CHAPTER 7

Reducing the Impacts of Coastal Uses

GOAL: *Reduce the impact of human coastal activities on coral reef ecosystems.*

Rationale for Action

Coral reef ecosystems are being continually and, in some cases, irreparably damaged by a number of avoidable human activities. Dredging for navigation or marinas, beach renourishment, sand mining, pipeline and cable installation, and coastal development and modification projects can degrade water quality around reefs. Although reefs contribute to tourism revenues, a boom in coastal tourism can lead to additional direct (e.g., from diving, snorkeling, and fishing) and indirect (e.g., through increasing demand for coastal development, sewage discharge, and vessel traffic) impacts on coral reef resources, compounding the adverse effects of coastal development.

As the number of people using and transiting coral reef areas has increased, so has the frequency of

OBJECTIVES

OBJECTIVE 1: Develop informal guidance, protocols, and technical assistance programs to reduce the risks of damage to coral reefs resulting from federal agency activities.

OBJECTIVE 2: Strengthen federal and state permitting and management programs for coastal development activities affecting coral reef habitats to minimize or prevent adverse impacts on coral reef ecosystems.

OBJECTIVE 3: Initiate actions at the national and international levels to prevent vessel groundings.

OBJECTIVE 4: Develop standard vessel grounding response, enforcement, and injury assessment guidance and improve the ability to remove grounded and abandoned vessels and restore damaged habitat.

OBJECTIVE 5: Strengthen existing and develop new resource management programs and protected areas to address the broad range of coastal activities.

OBJECTIVE 6: Develop mitigation guidelines for coastal development projects deemed essential by federal, state, and territory agencies.

vessel groundings in these areas. Vessels striking shallow coral reef resources cause localized damage to the habitat by crushing and fracturing the coral structures and displacing resident fishes. In addition, propeller scarring, anchoring, and other physical contacts cause damage to associated seagrass beds. Some affected habitats cannot recover without direct and often expensive human intervention, including direct removal of debris or vessels, emergency triage of injured animals, and long-term restoration of habitats and benthic communities.

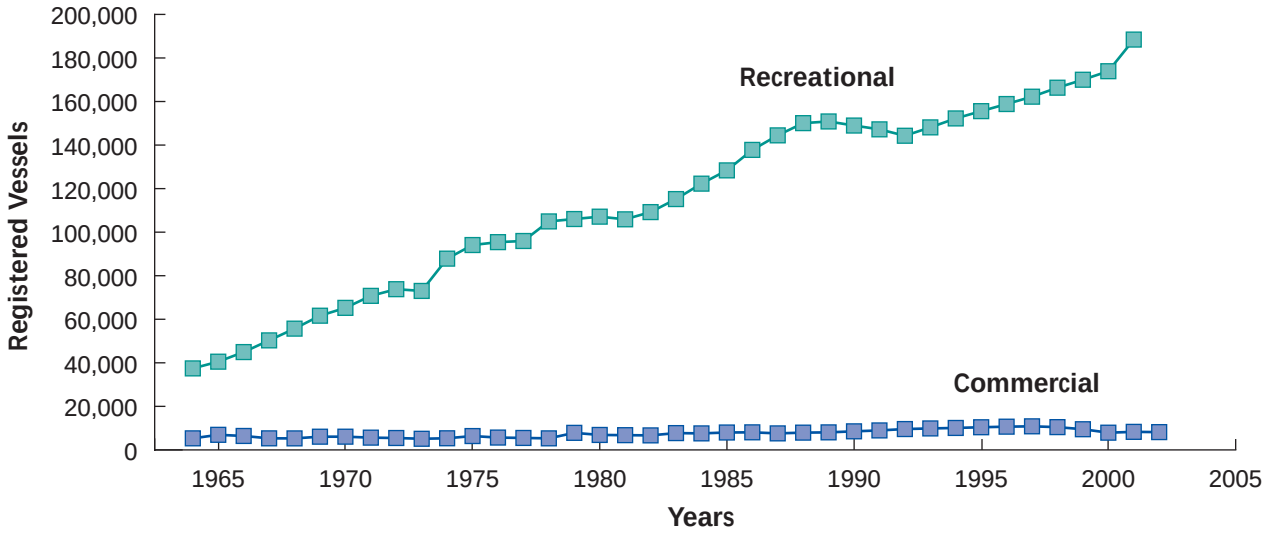
Many of these growing pressures have resulted from rapid growth in coastal populations and tourism throughout the past few decades. One striking example of this pressure is the increasing amount of recreational boats registered in South Florida (see figure 3). Resources for the programs responsible for implementing and enforcing existing conservation authorities have not kept pace with growth, impeding conservation efforts. Adequate planning and the consistent and proactive application of existing federal and state authorities and programs can reduce the adverse impacts of coastal development, shoreline modification, and vessel groundings.

