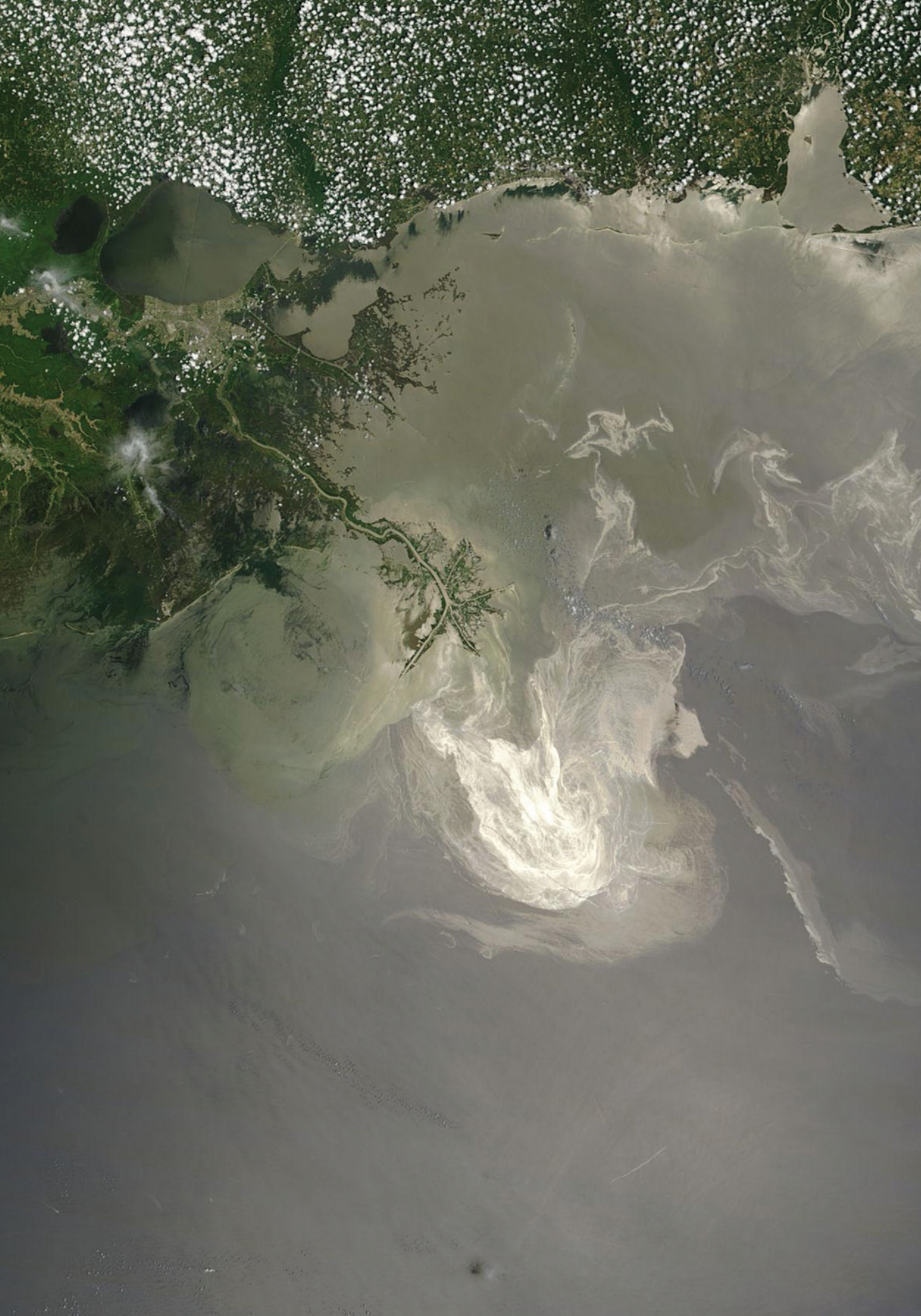
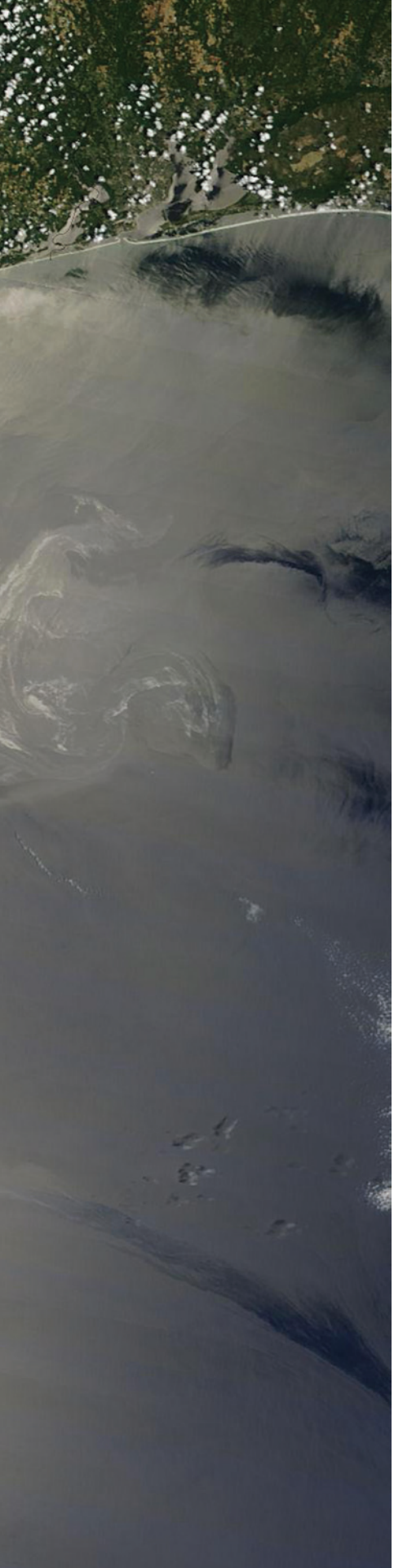




Chapter Seven

"People have plan fatigue . . . they've been planned to death"

