;

(4) developing sound scientific information on the condition of coral reef ecosystems or the threats to such ecosystems, including factors that cause coral disease;

(5) promoting and assisting to implement cooperative coral reef conservation projects that involve affected local communities, nongovernmental organizations, or others in the private sector;

- (6) increasing public knowledge and awareness of coral reef ecosystems and issues regarding their long term conservation;
- (7) mapping the location and distribution of coral reefs;
- (8) developing and implementing techniques to monitor and assess the status and condition of coral reefs;
- (9) developing and implementing cost-effective methods to restore degraded coral reef ecosystems; or
- (10) promoting ecologically sound navigation and anchorages near coral reefs.

(h) **PROJECT REPORTING-** Each grantee under this section shall provide periodic reports as required by the Administrator. Each report shall include all information required by the Administrator for evaluating the progress and success of the project.

(i) **CORAL REEF TASK FORCE-** The Administrator may consult with the Coral Reef Task Force to obtain guidance in establishing coral conservation project priorities under this section.

(j) **IMPLEMENTATION GUIDELINES-** Within 180 days after the date of the enactment of this Act, the Administrator shall promulgate necessary guidelines for implementing this section. In developing those guidelines, the Administrator shall consult with State, regional, and local entities involved in setting priorities for conservation of coral reefs and provide for appropriate public notice and opportunity for comment.

SEC. 205. CORAL REEF CONSERVATION FUND.

(a) **FUND-** The Administrator may enter into an agreement with a nonprofit organization that promotes coral reef conservation authorizing such organization to receive, hold, and administer funds received pursuant to this section. The organization shall invest, reinvest, and otherwise administer the funds and maintain such funds and any interest or revenues earned in a separate interest bearing account, hereafter referred to as the Fund, established by such organization solely to support partnerships between the public and private sectors that further the purposes of this Act and are consistent with the national coral reef action strategy under section 203.

(b) **AUTHORIZATION TO SOLICIT DONATIONS-** Pursuant to an agreement entered into under subsection (a) of this section, an organization may accept, receive, solicit, hold, administer, and use any gift to further the purposes of this title. Any moneys received as a gift shall be deposited and maintained in the Fund established by the organization under subsection (a).

(c) **REVIEW OF PERFORMANCE-** The Administrator shall conduct a continuing review of the grant program administered by an organization under this section. Each review shall

include a written assessment concerning the extent to which that organization has implemented the goals and requirements of this section and the national coral reef action strategy under section 203.

(d) ADMINISTRATION- Under an agreement entered into pursuant to subsection (a), the Administrator may transfer funds appropriated to carry out this title to an organization. Amounts received by an organization under this subsection may be used for matching, in whole or in part, contributions (whether in money, services, or property) made to the organization by private persons and State and local government agencies.

SEC. 206. EMERGENCY ASSISTANCE.

The Administrator may make grants to any State, local, or territorial government agency with jurisdiction over coral reefs for emergencies to address unforeseen or disaster-related circumstance pertaining to coral reefs or coral reef ecosystems.

SEC. 207. NATIONAL PROGRAM.

(a) IN GENERAL- Subject to the availability of appropriations, the Secretary may conduct activities to conserve coral reefs and coral reef ecosystems, that are consistent with this title, the National Marine Sanctuaries Act, the Coastal Zone Management Act of 1972, the Magnuson-Stevens Fishery Conservation and Management Act, the Endangered Species Act of 1973, and the Marine Mammal Protection Act of 1972.

(b) AUTHORIZED ACTIVITIES- Activities authorized under subsection (a) include--

- (1) mapping, monitoring, assessment, restoration, and scientific research that benefit the understanding, sustainable use, and long-term conservation of coral reefs and coral reef ecosystems;
- (2) enhancing public awareness, education, understanding, and appreciation of coral reefs and coral reef ecosystems;
- (3) providing assistance to States in removing abandoned fishing gear, marine debris, and abandoned vessels from coral reefs to conserve living marine resources; and
- (4) cooperative conservation and management of coral reefs and coral reef ecosystems with local, regional, or international programs and partners.

SEC. 208. EFFECTIVENESS REPORTS.

(a) GRANT PROGRAM- Not later than 3 years after the date of the enactment of this Act, the Administrator shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Resources of the House of Representatives a report that documents the effectiveness of the grant program under section 204 in meeting the purposes of this title. The report shall include a State-by-State summary of Federal and non-Federal

contributions toward the costs of each project.

(b) NATIONAL PROGRAM- Not later than 2 years after the date on which the Administrator publishes the national coral reef strategy under section 203 and every 2 years thereafter, the Administrator shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Resources of the House of Representatives a report describing all activities undertaken to implement that strategy, under section 203, including a description of the funds obligated each fiscal year to advance coral reef conservation.

SEC. 209. AUTHORIZATION OF APPROPRIATIONS.

(a) IN GENERAL- There are authorized to be appropriated to the Secretary to carry out this title \$16,000,000 for each of fiscal years 2001, 2002, 2003, and 2004, which may remain available until expended.

(b) ADMINISTRATION- Of the amounts appropriated under subsection (a), not more than the lesser of \$1,000,000 or 10 percent of the amounts appropriated, may be used for program administration or for overhead costs incurred by the National Oceanic and Atmospheric Administration or the Department of Commerce and assessed as an administrative charge.

(c) CORAL REEF CONSERVATION PROGRAM- From the amounts appropriated under subsection (a), there shall be made available to the Secretary \$8,000,000 for each of fiscal years 2001, 2002, 2003, and 2004 for coral reef conservation activities under section 204.