Summary of Implementation

The U.S. Coast Guard (USCG), the U.S. Department of the Interior (DOI), the U.S. Department of Defense (DoD), and NOAA have been working with state and territory governments to improve navigation through coral reef resources, examine

Figure 3. Increasing Trend in Recreational Vessel Registration in South Florida

The graph shows the increasing number of registered recreational vessels in South Florida (Broward, Collier, Miami-Dade, Monroe, and Palm Beach counties) compared to registered commercial fishing vessels. As of 2002, more than 191,000 recreational vessels were registered in these counties. Greater boat traffic reflects increased recreational fishing and increases the likelihood of groundings and other impacts on reefs.



Data Source: Ault et al. 2002.

the effectiveness of mitigation efforts, address coastal overuse and misuse, promote best practices, and protect important coastal areas. State and territory governments have taken legal steps to reduce the impacts to coral reef resources from overuse and misuse. For example, Puerto Rico passed Administrative Order (AO) 2003–25, which regulates recreational use in five natural reserves. This AO establishes a carrying capacity for each area, prohibits the anchoring of vessels in seagrasses and the tying of vessels to mangrove trees, and regulates other coastal activities. State and territory partners are also zoning coral reef areas to reduce user conflicts and abuse and increasing outreach and education.

Ship groundings and anchor damage continue to affect coral reef health throughout U.S. waters. USCRTF agencies have concentrated on improved planning for and response to ship groundings. The primary strategy has been to avoid vessel impacts by improving navigational aids and providing permanent moorings that obviate the need to anchor on coral reefs. Federal, state, and territory agencies are collaborating to develop rapid-response measures when groundings occur to remove vessels before irreparable harm is caused. Finally, NOAA and USCG have developed an inventory of existing grounded vessels to identify those that are appropriate for removal and other actions.

In addition to the damage caused by ship groundings, coral reef ecosystems are threatened by the recreational overuse and misuse associated with increased tourism. The USCRTF has identified this threat as one of six priority areas for action, and each state and territory, with assistance from federal agencies and nongovernmental partners, has developed local action strategies to address recreational impacts. Coastal zone management plans mandated by the Coastal Zone Management Act are additional mechanisms for coordinating these activities. States and territories are experimenting with novel approaches to improve incentives for coastal development projects that avoid damaging sensitive habitats.

