

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

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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)

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- 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.

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- 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”.

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