Recovery and Restoration

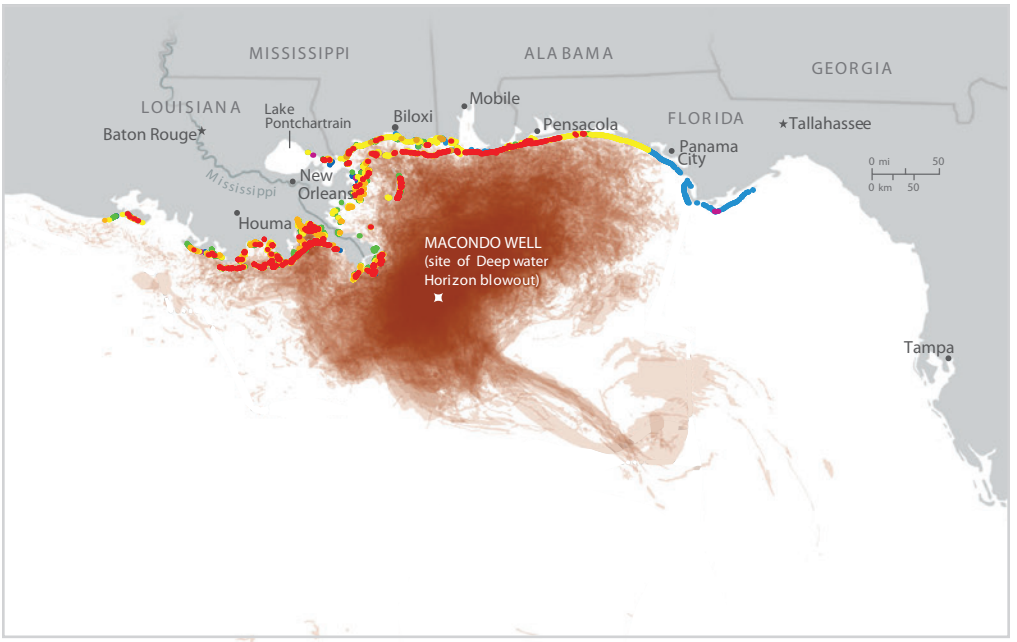
Whatever the final tally of shorelines oiled, fishing days lost, and waterfowl killed, the *Deepwater Horizon* oil spill touched virtually every aspect of life on the Gulf of Mexico coast— and far beyond. Tens of thousands of residents draw fish and seafood from the Gulf's waters, which supply much of the nation. Many thousands more produce oil and gas from its buried stores. Gulf coast ports handle enormous volumes of grain and freight leaving American farms and factories and goods arriving from abroad. Vacationers come from across the country and around the globe to sun and swim on Gulf coast beaches.

But even before the highly visible damages caused by the spill became clear, many of those crucial Gulf resources faced long-term threats. Indeed, the Louisiana coast—that essential borderland and nursery to the nation's richest fisheries—has hit a dark trifecta. First, more than 2,300 square miles[1] of coastal wetlands (an area larger than the State of Delaware) have been lost to the Gulf since the United States raised the massive levees along the lower Mississippi River after the devastating Great Flood of 1927. Exceptionally powerful hurricanes, always a threat to the region, struck the coast in

Satellite-eye views of the Gulf a month after the Macondo blowout reveal the extent of the spill. Oil appears lighter or darker in the photograph depending on the relative angles of sun and camera.

< NASA/GSFC, MODIS Rapid Response

FIGURE 7.1: Maximum Extent of Oil



Surface Oiling Surveys: May 17 - July 25
Shoreline Oiling: Most severe oiling observed through November

Map courtesy of National Geographic (surface oil) and modified by Commission staff, NOAA/Coast Guard SCAT map (shoreline oiling)

2005 (Katrina and Rita) and 2008 (Gustav and Ike), causing even more wetland loss and erosion. Second, low-oxygen bottom waters were in the process of forming a massive "dead zone" extending up to 7,700 square miles during the summer of 2010. Referred to as hypoxia, this phenomenon has intensified and expanded since the early 1970s[2] as a result of nutrient pollution, mainly from Midwestern agriculture. And finally, the *Deepwater Horizon* disaster made matters worse: 11 rig workers killed in the explosion and 17 injured;[3] many thousands of people out of work; birds and sea animals killed and significant habitats damaged or destroyed.

These three protracted tragedies—coastal land loss, hypoxia, and the oiling itself—set up the central question for recovery from the spill: can or should such a major pollution event steer political energy, human resources, and funding into solutions for a continuing, systemic tragedy? The spill itself is a regional issue, but the slow-motion decimation of the Gulf of Mexico's coastal and marine environment—created by federal and state policies, and exacerbated by energy infrastructure and pollution—is an unmet national challenge.

Beyond these acute effects, the wider American public might not understand (and certainly has not given high priority to addressing) the root problems affecting the interrelated Mississippi River–Gulf of Mexico system that extends into the nation's heartland. Absent a comprehensive approach and national commitment to the Gulf coastal ecosystems, there are insufficient authorities and inadequate funds available to address the costly and progressive environmental losses now underway. In the aftermath of the *Deepwater Horizon* spill, state and federal authorities have moved to link spill recovery to more comprehensive reforms that were already in progress.[4]

A comprehensive response to the oil spill (and preparedness for the future) requires a national vision for restoring the waters, land, and their ecosystems to health. "Restoration" is the term of art for attempting to bring natural resources back after a spill. It also describes the recovery of large ecosystems by addressing the longstanding environmental problems that have caused their deterioration. The goal of any such effort is not necessarily to rebuild wetlands and barrier islands so that the coast looks like it did 100 years ago, but rather to reintroduce elements of the natural system so that the Mississippi River Delta—the epicenter of the threatened coastal region—can begin to heal itself.[5]

To that end, conversations about repairing the Gulf coast and marine ecosystems increasingly aim at restoring the region's natural "resilience."[6] Prior to the spill, Gulf states and federal authorities were already in various stages of restoring parts of the Gulf. Numerous ecosystem challenges now face the regions of the Gulf coast affected by the *Deepwater Horizon* spill. Barrier islands and shorelines are eroding from Florida to Texas. Essential habitats in coastal bays and estuaries have been lost to or degraded by pollution, energy or other development, changes in freshwater inflows, and overfishing.[7]

