

## CHAPTER 11: CONSERVING AND RESTORING COASTAL HABITAT

*Wetlands, estuaries, seagrass beds, mudflats, sand beaches, mangrove forests, coral reefs... these are just some of the diverse habitats that make up the ocean and coastal environment and provide invaluable benefits to humans and marine life. Marine habitats face increasing pressures as activities within ocean and coastal areas intensify. Coastal habitat conservation and restoration should be integral to ocean and coastal management, as well as to the management of activities within watersheds, and should be strengthened through the development of national, regional, and local goals, the institution of a dedicated program for coastal and estuarine conservation, better coordination of federal habitat-related activities, and improved research, monitoring, and assessment.*

### ASSESSING THE THREATS TO COASTAL HABITAT

The diverse habitats that comprise the ocean and coastal environment provide tangible benefits such as buffering coastal communities against the effects of storms, filtering pollutants from runoff, and providing a basis for booming recreation and tourism industries. These habitats also provide spawning grounds, nurseries, shelter, and food for marine life, including a disproportionate number of rare and endangered species.<sup>1</sup>

As more people come to the coast to live, work, and visit, coastal habitats face increasing pressures. Most human activities in coastal areas provide distinct societal benefits, such as dredging rivers and harbors to facilitate navigation, converting forests and wetlands for agriculture and development, and building dams for flood control and hydropower. But these activities can also degrade coastal habitats and compromise their ability to adapt to environmental changes.

Serious habitat degradation is evident in every region, state, territory, and community along the nation's coastline. Since the early settlers arrived in the United States, the nation has lost more than half of its wetlands—over 110 million acres.<sup>2</sup> California has lost 91 percent of its wetlands since the 1780s.<sup>3</sup> The Southeastern United States experienced a loss of over 2.3 million acres of wetlands from the mid-1970s to the mid-1980s.<sup>4</sup> Significant wetlands loss has also occurred in the Pacific Islands. For example, American Samoa has lost about 25 percent of its wetlands to development, and much of the original extent of wetlands in the Commonwealth of the Northern Mariana Islands has been altered.<sup>5</sup>

Many mangrove forests, seagrass beds, and coral reefs have also fared poorly. Shallow-water reefs near urbanized coasts in the United States have been degraded by environmental and human disturbances such as hurricanes, fishing activities, coastal development, runoff, and sedimentation.<sup>6</sup> More than 50 percent of the historical seagrass cover has been lost in Tampa Bay, 76 percent in the Mississippi Sound, and 90 percent in

Galveston Bay. Extensive seagrass losses have also occurred in the Chesapeake Bay, Puget Sound, San Francisco Bay, and Florida's coastal waters.<sup>7</sup> Climate change, rising global temperatures, and sea-level rise place additional stresses on coastal habitats.

Because such a wide range of activities is affecting coastal habitats, an equally wide range of management tools will be needed to keep them healthy. Many of these approaches—maintaining water quality, minimizing trash and other debris, managing development—are discussed elsewhere. This chapter focuses on two types of activities that can be undertaken by government and nongovernment partners to protect the coast: conservation and restoration.

## **CONSERVING COASTAL HABITAT**

Conserving valuable ocean and coastal areas not only protects significant habitat and other natural resources, it also precludes the need to undertake costly and scientifically uncertain restoration efforts after an area has been degraded or lost. Current conservation needs, however, are not being met—a situation that will continue to worsen with increasing pressures on ocean and coastal environments and rising demands for coastal land.

### **Habitat Conservation Programs**

Millions of coastal acres have been designated for conservation by various levels of government, and the tools for implementing conservation programs are found in a multitude of statutes. A number of federal programs aim to preserve the natural attributes of specific areas while providing varying levels of access to the public for educational, recreational, and commercial purposes. These include the U.S. Department of the Interior's (DOI's) National Parks and Seashores, National Wildlife Refuges, National Monuments, and National Wilderness Areas; the National Oceanic and Atmospheric Administration's (NOAA's) National Marine Sanctuaries and National Estuarine Research Reserves; and the U.S. Environmental Protection Agency's (EPA's) National Estuary Program.