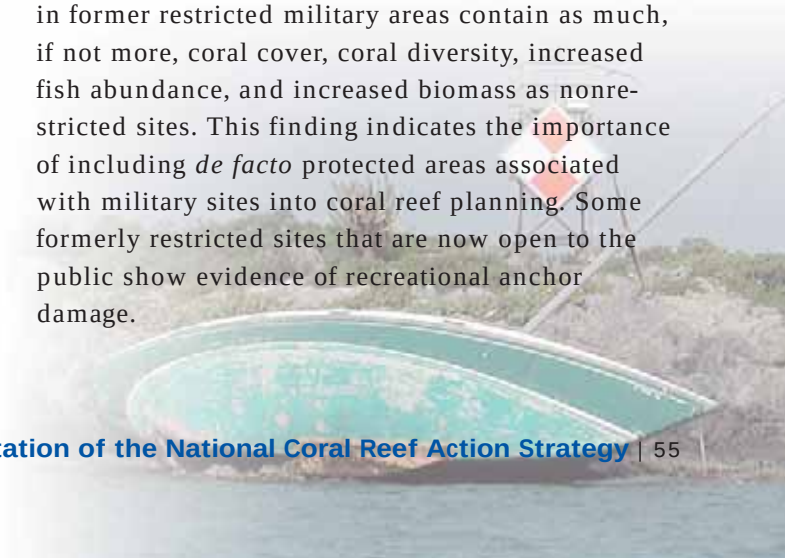
Many coastal activities that may impact coral reef ecosystems, including construction and dredging, require U.S. Army Corps of Engineers permits, environmental impact statements, and mitigation plans. Federal agencies have begun analyzing past mitigation activities to improve the permitting process and the success of mitigation efforts. Analysis conducted by the U.S. Fish and Wildlife Service (USFWS) has prompted the creation of interagency working groups in the Pacific and Atlantic/Caribbean region tasked with developing additional measures.

Highlights of Task Force Member Activities

OBJECTIVES 1 & 2: Develop informal guidance, protocols, and technical assistance programs to reduce the risks of damage to coral reefs resulting from federal agency activities. Strengthen federal and state permitting and management programs for coastal development activities affecting coral reef habitats to minimize or prevent adverse impacts on coral reef ecosystems.

Coral Damage and Enforcement Study

DoD sponsored a study to assess how enforced protection around military assets at Vieques Island and Culebra Island, Puerto Rico, affects nearshore marine ecosystems. Preliminary results show sites in former restricted military areas contain as much, if not more, coral cover, coral diversity, increased fish abundance, and increased biomass as nonrestricted sites. This finding indicates the importance of including *de facto* protected areas associated with military sites into coral reef planning. Some formerly restricted sites that are now open to the public show evidence of recreational anchor damage.



Grounded vessel off American Samoa. The U.S. Coral Reef Task Force members work to locate and prioritize removal of such vessels.

DoD Educates Personnel on Coral Reef Protection

DoD produced a brochure on coral reef protection for the military. The *Coral Reef Conservation Guide* provides an overview of DoD activities having the potential to adversely affect coral reef ecosystems and outlines DoD requirements and U.S. national laws and policies regarding coral reef protection. DoD continues to promote and distribute this brochure and other outreach material on coral reef protection.

Corps of Engineers Enhances Protection of Corals Through Its Regulatory Program

The Corps of Engineers has enhanced the protection of coral reefs through decisions under its regulatory program by stringently administering the avoidance, minimization, and compensatory mitigation provisions of its regulations in southeast Florida. Through its evaluation of alternatives for bringing natural gas pipelines into southeast Florida from the Bahamas, the pipeline companies have changed from horizontal directional drilling (HDD) under the three reef tracts off the coast to using tunnel technology that results in essentially eliminating all impacts to the reef tracts in less than 120 feet of water. The HDD approach would have directly impacted acres of coral and involved very high risk for additional unintended impacts during construction. Those impacts and potential impacts are eliminated. On two beach projects, the Corps review resulted in reducing impacts to hard bottom resources by more than half in each case, avoiding the most ecologically valuable resources, including coral resources. The permit decisions also require a much higher degree of care when removing the sand from offshore borrow areas by requiring specific operational constraints on the dredges. All unavoidable impacts will be fully offset by mitigation.

OBJECTIVES 3 & 4: Initiate actions at the national and international levels to prevent vessel groundings. Develop standard vessel grounding response, enforcement, and injury assessment guidance and improve the ability to remove grounded and abandoned vessels and restore damaged habitat.