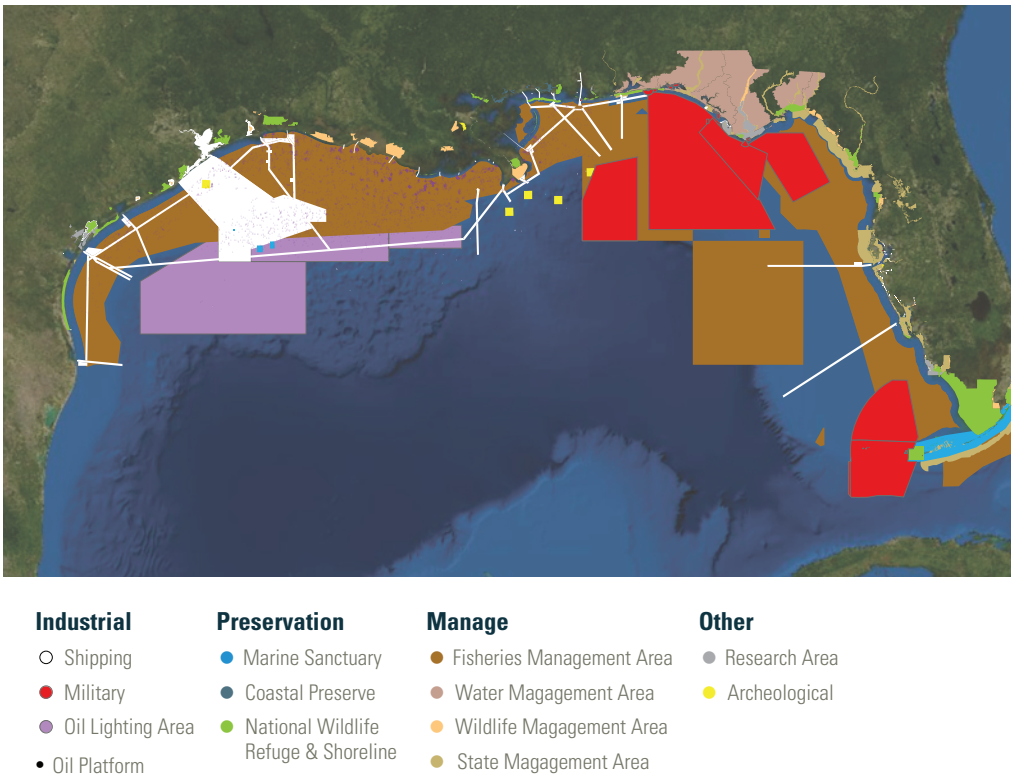
The largest and most formidable challenges, however, are to bring balance and efficiency to the Gulf's shared marine resources, and to address the rapid and continuous loss of wetlands, barrier islands, and shorelines comprising the Mississippi Delta and associated Chenier Plain of southwestern Louisiana. While many areas along the Gulf Coast require such restoration, the Mississippi Delta and the Gulf itself requires special attention.

Advancing Restoration Options for Offshore Ecosystems and Resources

Beyond restoration of Delta and other coastal ecosystems, a broader restoration effort—guided by new research and an understanding of what long-term damages may be resulting from the spill—seeks to improve the environmental quality of the marine habitat. These issues link a complex web of problems (including the annual appearance of the low-oxygen dead zone in waters of the Louisiana-Texas continental shelf) with the continued efforts to conserve the biodiversity and resources of offshore ecosystems.

Implementing the Gulf Hypoxia Action Plan. Hypoxia kills or excludes most marine animals over vast areas of the continental shelf. Scientific investigations have shown that such extensive and severe hypoxia is a recent phenomenon, fueled by the increased loads of nutrients carried down the Mississippi and Atchafalaya rivers, largely as a result of fertilizers used to support intense agriculture within the river basin.[8] Phytoplankton bloom thanks to the nutrients, and the process of their decay depletes oxygen over thousands of

FIGURE 7.2: Coastal Marine Users



NOAA

square miles of seabed. These hypoxic seafloor habitats could become prime candidates for restoration efforts in the aftermath of the *Deepwater Horizon* disaster.

A plan of action produced in 2001 and updated in 2008 by the Mississippi River Gulf of Mexico Watershed Nutrient Task Force* outlines how to proceed.[9] The Action Plan aims to reduce the average extent of the hypoxic zone to less than 5,000 square kilometers (1,930 square miles), or about one-fourth the area affected in 2010, by reducing the discharges of nitrogen and phosphorus into the Gulf. The original target date for achieving this goal was 2015, but implementation has languished. As part of a comprehensive restoration program, regulations that limit discharges under the Clean Water Act could be more rigorously applied, and federally-authorized conservation programs could be better targeted to achieve greater results. Hypoxia abatement should also be integrated with coastal ecosystem restoration in order to optimize nutrient removal by river diversions and to reduce the risks of injecting greater nutrient loads into the waters of the continental shelf.

Marine spatial planning. The U.S. part of the Gulf of Mexico is already as compartmentalized as any water body in the world. The Department of the Interior divides

* The Task Force consists of state and natural resources agencies and federal agencies, including NOAA, EPA, the Departments of Agriculture and of the Interior, and the Army Corps of Engineers.

the northern Gulf into a grid for administrative purposes. Oil and gas companies lease individual blocks within this grid for exploration and production.[10] Other entities manage the Gulf to maximize their own benefit—for fishing, tourism, or conservation.