DOI's U.S. Fish and Wildlife Service (USFWS) administers several programs that provide grants for the acquisition, restoration, and enhancement of coastal lands, including the National Coastal Wetlands Conservation Grants Program. NOAA carries out a number of programs that aim to conserve valuable coastal lands, restore degraded habitat, and advance the science of restoration technology. Several U.S. Department of Agriculture (USDA) forestry- and agriculture-related programs provide incentives for land protection, including coastal land protection. The U.S. Army Corps of Engineers (USACE) conducts a variety of environmental stewardship and restoration programs. And both USACE and EPA are involved in conserving wetland habitats through the wetland permitting program under the Clean Water Act. (All of these programs and authorities are summarized in Appendix D.)

Coastal habitat conservation programs also exist at the state, territorial, tribal, and local levels. For example, marine protected areas (discussed in greater detail in Chapter 6) can be designated by different levels of government for a variety of reasons, including habitat conservation.

Regulatory and nonregulatory conservation techniques are also used as tools for coastal conservation. Many local governments use a variety of planning and regulatory tools and techniques, including zoning and land use planning. Other tools—including fee simple land acquisition, the purchase or donation of easements, tax incentives and disincentives, and tradable development rights—play a special role in enabling willing landowners to limit future development on their land for conservation purposes. Land acquisition and easements are often implemented through partnerships among governments, nongovernmental organizations such as land trusts, and the private sector. These groups work together to leverage limited resources from several partners to fund projects and ensure that areas acquired for conservation purposes are properly

managed. As coastal populations grow and demands on coastal lands intensify, the resources needed to make such conservation partnerships work will continue to increase.

Conservation is important to maintain critical habitats and the benefits they provide, but it is also cost-effective, avoiding the much larger expense and scientific uncertainties associated with attempting to restore habitats that have already been degraded or lost.

### ***Federal Funding for Habitat Conservation***

The Land and Water Conservation Fund is a major source of federal funding for federal, state, and local conservation efforts, authorized to provide up to \$900 million a year in support of these projects. However, since the Fund's inception in 1965, Congress has appropriated less than half of the amount authorized.<sup>8</sup> A number of agriculture and forestry-related programs administered by USDA represent an even larger source of funds for land conservation projects. Funding for agri-environmental programs is expected to rise to a projected total of \$38.6 billion over the next ten years.<sup>9</sup> Several of these programs include multi-year contracts with farmers and ranchers to retire and protect certain lands. The Wetlands Reserve Program, Farmland Protection Program, and Grassland Reserve Program, in particular, pay for permanent conservation easements on lands enrolled in those programs. Another USDA program, the Forest Legacy Program, provides funds for conservation easement purchases for forest lands threatened with development. Though these funding sources are not specifically targeted for the conservation of coastal and ocean resources, the funds can be used in those areas. Moreover, conservation of habitat in upland watersheds that enhances water quality indirectly benefits coastal areas.

In addition to the need to increase these programs' focus on coastal habitat protection, the critical nature of coastal habitats—and the alarming rate at which they are being lost—requires more direct attention. Only a small fraction of federal spending is used to support coastal habitat conservation efforts, although habitat conservation is one of the goals of the Coastal Zone Management Act. To further that goal, in 2002, Congress appropriated money for the Coastal and Estuarine Land Conservation Program to provide a dedicated funding source to support coastal conservation partnerships among willing landowners, but this Program has not been made permanent.

**Recommendation 11–1. Congress should amend the Coastal Zone Management Act to create a dedicated funding program for coastal and estuarine land conservation. In addition, a larger share of U.S. Department of Agriculture and other federal agency conservation programs should be directed to coastal and estuarine lands. To guide these programs, each state should identify priority coastal habitats and develop a plan for establishing partnerships among willing landowners for conservation purposes, with participation from federal agency, local government, nongovernmental, and private-sector partners.**

## **RESTORING COASTAL HABITAT**

Once critical habitat has been lost, or the functioning of those areas diminished, restoration is often needed. Habitat restoration efforts are proliferating in response to heightened public awareness of, and concern for, the health of the nation's oceans and coasts. Several large-scale efforts are underway to restore the nation's unique ecological treasures, including coastal Louisiana, the Florida Everglades, the Chesapeake Bay, the San Francisco Bay-Delta, and the Great Lakes. The goals of these initiatives are extremely ambitious—reestablishing thousands of square miles of water flow and habitat to sustain healthy levels of fish and wildlife populations while maintaining water supply for human uses and allowing future development.