Florida Keys National Marine Sanctuary Protected From Ship Damage by International Designation

On March 8, 2002, the International Maritime Organization (IMO) provided final approval for the

designation of the marine area around the Florida Keys National Marine Sanctuary (FKNMS) as a Particularly Sensitive Sea Area (PSSA) (the third such area designated in the world), in part through the efforts of USCG, NOAA, and the U.S. Department of State. FKNMS is highly valuable ecologically and economically. Since the area is vulnerable to damage from ships colliding and grounding on the reef, as well as damage from anchors and the dragging and swinging of anchor cables, IMO has designated four areas to be avoided by ships and three mandatory no-anchoring areas. By being designated as a PSSA, the marine area around the Florida Keys is one of the most protected areas in the world.

Hurricane Anchor System Protects Mangroves and Allows Boats To Take Shelter

The National Park Service (NPS) and the Friends of the Virgin Islands National Park, with assistance from NOAA, developed an anchoring system for Hurricane Hole, St. John, which is part of the new Virgin Islands Coral Reef National Monument. Hurricane Hole is one of the most significant, intact nursery areas in the U.S. Virgin Islands (USVI). NPS prohibits anchoring throughout the monument; however, Hurricane Hole has traditionally been an anchoring area during severe storm events. To protect important nursery and mangrove habitats and still allow the area to be used during emergencies, the park decided to install a hurricane anchor system. The park held multiple stakeholder meetings and engaged a nautical engineering firm to design an anchor system to protect vessels and the fragile shoreline environment. Research and public meetings led to a chain-system anchor design with a strong holding capacity. The permanent anchor system will be installed on the sea floor, preserving the area's natural beauty, and can be accessed only before a major storm.

Vessel Cited for Anchoring in the Tortugas Reserve

Through a joint effort of USCG and NOAA, a commercial vessel owner was cited in October 2002 for anchoring in the Tortugas North Ecological Reserve. For the first time, quick action identified the responsible party and resulted in the establishment of a restoration project. The citation put other vessel owners on notice that such activity will not be tolerated. The restoration project that followed reattached more than 1,100 coral colonies and fragments to the affected coral reef site.

Workshops Promote Interagency Response to Abandoned Vessels

NOAA, USCG, the U.S. Department of Justice, the Pacific Basin Development Council, and state and territory partners conducted two workshops on the issues associated with vessel groundings and abandoned vessels in the U.S. Flag Pacific Islands. The workshops were held in 2002 in Honolulu, Hawai'i, and in Tumon, Guam. More than 90 participants representing 4 U.S. Flag Island jurisdictions, the Federated States of Micronesia, and 5 federal agencies took part in the workshops. The workshops focused on the following four topics associated with vessel groundings:

- Magnitude of the issue;
- Legal frameworks;
- Response and enforcement; and
- Damage assessment and restoration.

Participants discussed how to further address and monitor the magnitude of the issues in each jurisdiction, including prevention measures, legal and technical assistance, and funding mechanisms. As a result of the workshops, participants from the

Commonwealth of the Northern Mariana Islands (CNMI) conducted an interagency meeting that determined jurisdiction, scope of duties, limitations, regulations, and other issues regarding grounding response and assessment, hazardous spill cleanup, vessel removal, and reef restoration.

Inventory of Abandoned Vessels Assesses Risk and Prioritizes Removal

During 2002 and 2003, NOAA's Abandoned Vessels Project, with the help of the USCG and local partners, conducted field surveys of 176 abandoned vessels in Guam, the CNMI, the USVI, and Puerto Rico. The surveys validate an online inventory database of existing abandoned vessels and assess the environmental, public safety, and navigational risks of each vessel. The inventory helps resource managers understand the threats posed by abandoned vessels, prioritize their removal, and update navigational charts. This effort has led to the removal of several vessels and improvements in capacity to prevent and respond to vessel groundings.