All this activity also makes the Gulf a crowded space administratively, with coordination insufficient to resolve potential conflicts among oil and gas development, fishing, navigation, and military operations. The *Deepwater Horizon* disaster occurred at a time when U.S. policy toward its waters was under significant revision. The National Oceans Council, created by Executive Order in July 2010,[11] is authorized to set and manage executive-branch marine policy and to implement recommendations of a task force appointed by President Obama in 2009.[12]

Among the most significant initiatives are steps that would reorganize—or in some cases organize—how Americans benefit from resources in federal waters. Scientists and policy advocates use the phrase "coastal and marine spatial planning" to describe a suite of technologies, best practices, and inter-industry networking to optimize the use of resources for all.[13] In the Gulf of Mexico, where the oil and gas industry has a very large presence, marine spatial planning can help lead to better oversight, and in the event of an accident, better communication among all users. Massachusetts and Rhode Island recently formalized this approach to their state waters.[14] Norway has implemented planning in its crowded northern waters, an area which includes oil and gas infrastructure.[15]

More a management or governance strategy than a discrete program, marine spatial planning is evolutionary in nature. The Department of the Interior is already charged to manage energy resources on the outer continental shelf in a way that is, among other requirements, "consistent with the need . . . to balance orderly resource development with protection of the human, marine, and coastal environments."[16] Proponents expect federal and statewide marine spatial planning to bring together agencies, jurisdictions, and communities to share information and best practices—and in so doing, better balance the many interests on and beneath the water.[17]

Marine protected areas. Within the context of coastal and marine spatial planning, there are opportunities for protection and restoration of resources harmed not only by the present oil spill, but also by oil and gas development generally and other commercial activities. Marine protected areas have been effective as a means to conserve marine biodiversity and enhance the resilience of fish stocks in the face of harvest pressures.[18] Strategically selected and designated marine protected areas could be an effective way to restore offshore ecosystems within the framework of a comprehensive restoration program. Modern management tools can go a long way toward making Gulf fisheries more robust by preventing overfishing. The *Deepwater Horizon* disaster delayed the start of a new National Oceanic and Atmospheric Administration (NOAA) fisheries management policy. On November 4, 2010, the "NOAA Catch Share Policy" went into effect. The policy divides the total allowable catch in a fishery into shares held by individuals and various entities. The holders of the catch shares must cease fishing once they have reached their limit. This is one step toward protecting the health of commercial and recreational fisheries.

FIGURE 7.3: Coastal Vulnerability Index

USGS National Assessment of Coastal Vulnerability to Future Sea-Level Rise –Open File Report 00-179

Toward a Functioning Delta

The Delta difference. The land at the mouth of the Mississippi River differs from that of neighboring regions: the underlying rock is hundreds of feet below the surface,[19] buried by mud deposited over many millennia. River-borne sediment has, literally, created the land—a coastal habitat of remarkable biological productivity, and a buffer that protects the densely settled land upriver from the full force of battering waves. But the sea constantly carries that coastal land away.

The Mississippi River, extending some 2,300 miles upstream to Minnesota, runs through the heart of the third largest watershed in the world (after the Amazon and the Congo). Water enters its basin from 31 states. Water from the northern reaches of the basin can take a month to reach the Gulf. About two weeks after the historic rains that flooded Nashville and killed at least 31 people across the southeast in May 2010, the water flowed past New Orleans; when it entered the Gulf, that freshwater swell may have helped keep oil-covered offshore waters away from marshes in the spill's early days.[20]

As the Mississippi meanders south, it picks up silt, sand, and organic materials. Under largely natural conditions (before the 1930s), the river cast this sediment across the wetland plain before draining into the Gulf. The accumulating material attracts the microbes and marsh grasses that undergird the coastal ecosystem. During the 7,000 to 8,000 years since the end of the last ice age, the Mississippi has shaped and reshaped its delta—even, on occasion, carving wholly new routes to the Gulf.

Voices from the Gulf

"Louisiana is paying a grave price for what the rest of the country is enjoying."

Dennis Woltering

Brenda Dardar Robichaux,
Former Chief of the United Houma Nation,
Raceland, LA

Brenda Dardar Robichaux could not help noticing as the local coastline, ditched for oil-related navigation and pipeline corridors, progressively disappeared all through Terrebonne, Lafourche, Jefferson, St. Mary, St. Bernard and Plaquemines parishes. As Principal Chief (from 1997 until 2010) of the 17,000-member United Houma Nation, whose people lived in and made their livelihoods from the coastal lands of southeastern Louisiana, she said, "We have seen small canals turn into large bayous; we have watched hundreds of acres of wetlands wash away; we have seen freshwater bayous turn into saltwater." And her people have become exposed to severe risks: "Hurricanes Gustav and Ike destroyed our community on Isle de Jean Charles because we no longer have the barrier islands protecting us. Today Isle de Jean Charles is just a sliver of what it once was. The length of the island is still several miles, but the width is maybe an acre. When I was little there were fields that we [the Houma People] raised cattle and horses on. We had gardens and the kids played baseball. Now there is no such thing. The backyards are water."

Former Chief Robichaux initially saw some possible good coming from the spill: serious attention being paid to coastal restoration. "The spill certainly adds another level of awareness to the problem—like Katrina did—but we need major change now, and not just little projects. When the oil spill happened, I was hopeful that all the attention it was bringing might finally wake people up. I was optimistic. I was thinking if we're ever going to get vision for coastal restoration off the ground, now is the time. But I don't see that happening."

For centuries, the United Houma Nation's culture and economy have been entwined with the bounty of the gulf. "Our people follow the seasons," Robichaux explained. "In the summer we catch shrimp, crabs, and garfish. In the winter we harvest oysters and trap nutria, muskrat, and otters…Houma fishermen are intimately familiar with the lakes and bayous of our region. They know the stories of how these places got their names. They know how the tides flow and the winds blow… All of these traditions are in danger of disappearing."

Like all Americans, she knew well the nation's dependence on oil: "Louisiana is paying a grave price for what the rest of the country is enjoying, whether it's seafood or what oil and gas provide. But our tribal citizens are paying the ultimate price, because we live along the coast of southeast Louisiana. We as a nation, not only people in Louisiana, not just people on the coast, but the nation, need to evaluate our dependency on oil and gas. We need to re-evaluate our entire lifestyle. It's not just a Gulf Coast issue."