### Box 11.1 Examples of Large-Scale Coastal Habitat Loss and Restoration Efforts

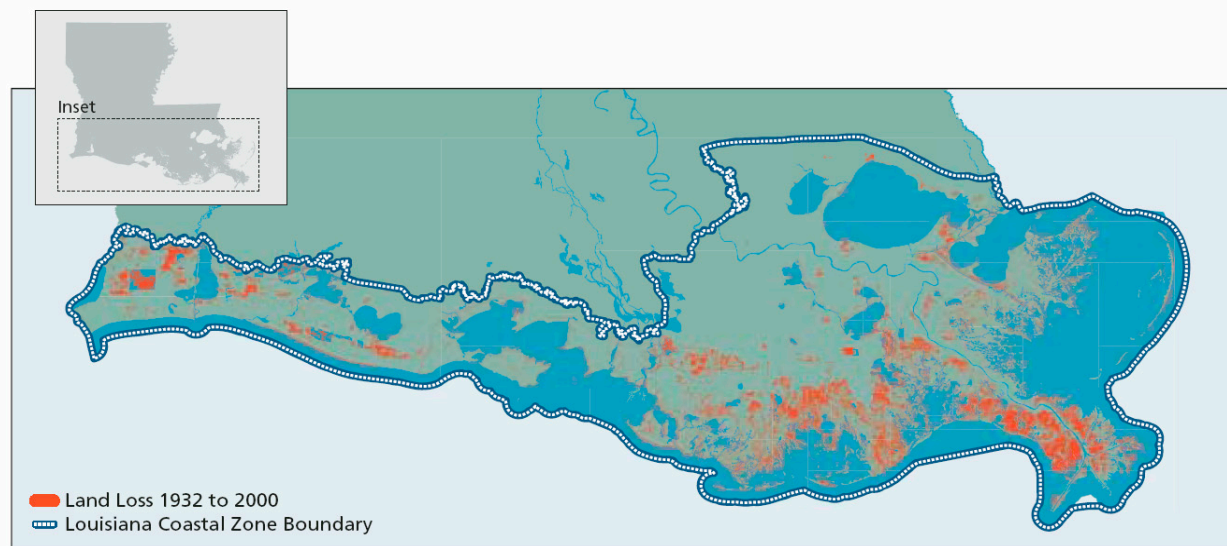
Large-scale restoration efforts are challenging in a number of ways. First, the success of these efforts requires an understanding about how to recreate natural systems and restore historical ecosystem functions, a field still in its infancy. Second, these efforts cross political boundaries and affect a broad range of human activities, requiring support and intense coordination among a wide range of governmental and nongovernmental stakeholders. While some restoration projects have been successful, continued progress will depend on sustained funding, government leadership and coordination, scientific research, and stakeholder support.

#### Coastal Louisiana

Nowhere is the problem of habitat loss more compelling than in coastal Louisiana, which experiences about 80 percent of the total annual coastal land loss in the continental United States.<sup>10</sup> From 1956 to 2000, an average of 34 square miles of Louisiana's wetlands disappeared into the sea every year (Figure 11.1). If this rate of loss continues, an estimated 700 additional square miles of coastal wetlands will be lost over the next fifty years, threatening billions of dollars worth of resources vital to the state's—and the nation's—economic well-being.<sup>11</sup>

The devastating losses are the result of a number of converging factors, including both human activities and natural processes. Chief among them are the dams, levees, and channels developed along the Mississippi River and its tributaries, as well as a network of canals that provide access to oil and gas well sites. These projects, which have supported nationally important infrastructure, navigation routes, and energy supplies, have also resulted in a 67 percent decrease in the supply of sediments to the coastal area and have disrupted the natural flow of water that kept the wetlands healthy.<sup>12</sup> Sea-level rise, coastal storms, destruction of marsh

Figure 11.1 Dramatic Coastal Land Loss in Louisiana



From 1932 to 2000, coastal Louisiana lost 1,900 square miles of land—an area roughly equivalent to the size of Delaware. An additional 700 square miles could potentially be lost over the next fifty years if no new restoration takes place, putting more than 2 million coastal residents at risk from floods and storms.