Navy Develops Operations Best Management Practices

The U.S. Navy continued development of best management practices for its installations and vessels operating in proximity to coral reefs and training protocols for personnel to implement such measures. This project will also develop checklists of recommended best management practices for application during facility construction or vessel operation to avoid potential degradation of coral reefs.

Impromptu Mapping in Saipan Harbor Reveals Danger to Navigation

During a monitoring cruise to Saipan, NOAA scientists were asked by the CNMI Port Authority to map the Saipan inner harbor area because of concerns about possible shoal soundings in or near the main shipping channel. After consulting with hydrographers, a reconnaissance survey was run and NOAA presented a preliminary report to the harbormaster. The data were immediately sent for more detailed and rigorous analysis. From these data, NOAA issued a Danger to Navigation Report. As a result, the Saipan harbor is now restricted to vessels with less than 30 feet of draft until improvements to the channel can be made. Although the harbor survey was done primarily to define bathymetry and not specifically to assess benthic habitats, the data have aided in the protection of coral reefs around the Saipan harbor by averting potential damage caused by vessels grounding on shoals in the channel.

OBJECTIVE 5: Strengthen existing and develop new resource management programs and protected areas to address the broad range of coastal activities.

Easements Restore Coastal Wetlands and Reduce Runoff

In 2002, USFWS Partners for Fish and Wildlife Program provided technical assistance to the U.S. Department of Agriculture Natural Resources Conservation Service Wetland Reserve Program (WRP) to purchase 15,396 acres of conservation easements in coastal Martin County, Florida. In 2003, 12,936 acres of easements were purchased and restored to functioning wetlands to reduce land-based runoff in coastal lagoons containing dense seagrasses and the sabellariid reef ecosystem.

This Allapattah Ranch WRP project will improve and increase habitat coverage for a number of aquatic and terrestrial organisms by reducing sedimentation in nearshore waters, benefiting hawksbill, green, loggerhead, and leatherback sea turtles. A large number of state-listed and federal-listed species, including numerous migratory and wading birds, will also benefit. Since 1998, approximately 135,000 acres in Florida were enrolled in this cooperative agency program that highlights conservation partnerships with private landowners while allowing some sustainable uses of private lands.

Multiagency Partnership Results in Maui Land Trust

USFWS provided technical assistance to the Maui Coastal Land Trust, Ducks Unlimited, and the Hawai'i Division of Forestry and Wildlife in 2002 to help obtain $2 million in federal assistance to purchase and protect a unique, 277-acre coastal ecosystem encompassing a wetland, riparian habitats, 1.2 miles of marine shoreline (including 8,000 feet fronting one of the most extensive coral reef systems on Maui), and one of the last intact sand dune complexes in the state. The funds, provided to the State of Hawai'i through the USFWS National Coastal Wetland Grant Program and Section 6 Recovery Land Acquisition Grant Program, were awarded to the Maui Coastal Land Trust to purchase, hold, and manage the property in perpetuity. In 2003, the USFWS Private Stewardship Grant Program awarded $107,080 to the Maui Coastal Land Trust to initiate habitat restoration activities that will benefit not only the nearby coral reef system, but migratory bird species, sea turtle nests, rare coastal plants, and important archeological resources in the surrounding dunes as well.

Guam's replanting efforts to combat erosion are conducted by the Guam Department of Agriculture.

DoD Develops Tools To Avoid Sensitive Marine Resources

DoD is collating environmental data in geographic information systems (GISs) to help resource managers more readily identify and avoid sensitive marine ecosystems. Coral reef assessment information is an integral part of the GIS tools. Using this marine resource assessment data and other available resources, the Environmental Information Management System (EIMS) has been assembled for marine areas in which the U.S. Navy routinely operates. EIMS will raise the environmental awareness of facility planners and ship operators and help ensure that training exercises can be better planned and timed to avoid sensitive marine resources.