Beginning late in the nineteenth century, the Atchafalaya River in southern Louisiana captured an increasing share of Mississippi waters, greatly reducing flow into the lower part of the Mississippi.[21] Were nature left to itself, the flow would have diverted over time primarily to the Atchafalaya, which provides a much shorter route to the Gulf. This change would have been catastrophic to communities and industry along the lower river, leaving the port of New Orleans on a silted-in bayou without a freshwater supply. To forestall that switch in river channels, the U.S. Army Corps of Engineers built the Old River Control Structures: a series of dams, completed in 1963, that ensure 70 percent of Mississippi waters flow past New Orleans and 30 percent reach the Gulf through the Atchafalaya. All other distributaries of the great river have been closed.[22]

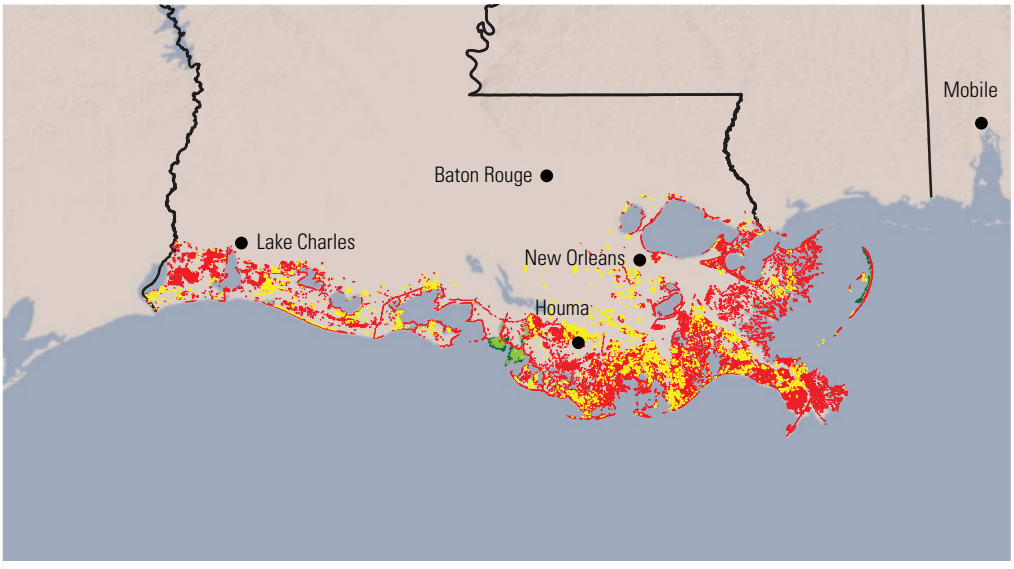
Managing the river for human ends—to improve navigation and control flooding with artificial levees—accelerates the natural deterioration of coastal wetlands and landforms. Flooding is the process that feeds this landscape, causing the accretion of sediments through which nature constructed the Delta. Under human control, the river now carries that sediment out into the Gulf, where it is deposited beyond the reach of natural deltaic processes, breaking the Delta's means for self-preservation. Managing the flow down the Atchafalaya was only the most recent intervention that has disrupted the natural mechanisms at work in the Delta. Addressing the central issue of the Delta's functioning lies at the core of strategies for long-term restoration.

The sediment problem. The re-engineering of the Mississippi River system—resulting in the "sediment starvation" of the Delta—began even before the Great Flood of 1927, when 145 levees failed, at least 246 people died, and floodwaters throughout the river basin caused the modern equivalent of $2 billion to $5 billion in damage.[23] It accelerated after that flood, when the Flood Control Act of 1928 authorized an epic levee-building program.[24] The Mississippi River and Tributaries Project engaged the Corps in building levees to contain floods, constructing strategic floodways, improving the river channels for shipping and floodwater carrying capacity, and reconstructing tributary basins for flood control. The Corps now manages the resulting protective system, with 2,203 miles of levees.[25]

As flooding decreased, and improved river traffic and long-distance shipping allowed local communities to grow, the closure of the Mississippi's crevasses, flood plains, and distributaries had the unforeseen consequence of endangering the very communities that enjoyed those benefits. In written remarks to the Commission, Senator Mary Landrieu decried the "strangulation" of nature: "For more than a century, the federal government has mismanaged critical water-resource projects, placing delicate ecosystems like the Mississippi River Delta at extreme risk of complete and utter collapse."[26] The loss of protective wetlands, like a catastrophic oil spill, is a manmade disaster.

In effect, the system built by the Corps is causing southern Louisiana to disappear (even though the Corps has, during the past 20 years, begun taking steps to offset these unforeseen consequences).[27] The annual sediment load reaching the Delta has decreased from 400 million metric tons before 1900 to 145 million metric tons in recent years. And very little of that reaches wetlands.[28]

FIGURE 7.4: Louisiana Coastal Erosion



USGS Open File Report 2009-11-0408

Rising waters. Even as the altered river delivers less sediment to replenish the Delta, the relative sea level is rising in southern Louisiana—the net result of land subsidence and actual sea level rise.[29] Subsidence is a critical problem in the Gulf region, which naturally sinks 1 to 5 millimeters per year. In some places near the outer Delta, subsidence is nearly 10 millimeters per year, largely from manmade impacts.[30] It is particularly intense in the Delta, where the Gulf has swallowed more than 2,300 square miles of coastal wetlands since the early part of the twentieth century.[31] Explanations for the phenomenon vary. One is that sediment rich in organic material behaves like a sponge: squeeze out the water and it shrinks.[32] Another relates to deep tectonic faulting.[33] A third correlates hydrocarbon extraction with subsidence-driven wetland loss.[34] Whatever the reason, the channeling of river sediment into the Gulf is interrupting natural land generation, and the region cannot keep pace with relative sea level rise.