Source: U.S. Geological Survey. "Without Restoration, Coastal Land Loss to Continue." News release. <[http://www.nwrc.usgs.gov/releases/pr03\\_004.htm](http://www.nwrc.usgs.gov/releases/pr03_004.htm)> (Accessed January 2004). Map Source: U.S. Geological Survey, Lafayette, LA.

plants by muskrat and nutria, and the subsidence of the region over geologic time intensify the problem and put the state's more than two million coastal residents at increasing risk.

Restoration efforts have intensified since the passage of the Coastal Wetlands Planning, Protection, and Restoration Act in 1990 (also known as the Breaux Act), which focused national attention and significant federal funding on over one hundred conservation and restoration projects. In 1998, a more comprehensive ecosystem-based plan to restore the natural processes of the region's coastal wetlands was jointly developed by the state of Louisiana and the federal government.<sup>13</sup> Strategies being developed in the Louisiana Comprehensive Coastwide Ecosystem Restoration Study, currently under review by the National Research Council, will determine the feasibility of sustaining Louisiana's coastal ecosystem.

### **The Florida Everglades**

Another extensive effort to restore a regional ecosystem dramatically altered by human activities is taking place in the Florida Everglades, an unparalleled network of mangroves, coastal marshes, seagrass beds, lakes, rivers, estuaries, and bays that once stretched from Orlando to Florida Bay. A long history of water diversions, flood control projects and agricultural and urban development in South Florida has reduced the size of the Everglades by half, threatening or endangering numerous plant and animal species in the process.<sup>14</sup> As a result of altered water flows and development, the region has experienced numerous environmental problems such as nutrient enrichment, pesticide contamination, mercury buildup in plants and animals, widespread invasion by exotic species, increased algal blooms, seagrass die off, and declines in fishery resources.<sup>15</sup>

In 1992, Congress authorized a comprehensive review of the potential to restore the Everglades ecosystem. This review resulted in the development of the Comprehensive Everglades Restoration Plan, the largest such effort ever pursued based on the size of the ecosystem and the nearly 200 individual projects being developed to implement the plan.<sup>16</sup> Many of these projects involve massive and expensive engineering and construction feats designed to restore natural hydrological functions and water quality throughout the entire region. For example, the Plan calls for the removal of 240 miles of levees and canals and the construction of a network of reservoirs, underground storage wells, and pumping stations to recreate historic water flow quantities, quality, timing, and distribution, while meeting the freshwater and flood protection needs of Florida's growing population. The National Research Council, which is performing an independent scientific peer review of the restoration effort, referred to it as demanding "the most advanced, interdisciplinary, and scientifically sound capabilities that the nation has to offer."<sup>17</sup>

Despite its immense size and scope, the Comprehensive Everglades Restoration Plan is only one component of an initiative to restore the southern half of the state and the nearshore waters of Florida. The larger effort is being headed by the South Florida Ecosystem Task Force, which is charged with developing a strategy for coordinating hundreds of projects carried out by several different federal, state, tribal, and local entities, universities, and other stakeholder groups. The Task Force is made up of senior level officials from seven federal agencies, the Florida Department of Environmental Protection, the Miccosukee and Seminole tribes, the South Florida Water Management District, the Florida Governor's Office, and two local governments.