Erosion Prevention on Offshore Islets in Hawai'i

USFWS funded the protection of fragile coral reefs from burial by rain-induced mudslides from the slopes of highly eroded islets near Oahu. Alien plants were removed and replaced with native species to stabilize the soils. This project served as a foundation to reach out to the local communities by creating educational opportunities for schools and fostering increased communication with such stakeholder groups as fishermen, kayakers, and hikers. In addition to protecting Hawaii's fragile

coral reefs, this project benefited the habitat of burrowing seabirds. Ongoing work on other Hawai'i islets will benefit multiple species of nesting birds and endangered coastal plants and arthropods. The State of Hawai'i, The Nature Conservancy, Bishop Museum, University of Hawai'i, and NPS continue their partnership with USFWS and work together to monitor and restore these islets.

OBJECTIVE 6: Develop mitigation guidelines for coastal development projects deemed essential by federal, state, and territory agencies.

Results From Mitigation Reports Trigger Federal Action

In 2002, USFWS, with additional funding from the U.S. Environmental Protection Agency (EPA), conducted an evaluation of compensatory mitigation (i.e., the restoration, creation, or preservation of coral reef resources as compensation for unavoidable impacts) for federally funded or permitted coastal construction projects in the U.S. Pacific (*http://pacificislands.fws.gov/worg/pcrmreport.pdf*). The review showed limited implementation of such policies, which resulted in poor compensation for habitat loss. The reviewers examined past files for documenting the mitigation process, assessed the relative effectiveness of mitigation activities, and provided recommendations to improve future compensatory activities. Of the 11 projects evaluated, 9 implemented some form of compensatory mitigation. Of those nine, only four effectively offset losses to the coral reef ecosystem. Therefore, the mitigation record in the Pacific was the successful mitigation of 116 acres and the loss of 62 acres.

Building on the Pacific report described above, USFWS released a draft report in 2003 of projects in South Florida and the U.S. Caribbean that had compensatory mitigation for impacts on coral reef resources (*http://www.fws.gov/southeast/es*). The review was completed in 2004. These Atlantic and Caribbean projects removed 264 acres of coral reef habitat with compensatory mitigation expected to be a total of 118 acres. The record in the Atlantic was similar to the results in the Pacific with successful mitigation of 5 acres and the loss of 76 acres.

Both studies pointed out large information gaps in the existing compensatory mitigation process. Both studies were also based on data over the last several years, including early years of limited success in mitigation. Mitigation approaches and mitigation success has substantially improved in the past 5 years, though further improvement is needed.

Recommendations made to improve mitigation activities include:

- Developing regional Interagency Coral Reef Mitigation Strategies;
- Identifying or creating a set of methodologies to adequately assess project impacts and appropriate mitigation measures;
- Developing a monitoring and tracking system for compensatory mitigation;
- Identifying and assessing additional mitigation approaches and activities; and
- Prioritizing compensatory mitigation activities in plans for large projects.

Implementing the recommendations should help federal agencies replace lost coral reef resources more efficiently and effectively.