Navigation and channeling the wetlands. Relative sea level rise endangers marsh grasses and other swamp trees as they become subject to inundation by the salty Gulf. At the same time, the growing oil and gas industry dredged 10,000 miles of canals through Louisiana's wetlands in order to move in drilling barges or lay pipelines, leaving arrow-straight channels through what had been a convoluted maze.[35] Dredged sediment lines the canal: artificial banks change water flow and prevent flooding, so sediment mobilized by tidal flows cannot replenish the land. Water forms pools behind the banks, submerging marsh. And the channels admit saltwater flow into brackish and freshwater environments,

jeopardizing the overall ecosystem. Researchers have reached no solid consensus on how much wetland loss to attribute to the canals' direct and indirect effects, although some scientists attribute 35 percent to the canals' indirect effects.[36] In 2009, a Minerals Management Service study concluded, "The construction of outer continental shelf-related pipelines through coastal ecosystems can cause locally intense habitat changes, thereby contributing to the loss of critically important land and wetland areas" through their conversion to open water, or from freshwater marsh into saltwater marsh.[37]

Congress and the Corps put the most well known of the navigation canals out of business in 2008. The Corps in 1968 finished the Mississippi River Gulf Outlet—affectionately, or derisively, called "Mr. Go" (MRGO)—a straight shot from the Gulf to the Port of New Orleans. This canal's story is emblematic of the larger problem of wetland canals' environmental impacts. The 66-mile outlet shortened and simplified ships' approach to the port. Heralded as a boon to economic development, the project never proved transformative—except environmentally. Construction destroyed the existing ecosystems and excavated more than 270 million cubic yards of material—slightly more than was removed to build the Panama Canal.[38] The project converted about 3,350 acres of fresh or intermediate marsh and 8,000 acres of cypress swamps into brackish marsh. Nearly 20,000 acres of brackish marsh and swamp became saline marsh. More than 5,000 acres of marsh next to the channel had disappeared by 1996.[39] Maintenance costs increased significantly over the years, including costs related to hurricanes—even as shipping through the canal declined. The Corps estimated that the canal would require $22.1 million per year in dredging, or about $12,657 per ship every day. By the late 1990s, multiple stakeholders had pressed the Corps to close the canal.[40]

That was before Katrina. As the hurricane approached Louisiana's eastern coast, its storm surge pushed into the shipping channel, breaching levees, thereby contributing to the flooding of New Orleans.[41] Congress de-authorized the Mississippi River Gulf Outlet canal in 2008 and a contractor sealed off its southern entrance with rock fill in 2009.[42] Congress has undertaken no similar effort to address the ongoing harm caused by vast network of canals and infrastructure built into the wetlands—incursions that have hastened by decades the demise of the already sediment-starved Delta.

Planning without end. By the early 1950s, Gulf coast researchers had become aware of gaps in understanding how coasts naturally worked. In 1952, Louisiana State University created a Coastal Studies Institute. Scientists there and elsewhere sought to explain the relationship between floods breaching natural levees and the health of marshland and barrier islands fed by the sediment.[43]

The U.S. Fish and Wildlife Service in 1959 sent the Corps a memorandum suggesting that the declining health of oyster reefs caused by increasing salinity might be addressed by diverting fresh water from the Mississippi into discrete areas.[44] The first diversion, at Caernarvon, was authorized in 1965, and two years later Congress instructed the Corps to develop a strategy "in the interest of hurricane protection, prevention of saltwater intrusion, preservation of fish and wildlife, [and] prevention of erosion."[45] A 1973 report to the Corps suggested diversions to deliver sediment and lower salinity.[46] A 1979

study examined the economic impacts of wetland loss, with guidelines that "center on avoiding the disruption of wetland hydrology," and found that land loss was greater than previously measured.[47] Eight years later, a new group called the Coalition to Restore Coastal Louisiana suggested the same strategy: fix the hydrology.[48] In the 20 years since, a few small-scale programs and many reports have directed the state and federal governments to fix the hydrology. None approach the necessary scale for meaningful restoration[49], although they have provided smaller successes and helpful organizational models.

Simulations predict that, at the current rate of land loss, much of southern Louisiana will disappear by 2100. The region will transition from marshy lowlands to a fully aquatic system because of erosion and submergence,[50] leaving New Orleans an expensive island fortress.

Among efforts to identify and begin to address the problem are these highlights:

- Louisiana Act 6. In 1989, the Louisiana legislature passed Act 6, establishing a wetlands authority and an executive office to prioritize and manage a restoration strategy and projects.

- The Coastal Wetlands, Planning, Protection and Restoration Act. The following year, Congress enacted the so-called Breaux Act, named for its sponsor, Louisiana Senator John Breaux. It authorizes civil works aimed at marsh regeneration, shoreline protection, barrier-island reconstruction, hydrologic engineering, and the use of dredged material for restoration purposes. The Act has a dedicated funding source, the Sport Fish Restoration and Boating Trust Fund, which receives taxes on gasoline for motorboats and other small engines, and on sport-fishing equipment.[51] The taxes have yielded between nearly $30 million and $80 million per year.[52] Programs under the Act, which involve collaboration among Louisiana and five federal agencies including the Corps, have been credited with protecting 110,000 acres of wetlands.[53]

  In 1998, more ambitiously, the Breaux Act agencies agreed to the recommendations of Coast 2050, an 18-month feasibility study for coastal restoration. The report was based upon original research and 65 public meetings, and was supported by 20 coastal parishes. The report's recommendations were aimed at allowing healthy flows of sediment into the Mississippi, preserving salinity levels and land critical to sensitive habitats, and diverting sediment-rich fresh water to replenish starving marsh.[54]

  In 2004, the Corps produced its Louisiana Coastal Area Comprehensive Coastwide Ecosystem Restoration report, a package of projects meant to meet the coastal challenges. This led to creation of the Louisiana Coastal Area Ecosystem Restoration Program under the 2007 Water Resources Development Act. After the Office of Management and Budget opposed the high price tag of a more comprehensive proposal—about $14 billion—the Corps slimmed its initial implementation down to 15 projects that would together cost more than $2 billion.[55]

Katrina's aftermath. Weeks after Hurricane Katrina ravaged much of coastal Louisiana and Mississippi, the Louisiana legislature established a Coastal Protection and Restoration Authority that combined responses to wetland loss and hurricane risk—related goals separated in state bureaucracy. In September 2006, Louisianans approved a constitutional amendment that explicitly ties state revenues from oil and gas activities in federal waters to storm protection and rebuilding wetlands.[56]

The relative priority of the two goals is not yet certain. Although one rule of thumb for the Louisiana coast holds that each 2.7 square miles of marshland reduces a hurricane's storm surge by one foot,[57] the relationship has not been easy to precisely quantify. In the meantime, construction for storm protection is tangible and has been readily funded. The Corps has been able to fast-track building new levees to protect New Orleans from the projected "100-year storm"; the project should be completed in 2011—just five years after it began. By contrast, direct instructions and guaranteed funding have mostly eluded restoration efforts. The state has engaged the Corps to design and build two new, large levee systems, but their effects on southern Louisiana communities and wetland survival are still being studied.[58] Traditional flood protection usually involves "hard-engineering," essentially levee-building. Part of the promise of the state's newly organized approach is in protective "soft-engineering," or regenerating wetlands and barrier islands for the dual purposes of ecosystem restoration and storm protection.