In addition to the large-scale, regional restoration efforts described above, there are numerous smaller-scale projects that collectively make significant contributions to restoring the health of coastal environments. Examples of these efforts include local initiatives to restore wetlands, bays, riverbanks, and streams in coastal communities. Because coastal habitat restoration efforts are often costly and complicated, they require the participation of a wide range of stakeholders to accomplish goals not achievable by any one party. As a result, these projects often demonstrate the power of public-private partnerships, bringing together community members, government agencies, and businesses to solve common problems. They also require substantial



volunteer effort, emphasizing the need for outreach and education among community members to enhance stewardship. The Coastal America partnership, formed in 1991 through a Memorandum of Understanding signed by several federal departments and agencies, has had notable success in bringing together a wide range of participants to implement restoration projects throughout the nation. The partnership focuses on overcoming institutional barriers and inconsistent federal agency jurisdictions and authorities to achieve mutual restoration goals.

### **Box 11.2 A Community Habitat Restoration Effort: Friends of Heeia State Park**

There are thousands of examples of local efforts in which concerned citizens, government entities, business, and other stakeholders have helped restore coastal habitats valuable to both native plant and animal species and to the culture of the local community. Friends of Heeia State Park, a nonprofit educational institution located on the Hawaiian Island of Oahu, coordinates several community restoration activities each year during which local volunteers help clean up beaches and streams, monitor water quality, and remove invasive species. Recently, the group received a grant from the U.S. Environmental Protection Agency to conduct a project replacing non-native coastal plants, which were preventing adequate filtering of waters from the watershed to the Heeia Bay, with native species. The project was part of a larger effort to restore portions of the entire Heeia watershed that had become degraded by nonpoint source pollution originating from various human activities. Thousands of volunteers participated in the project.<sup>18</sup>

These and other local restoration efforts are vital components of the overall goal of improving the health of coastal habitats nationwide. They also serve a valuable role in promoting coastal stewardship by instilling a sense of ownership and responsibility throughout the community. Improving communication and coordination among these efforts, and enhancing the research efforts needed to determine the most effective restoration strategies, will strengthen the ability of individual projects to contribute to the overall improvement of ocean and coastal health.

The success of individual coastal habitat restoration efforts in achieving larger ecosystem objectives can be enhanced through the development of comprehensive regional restoration strategies. These strategies will vary according to the unique circumstances in each region, but should also be part of an overarching national strategy that can enhance the effectiveness of regional efforts and provide a basis for evaluating progress.

In 2000, the Estuary Restoration Act called for a national strategy to include the goal of restoring one million acres of estuarine habitat by 2010. The Act established an interagency council to develop the strategy, create a comprehensive approach to estuarine habitat restoration efforts, foster coordination of federal and nonfederal activities, and administer a program for setting priorities and providing appropriate technical and financial assistance. In 2002, the Estuary Habitat Restoration Council—chaired by USACE and made up of designees from NOAA, EPA, USFWS, and USDA—published its final strategy, which encourages an ecosystem-based approach, including strengthening public–private partnerships and applying innovative restoration technologies, monitoring capabilities, and performance measurement tools.<sup>19</sup>

The establishment of the Estuary Habitat Restoration Council as a forum for federal agency coordination and communication at the national level is a significant and positive step. There remains, however, a need for a federal coordinating forum with responsibilities and membership that is broader than the Estuary Habitat Restoration Council—one that can coordinate the development and implementation not only of estuarine habitat restoration efforts, but activities that affect all types of coastal habitat and include conservation as well as restoration measures. This forum could also be responsible for fostering the development and implementation of goals and priorities at the regional level.

## IMPROVING HABITAT CONSERVATION AND RESTORATION

Currently the many entities that administer conservation and restoration activities operate largely independently of one another, with no framework for assessing overall benefits in an ecosystem-based context. The multitude of disjointed programs prohibits a comprehensive assessment of the progress of conservation and restoration efforts and makes it difficult to ensure the most effective use of limited resources.

Consistent local, state, regional, and national goals are vital for prioritizing conservation and restoration needs and orchestrating effective efforts at all levels. In particular, these efforts should be assessed in a regional, ecosystem context. This will be aided by improved regional coordination and the creation of regional ocean councils, as discussed in Chapter 5. The regional ocean information programs, also discussed in Chapter 5, will help meet the information needs essential to the success of these initiatives. Conserving and restoring historical ecosystem functions are significant steps in sustaining the health of the nation's ocean and coastal resources. Over time, the regional ocean councils will also help to improve the management of all activities that affect coastal habitats and the well-being of coastal communities.