Hawai'i Interagency Mitigation Working Group Formed

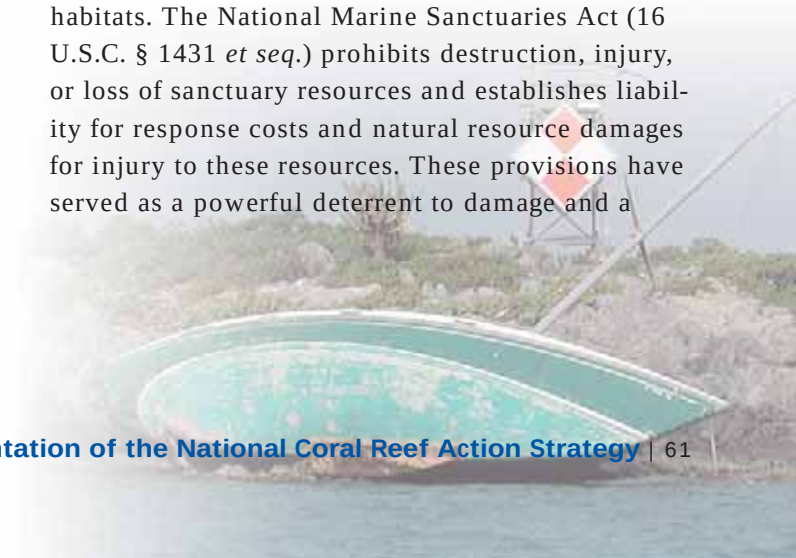
In 2002, as a result of the Pacific Compensatory Mitigation Report, the Hawai'i Interagency Coral Reef Mitigation Working Group (HIWG) was formed to improve the performance of natural resource agencies in providing recommendations for compensatory mitigation. The working group includes USFWS, EPA, NOAA, the Army Corps of Engineers (Regulatory and Civil Works), and Hawaii's Department of Land and Natural Resources and Department of Health. The group is working to address problems outlined in the Pacific Compensatory Mitigation Report and is meeting on a bimonthly basis to write an Interagency Coral Reef Mitigation Strategy. HIWG sponsored a resource assessment workshop to establish ecological criteria for assessing coral reef resource functions and biological values from which workshop proceedings were released in late 2004.

Future Challenges

The pressures of rapid growth of coastal populations and reef-related tourism over the past few decades have had a variety of adverse impacts on coastal coral reef habitats. In many areas, damage incurred as a result of coastal development, shoreline modification, and vessel groundings can be prevented or mitigated through consistent and proactive application of existing federal and state authorities and programs. However, lack of resources, information, and other tools have limited the ability of many programs to prevent impacts to valuable coral reef ecosystems.

There are a variety of challenges to reducing the impacts of coastal uses on reef habitats. In many areas, implementation of existing tools or development of new technologies is needed to help prevent damage by vessels to coral reef habitats. Improvements in mitigation measures and adherence to mitigation plans could help protect and restore sensitive coral reef resources. In addition, education and outreach continue to be priority needs to help reduce impacts on reefs from a variety of coastal activities.

Address damage by vessels. USCRTF members have initiated workshops and other management efforts to address the impacts of ships on coral reef ecosystems; however, increased efforts are required to fully address this issue. For example, collaborative initiatives among managers and vessel operators, including the establishment of additional safe harbor areas and no-anchoring zones, could provide viable alternatives to anchoring in sensitive reef habitats. The National Marine Sanctuaries Act (16 U.S.C. § 1431 *et seq.*) prohibits destruction, injury, or loss of sanctuary resources and establishes liability for response costs and natural resource damages for injury to these resources. These provisions have served as a powerful deterrent to damage and a



source of funds for restoration. Similar tools are lacking outside sanctuaries.

Improve assessment of cumulative impacts. Another major area of concern has been the inability to assess cumulative impacts. Habitat loss through degradation or destruction through immediate or gradual causes has contributed extensively to the general world trend of declining reef health. The improvement of GIS mapping technology may soon provide an excellent tool for projecting original habitat compositions and tracking cumulative impacts to date. This is an extension of the shifting baselines concept and will raise recognition of the impact of habitat degradation on overall reef health. It will also do much for managers by strengthening the science behind the law in managing coral reefs.

Mitigate habitat impact. The adverse impacts on reef systems of coastal development, dredging, and shoreline modification have been significant in many areas. To address this challenge, managers need an assessment of more effective options for mitigating impacts to reef ecosystems and better integration and accountability of compensatory mitigation in coral reef systems.

Provide education and outreach. Members of the USCRTF have made efforts in the previous 2 years to enhance education and outreach to improve understanding of the impacts of coastal uses on coral reefs and how to prevent or reduce these impacts. However, this issue requires increased commitment. To be successful in protecting fragile coral reef ecosystems, additional efforts are needed to help identify the causes of reef degradation and how to prevent them.