Congress also asked the Corps to develop comprehensive statewide hurricane-protection options after Hurricanes Katrina and Rita. The Department of Defense Appropriation Act of 2006 directed the Corps to design a suite of improvements to the Louisiana and Mississippi coasts, including improvements for "hurricane and storm damage reduction, prevention of saltwater intrusion, preservation of fish and wildlife, prevention of erosion, and other related water resource purposes at full Federal expense."[59] A September 2009 Chief of Engineers' report suggested 12 projects for Mississippi, costing more than $1 billion, that would help restore barrier islands, beaches, sensitive habitats, and coastal ecosystems. Congress has appropriated $439 million to implement Mississippi's program so far.[60] The Corps has also drafted a counterpart Louisiana Coastal Protection and Restoration Final Technical Report,[61] but the future of the Louisiana program is uncertain, as the report includes a wide range of options rather than a specific plan.

Other sources of funding for sustained restoration efforts include the State of Louisiana's Coastal Protection and Restoration Fund, about $25 million a year from state mineral income plus budget surpluses in 2007–2009;[62] the federal Coastal Impact Assistance Program, which authorizes $250 million split among six states in each fiscal year from 2007–2010 to fund natural resources recovery, conservation, and protective measures;[63] and the federal Gulf of Mexico Energy Security Act, in which participating Gulf states (all but Florida) share 37.5 percent of federal offshore revenue from new lease areas for use in coastal protection, including onshore infrastructure projects that mitigate the impacts of outer continental shelf energy activities.[64]

Voices from the Gulf

"An entire culture being washed away by crude oil and chemicals"

Claire Luby

Clarence R. Duplessis,
Commercial Fisherman, Davant, LA

When Clarence R. Duplessis was born in 1945 in the small Gulf Coast fishing community of Davant, just north of Pointe-a-la-Hache, he became the seventh generation of his family to live in Plaquemines Parish, Louisiana. After high school, Duplessis, joined the U.S. Marine Corps, served a tour of duty in Vietnam, and met his wife, Bonnie, who served in the Navy.

Upon their return to Louisiana, Mr. Duplessis found work at the Kaiser Aluminum plant in Chalmette, La. In 1989, when the plant shut, he says, "I had a young family to feed, clothe, and educate. This. . . was a problem with a solution. I was still young and had experience with shrimping and oystering. I had salt water in my veins at birth. I went fishing and my children paid their college tuition by working as deckhands.

"In 2005, Hurricane Katrina hit us with a crippling blow. Wow! A major problem!. . . My wife and I lost everything we owned in Hurricane Katrina. . . Even then, though the entire region was wiped out and the insurance companies packed their bags and left us, there was still a solution…The fishing communities and people of South Louisiana are some of the hardest working, defiant yet kindest people on God's earth. After the storm we faced the difficult task of rebuilding, but that was the solution.

"Now, five years later we are facing the *Deepwater Horizon* oil spill. This is the worst of our problems because we have no answers, no solutions, only questions. As we watch our livelihood and even an entire culture being washed away by crude oil and chemicals that no one knows the long term effects of, we ask: [W]ill we have the mortgage payment next month? . . . How long will this last? Will I be able to go oystering next year or ever again? How long will it take the fisheries to recover?. . . Will BP do what is right or will they pack their bags and leave us like the insurance companies did? What can I do to survive?...I have a thousand questions and no answers. Now, I hope you can understand why this problem is the worst of my life!"

Toward coordinated strategies and action. In the fall of 2009, President Obama directed the Council on Environmental Quality and the Office of Management and Budget to co-chair a Louisiana-Mississippi Gulf Coast Ecosystem Restoration Working Group, made up of federal agency and state representatives.[65] Six months later—about six weeks before the *Deepwater Horizon* exploded—the group presented a "road map" for federal-state collaboration and set out 2010–2011 deadlines for advancing policymaking.[66] The President's fiscal year 2011 budget requested $19 million for construction, sediment use, and river diversions and $16.6 million for studies of eventual restoration projects.

After the spill, the President in June commissioned Secretary of the Navy and former Governor of Mississippi Ray Mabus to study Gulf coast recovery and propose ways to address chronic Gulf marine and coastal issues. The resulting "Mabus report," published on September 28, 2010, analyzed ecosystem restoration, human health, economic recovery, and the nonprofit sector.[67] A week later, the President issued Executive Order 13554, creating a Gulf Coast Ecosystem Restoration Task Force comprised of federal agency and state representatives to "coordinate intergovernmental responsibilities, planning, and exchange of information so as to better implement Gulf Coast ecosystem restoration and to facilitate appropriate accountability and support throughout the restoration process."[68]

In the course of his work, Secretary Mabus repeatedly referred to the rising public impatience with plans unaccompanied by action. As he put it in June, "I also understand that people have plan fatigue, that they've been planned to death."[69] In the meantime, at current erosion rates, an area of the Delta the size of a football field is consumed by Gulf waters every hour.[70]

Identifying options for funding and governance. The twentieth-century re-engineering of the Mississippi River basin, and subsequent piecemeal efforts to restore its nourishing flows of water and sediment, teach important lessons about any future, comprehensive approach to coastal management. Many of the re-engineering projects have provided only incremental gains.[71] Discrete restoration projects, moreover, are unable to reverse the loss of Delta land and habitats in the aggregate. The many layers of federal, state, and local authorities—some overlapping and conflicting—make it difficult as a practical matter to devise, implement, and make mid-course corrections to a strategy for restoration. And secure, sustained sources of funding on the scale required to do the necessary work are not now in place.[72] The contrast with the reconstruction of the protective hurricane levees around New Orleans from 2006 through 2011 could not be clearer.