**Recommendation 11–2. The regional ocean councils, working with state coastal management programs and other governmental and nongovernmental entities, should assess regional needs and set goals and priorities for ocean and coastal habitat conservation and restoration efforts that are consistent with state and local goals. The National Ocean Council should develop national goals that are consistent with regional, state, and local goals, and should ensure coordination among all related federal implementation activities.**

An increased and dedicated funding source for coastal conservation activities is called for earlier in the chapter. Similarly, restoration initiatives will require sufficient funding to develop the best techniques, implement restoration activities, and track their success. In addition to federal investments, innovative sources of funding can be identified through partnerships with the private sector.

## ENHANCING INFORMATION AND UNDERSTANDING

One of the most significant obstacles to conservation and restoration efforts is the lack of adequate knowledge about the structure and functioning of coastal habitats and the relative effectiveness of restoration techniques. Furthermore, many individual efforts do not benefit from the knowledge and positive experiences that do exist. Enhanced support for ecosystem restoration science and applied research on effective restoration techniques is needed, as is support for programs that educate practitioners on how to implement these techniques. A better understanding of the connections between human activities and their impacts on coastal habitats will lead to better management of coastal resources and a strengthened stewardship ethic among all stakeholders and citizens.

Coordinated and comprehensive inventories and assessments are essential for identifying critical habitats, evaluating the causes of habitat loss and degradation, and setting priorities for conservation and restoration efforts, thus enabling decision makers to focus limited resources on the most pressing needs. The regional ecosystem assessments called for in Chapter 5 will provide timely and comprehensive information on the status of coastal habitats.

In addition to improved understanding and broad national assessments and inventories, the nation needs better ongoing monitoring. Currently, most federal funding available for conservation and restoration efforts can only be used for direct implementation, not for the equally important tasks of monitoring the success of these efforts and further advancing restoration science.

Finally, conservation and restoration efforts must build on past successes to achieve progress. Currently, there is no accessible nationwide system for sharing information, including research results, planning processes, conservation and restoration techniques, and funding opportunities. A broadened and redefined Estuary Habitat Restoration Council could serve as a mechanism for this type of information sharing. Information pertinent to coastal habitat conservation and restoration efforts can also be shared through the regional ocean councils and regional information collection programs.

**Recommendation 11–3. The Department of the Interior, National Oceanic and Atmospheric Administration, U.S. Department of Agriculture, and U.S. Army Corps of Engineers should enhance their restoration science, monitoring, and assessment activities. Congress should amend relevant legislation to allow greater discretion in using a portion of federal habitat conservation and restoration funds for related research, monitoring, and assessments.**

## PROTECTING THE NATION’S WETLANDS: A SPECIAL CASE

Coastal wetlands, including marshes, swamps, and bogs, are an important and integral component of coastal habitat. USACE regulations define wetlands as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support vegetation that typically lives in saturated soils. Coastal watersheds currently include about 30 percent of all wetlands in the lower forty-eight states, a total of approximately 27 million acres.<sup>20</sup> Like other coastal habitats, wetlands provide a variety of valuable ecosystem services, such as improving water quality, providing natural flood control, recharging groundwater, stabilizing shorelines, contributing to recreational value, and serving as nursery areas for thousands of species of plants, fish, and other animals.

The functions and values provided by wetlands have not always been recognized. Prior to the 1970s, federal policies for agriculture, development, and insect control encouraged the draining and filling of wetlands—referred to disparagingly at the time as swamps. A 2001 National Research Council report found that, as a result, by the 1980s the area of wetlands in the contiguous United States had decreased to approximately 53 percent of its extent one hundred years earlier.<sup>21</sup>

In response to this dramatic loss of wetlands, the National Wetlands Inventory (NWI) Program was formed in 1975 to collect information about remaining wetlands. To date, approximately one-half of the United States is represented in the inventory, which includes all wetlands and deepwater habitats, such as lakes, rivers, and streams as well as marshes, bogs, and swamps. NWI data are used by Congress, all levels of government, academia, the private sector, and nongovernmental organizations for a variety of purposes, including resource management, transportation planning, infrastructure siting, and conservation and restoration planning. Despite these important applications, NWI data remain incomplete for much of the nation and relatively inaccessible to many who could put the data to beneficial use.