(d) NATIONAL CORAL REEF ACTIVITIES- From the amounts appropriated under subsection (a), there shall be made available to the Secretary \$8,000,000 for each of fiscal years 2001, 2002, 2003, and 2004 for activities under section 207.

SEC. 210. DEFINITIONS.

In this title:

(1) ADMINISTRATOR- The term 'Administrator' means the Administrator of the National Oceanic and Atmospheric Administration.

(2) CONSERVATION- The term 'conservation' means the use of methods and procedures necessary to preserve or sustain corals and associated species as diverse, viable, and self-perpetuating coral reef ecosystems, including all activities associated with resource management, such as assessment, conservation, protection, restoration, sustainable use, and management of habitat; mapping; habitat monitoring; assistance in the development of management strategies for marine protected areas and marine resources consistent with the National Marine Sanctuaries Act (16 U.S.C. 1431 et seq.) and the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.); law enforcement; conflict resolution initiatives; community outreach and education; and that promote safe and ecologically sound navigation.

(3) CORAL- The term `coral' means species of the phylum Cnidaria, including--

(A) all species of the orders Antipatharia (black corals), Scleractinia (stony corals), Gorgonacea (horny corals), Stolonifera (organpipe corals and others), Alcyonacea (soft corals), and Coenothecalia (blue coral), of the class Anthozoa; and

(B) all species of the order Hydrocorallina (fire corals and hydrocorals) of the class Hydrozoa.

(4) CORAL REEF- The term `coral reef' means any reefs or shoals composed primarily of corals.

(5) CORAL REEF ECOSYSTEM- The term `coral reef ecosystem' means coral and other species of reef organisms (including reef plants) associated with coral reefs, and the nonliving environmental factors that directly affect coral reefs, that together function as an ecological unit in nature.

(6) CORAL PRODUCTS- The term `coral products' means any living or dead specimens, parts, or derivatives, or any product containing specimens, parts, or derivatives, of any species referred to in paragraph (3).

(7) SECRETARY- The term `Secretary' means the Secretary of Commerce.

(8) STATE- The term `State' means any State of the U.S. that contains a coral reef ecosystem within its seaward boundaries, American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, and the Virgin Islands, and any other territory or possession of the U.S., or separate sovereign in free association with the U.S., that contains a coral reef ecosystem within its seaward boundaries.

CORAL REEF TASK FORCE



APPENDIX B

The following list of members and contacts of the U.S. Coral Reef Task Force (and its Working Groups) is provided as a resource for more information on coral reef activities of federal, state, territorial and commonwealth government organizations. Additional information on coral reef activities of specific organizations may be available from these and other contacts. Information on the U.S. Coral Reef Task Force and Task Force Working Groups is available at <http://coralreef.gov/>.

U.S. CORAL REEF TASK FORCE Members and Contacts

<u>Organization</u>	<u>Member</u>	<u>Contact</u>
Department of the Interior (co-chair)	Secretary	Randy Bowman (202-208-6211)
Department of Commerce (co-chair)	Secretary	Roger Griffis (301-713-2989)
Agency for International Development	Administrator	Barbara Best (202-712-0053)
Commonwealth of the Northern Marianas Islands	Governor	Becky Lizama (670-234-6623)
Commonwealth of Puerto Rico	Governor	Damaris Delgado (787-725-1155)
Department of Agriculture	Secretary	Howard Hankin (202-690-0082)
Department of Defense	Secretary	Tom Egeland (703-588-6671)
Department of Justice	Secretary	Sylvia Quast (202-514-1806)
Department of Transportation	Secretary	John Davis (202-267-0295)
Department of State	Secretary	Tom Praster (202-647-2255)
Environmental Protection Agency	Administrator	Macara Lousberg (202-260-9109)

Appendix B: Coral Reef Task Force Contacts

Federated States of Micronesia	Ambassador	
Marshall Islands	Ambassador	
National Aeronautics and Space Administration	Administrator	Gene Feldman (301-286-9428)
National Science Foundation	Director	Phil Taylor (703-292-8400)
Palau	Ambassador	
State of Florida	Governor	Paula Allen (850-488-3456)
State of Hawaii	Governor	Athline Clark (808-587-0099)
Territory of American Samoa	Governor	Lelei Peau (684-633-4456)
Territory of the U.S. Virgin Islands	Governor	Janice Hodge (340-774-3320)

U.S. CORAL REEF TASK FORCE
WORKING GROUP CHAIRS

WORKING GROUP

CHAIR (OR CURRENT CONTACT)

COASTAL USES

David Kennedy
P: 301-713-2989
F: 301-713-4389
Email: david.kennedy@noaa.gov

MAPPING AND INFORMATION

Mark Monaco, NOAA (cochair)
Gene Feldman, NASA (cochair)
Susan White, DOI (cochair)
P: 301-713-3028x160
F: 301-7134384
Email: mark.Monaco@noaa.gov

AIR AND WATER QUALITY

Macara Lousberg, EPA
P :202-260-9109
F: 202-260-9960
Email: lousberg.macara@epa.gov

ECOSYSTEM SCIENCE
AND CONSERVATION

Karen Koltes, DOI
P: 202-208-5345
F: 202-501-7759
Email : Karen_Koltes@ios.doi.gov

INTERNATIONAL

Barbara Best, USAID
Tom Praster, DOS
P: 202-712-0553
F: 202-216-3174
Email: bbest@usaid.gov

OUTREACH AND EDUCATION

Athline Clark, Hawaii
Howard Hankin, USDA
Elizabeth Day, NOAA
P: (301)713-2431 x148
F:(301)713-1799
Email: Elizabeth.Day@noaa.gov