Estimates of the cost of Gulf restoration, including but not limited to the Mississippi Delta, vary widely, but according to testimony before the Commission, full restoration of the Gulf will require $15 billion to $20 billion: a minimum of $500 million annually for 30 years.[73] Current funding sources do not approach those figures. Beginning in 2017, Phase II of the Gulf of Mexico Energy Security Act,[74] which governs sharing of oil-related revenues, will begin to bring large amounts of money to the Gulf States. Much of this could be directed to restoration.

The *Deepwater Horizon* disaster provides a significant opportunity to begin funding restoration sooner. It will generate monies that can be directed to jumpstart key Gulf restoration projects. And it can provide the basis for launching a long-needed federal-state entity capable of managing the restoration effort over the longer term, guided by a clear set of principles.

In the aftermath of the spill, the responsible party (or parties) will be liable for damages in the amount necessary for "restoring, rehabilitating, replacing, or acquiring the equivalent of" natural resources harmed by the spill.[75] The responsible party will also pay fines if found in violation of federal laws. The maximum civil penalties under the Clean Water Act could range from $4.5 billion to $21 billion, depending upon findings of negligence and the calculation of barrels discharged. The Act provides for a civil penalty for unpermitted discharges of up to $37,500 per day of violation or up to $1,100 per barrel of oil discharged. In the case of an operator's gross negligence or willful misconduct, the penalty becomes not less than $140,000 and not more than $4,300 per barrel of oil discharged.[76] Criminal fines could be large, as well.[77] A negligent violation of the Clean Water Act's criminal provision is subject to a fine of between $2,500 and $25,000 per day of violation for a first violation and up to $50,000 per day for subsequent violations.[78] For knowing violations of the Act, criminal fines range between $5,000 and $50,000 per day of violation for a first conviction, and up to $100,000 per day for subsequent violations.[79] Civil and criminal fines are both deposited in the Oil Spill Liability Trust Fund, established after the *Exxon Valdez* spill to help pay for cleanup and certain damages after a spill, but use of that Fund is restricted.[80]

The Mabus report, as well as regional members of Congress and Governors from the Gulf, have proposed directing a significant amount of the penalty funds to long-term ecosystem restoration in the Gulf (and in the case of the Mabus report, to economic and health recovery as well). Secretary Mabus recommended that the President urge Congress to pass legislation to dedicate some of the penalties for those purposes.

Legislative proposals to establish a coordinating and decisionmaking council, as recommended in Secretary Mabus's report,[81] call for a state-federal governing entity that has authority to prioritize restoration projects based on a comprehensive strategic plan. Although the details of early proposals varied, most recognized the need for a single, Gulf-wide decisionmaking authority and a strong leadership commitment to fund only those projects that conform to an agreed-upon vision for long-term restoration.

Planning and program design for any comprehensive Gulf restoration effort will have to be based on sound science. In different circumstances, the *Exxon Valdez* Trustee Council Science Panel reviewed all proposed projects both for technical merit and for consistency with the overall restoration goals (as set forth in the Restoration Plan) and annual work plans.[82] This effort, although encompassing projects of a different nature and scope than those in the Gulf, enabled effective scientific communication with the Trustee Council.[83]

A successful Gulf-wide scientific process would likewise be structured to allow meaningful and timely input by scientists into the decisionmaking process. Ideally, it would provide a science program with the resources to evaluate individual projects for consistency with a comprehensive plan; to research long-term restoration issues; and to develop and apply performance measures and indicators of long-term restoration that allow decisionmakers to adjust the plan based on new science or changed circumstances. Particularly with respect to long-term research issues, the diverse resources and expertise of the federal government should be brought to bear.

Finally, no authority will succeed without the confidence and support of the citizens of the region. Leaders of restoration efforts emphasize the importance of gaining the support of those most directly affected by restoration projects. Local citizen support is important for several reasons: it can reduce delay of projects due to litigation or other opposition; it contributes to political support for overall goals and funding, in the short and long terms; and it contributes to overall trust in government, which results in support for local projects.[84] Any structure should therefore include a citizens' advisory council to provide formal advice and a direct line to citizens' concerns.

Putting Restoration on the Agenda

Speaking to the nation in June 2010 from the Oval Office, President Obama clearly linked spill recovery and long-term stewardship: "The oil spill represents just the latest blow to a place that's already suffered multiple economic disasters and decades of environmental degradation that has led to disappearing wetlands and habitats. And the region still hasn't recovered from Hurricanes Katrina and Rita. That's why we must make a commitment to the Gulf Coast that goes beyond responding to the crisis of the moment."[85] In mid-July, Louisiana Governor Bobby Jindal announced his "Agenda for Revitalizing Coastal Louisiana," which extols Louisianans' resilience both in general and in recovering from the 2005 and 2008 storms: "There is not a doubt in my mind that we will recover and restore our coast and our wetlands to not only be Sportsman's Paradise again, but to be an even more plentiful source of abundant natural resources than ever before."[86]

"Restoration" itself has several specified meanings. NOAA defines post-spill restoration under the Oil Pollution Act as "the goal of a natural resource damage assessment, which involves rehabilitating, replacing, or acquiring the equivalent of injured natural resources and the services they provided."[87] In some cases after an oil spill, natural resource trustees—such as the involved state and federal agencies—and the party responsible for the spill can alter the charge. For example, the concept of "enhancement" that emerged after *Exxon Valdez* gave trustees additional latitude in restoring Prince William Sound and its ecological region.[88] This addition enabled planners to strive for improvements, rather than returning to a baseline.

Nature has no baseline: natural systems change and evolve continuously. "Restoration" therefore should have another, broader meaning. In the Gulf, it must encompass reversing the progressive erosion of coastal land and habitats that buffer human communities from storms and sustain the area's biological productivity. In this context, restoration does not imply returning landforms to a particular map, but rather making the river,

Delta, and Gulf coastal and marine systems more resilient. The economies of the Gulf—fisheries, energy, and tourism—are as rooted in the environment as any in the developed world. Restoration, or restored resilience, represents an effort to sustain these diverse, interdependent activities and the environment on which they depend for future generations.