**Recommendation 11–4. The U.S. Fish and Wildlife Service should complete, digitize, and periodically update the National Wetlands Inventory.**

By the late 1980s, federal policies had shifted and the protection of wetlands became a national priority. In 1989, President George H.W. Bush acknowledged the importance of wetlands by establishing the goal of “no net loss of wetlands,” a goal that has been supported by subsequent administrations. As a result of these shifts in attitude and policy, the rate of wetlands loss has decreased substantially, although there is some uncertainty as to the extent of the decrease and the functional value of remaining wetlands compared to their historic counterparts.<sup>22</sup> Despite selected improvements, wetlands continue to be lost due to subsidence, erosion, storms, and human activities, including the conversion of such areas for other uses.



There is no single, comprehensive federal wetlands protection law. Instead, multiple federal statutes and programs provide protections in different forms, including the various conservation and restoration programs described earlier in this chapter. State, local, and tribal wetland programs add to the success—and the complexity—of wetlands protection efforts.

The Clean Water Act Section 404 program is the primary federal regulatory program providing protection for the nation's wetlands. The goal of the program is to avoid deliberate discharges of materials into wetlands, or to minimize discharges where they cannot be avoided. The program requires permits for discharges of materials (such as dredged materials, or other soil or sand used as fill) into U.S. waters, although several major categories of activities are generally exempted, including certain ongoing farming, ranching, and silviculture operations. When a permit is issued that will result in some wetlands loss, *compensatory mitigation* is often required; that is, wetlands must be restored, enhanced, preserved, or created elsewhere to replace the permitted loss of wetland acres and functions.

Although it has shown some success in slowing the rate of wetlands loss, Section 404 does not constitute a comprehensive national wetlands management and protection program. It does not address many kinds of activities that affect wetlands and its implementation has been uneven; a large gap remains between the mitigation required in connection with permitted activities and that which has actually been achieved. Moreover, the navigation, flood control, and other civil works projects undertaken by the USACE itself may have impacts as great as, or greater than, those of any permitted activity. Mitigation for some federal projects has also fallen far short of what was originally approved. Finally, the Section 404 program has generally failed to give sufficient consideration to the cumulative impacts associated with issuing multiple individual permits, or conducting a variety of federal projects, in the same geographic or watershed area. (Recommendations on improving the ability of USACE to address the regional, cumulative impacts of its activities are provided in Chapter 12.)

Other provisions of the Clean Water Act, such as those dealing with stormwater runoff and certain types of pollution, also provide some measure of wetlands protection, but not in the context of a coordinated wetlands management regime. As the nation recognizes the interconnectedness of upland and downstream areas, considers entire watershed systems, and moves toward an ecosystem approach, comprehensive wetlands protection should be considered as an integral part of ocean and coastal management.

**Recommendation 11–5. The National Ocean Council should coordinate development of a comprehensive wetlands protection framework that is linked to coastal habitat and watershed management efforts and should make specific recommendations for the integration of the Clean Water Act Section 404 wetlands permitting process into that broader management approach.**

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<sup>1</sup> Reid, W.V., and M.C. Trexler. *Drowning the Natural Heritage: Climate Change and U.S. Coastal Biodiversity*. Washington, DC: World Resources Institute, 1991.

<sup>2</sup> Fretwell, J.D., J.S. Williams, and P.J. Redman. *National Water Summary on Wetland Resources*. USGS Water-Supply Paper 2425. Washington, DC: U.S. Geological Survey, 1996.

<sup>3</sup> Dahl, T.E. *Wetlands Losses in the United States: 1780's to 1980's*. Washington, DC, and Jamestown, ND: U.S. Department of the Interior and Northern Prairie Wildlife Research Center, 1990.

<sup>4</sup> U.S. Department of the Interior/U.S. Fish and Wildlife Service, and U.S. Environmental Protection Agency. *Southeast Wetlands: Status and Trends, Mid-1970s to Mid-1980s*. Washington, DC, 1994.

<sup>5</sup> National Ocean Service, Office of Ocean and Coastal Resource Management. *State Enhancement Grant Assessments and Strategies: Wetlands*. Silver Spring, MD: National Oceanic and Atmospheric Administration, 1999.

<sup>6</sup> Turgeon, D.D., et al. *The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2002*. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Ocean Service, 2002.

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- <sup>7</sup> Bookman, C.A., T.J. Culliton, and M.A. Warren. "Trends in U.S. Coastal Regions, 1970–1998." Addendum to the proceedings *Trends and Future Challenges for U.S. National Ocean and Coastal Policy*. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Ocean Service, 1999.
- <sup>8</sup> Congressional Research Service. *Land and Water Conservation Fund: Current Status and Issues*. Report #97-792. Washington, DC: Library of Congress, 2002.
- <sup>9</sup> Economic Research Service. *ERS Analysis: Conservation Programs*. Washington, DC: U.S. Department of Agriculture, 2002.
- <sup>10</sup> Congressional Research Service. *Wetland Issues*. Report #IB97014. Washington, DC: Library of Congress, 2003.
- <sup>11</sup> U.S. Geological Survey. "Without Restoration, Coastal Land Loss to Continue." News release. <[http://www.nwrc.usgs.gov/releases/pr03\\_004.htm](http://www.nwrc.usgs.gov/releases/pr03_004.htm)> accessed January 2004.
- <sup>12</sup> Ibid.
- <sup>13</sup> Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. *Coast 2050: Toward a Sustainable Coastal Louisiana*. Baton Rouge, LA: Louisiana Department of Natural Resources, 1998.
- <sup>14</sup> Congressional Research Service. *South Florida Ecosystem Restoration and the Comprehensive Everglades Restoration Plan*. Report #RS20702. Washington, DC: Library of Congress, 2001.
- <sup>15</sup> McPherson, B.F., and R. Halley. *The South Florida Environment: A Region under Stress*. USGS Circular 1134. Washington, DC: U.S. Geological Survey, 1996.
- <sup>16</sup> U.S. Army Corps of Engineers, Jacksonville District and South Florida Water Management District. *Central and Southern Florida Comprehensive Review Study, Final Integrated Feasibility Report and Programmatic Environmental Impact Statement*. April 1999.
- <sup>17</sup> National Academies. "Restoration of the Greater Everglades Ecosystem." <[http://www7.nationalacademies.org/wstb/restoration\\_greater\\_everglades\\_ecosystem.html](http://www7.nationalacademies.org/wstb/restoration_greater_everglades_ecosystem.html)> Accessed November 12, 2003.
- <sup>18</sup> U.S. Environmental Protection Agency. "He'eia Coastal Restoration Project: Thousands of Volunteers Replace Alien Plants with Native Species." <<http://www.epa.gov/owow/nps/Section319III/HL.htm>> Accessed February 1, 2004.
- <sup>19</sup> Estuary Habitat Restoration Council. "Final Estuary Habitat Restoration Strategy." *Federal Register* 67, no. 232 (December 3, 2002): 71942–49.
- <sup>20</sup> National Oceanic and Atmospheric Administration, National Marine Fisheries Service. "Wetlands: What's Happening with Coastal Wetlands?" <<http://www.nmfs.noaa.gov/habitat/habitatprotection/wetlands4.htm>> Accessed October 17, 2003.
- <sup>21</sup> National Research Council. *Compensating for Wetland Losses under the Clean Water Act*. Washington, DC: National Academy Press, 2001.
- <sup>22</sup> U.S. Environmental Protection Agency. *Draft Report on the Environment*. EPA-260-R-02-006. Washington, DC, June 2003.