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## **Coastal Louisiana: Attempting to Restore an Ecosystem**

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Jeffrey Zinn  
Specialist in Natural Resources Policy  
Resources, Science, and Industry Division

# Coastal Louisiana: Attempting to Restore an Ecosystem

## Summary

About 15,000 acres of wetlands in coastal Louisiana are being converted to open water each year. This loss of wetlands is attributed to several factors, some natural and others the result of human activity. This loss has substantial ecological, economic, and social costs. Ecological costs center on loss of wetland habitat critical to many plant, animal, and fish species, including ones that have commercial or recreational value. Economic and social costs include an increased exposure to storms with greater potential for damage to property, and smaller seafood harvests. While these costs are concentrated in Louisiana, they can affect the regional and national economy, as the Mississippi River bisects coastal Louisiana and a significant amount of oil and gas enters the national distribution system through this region.

Since the wetland loss problem was initially recognized about 35 years ago, several federal agencies, the state, and local universities have been working to better understand why these losses are occurring, and how to slow and eventually reverse this process. Numerous projects with restoration benefits have been initiated at specific sites, especially since legislation increased federal funds in the early 1990s. These projects are neutralizing conditions that lead to loss at some sites, and are reestablishing some wetlands. These projects are expected to have many ecological, economic, and social benefits. A July 2004 U.S. Army Corps of Engineers report, a draft ecosystem restoration study, identifies more than 150 possible remedies.

Congress continues to consider legislative options to address wetlands loss in coastal Louisiana. Some legislative proposals would dedicate some federal revenues from offshore oil and gas development to restoration efforts. Other proposals would authorize specific restoration projects or activities, or further examination of the causes and effects of loss. Among the many questions being raised are:

- Is this wetland loss a local, state, or a national problem?
- What options are available to respond to this problem?
- How much would each option cost and what would it accomplish?
- What portion of the cost should the federal government pay?
- What roles should the federal government and the state play in restoration?

Responding to widespread wetland losses in coastal Louisiana has been characterized by some as a large-scale restoration of an ecosystem. Proponents of taking action equate proposed responses to restoration efforts in other places, such as the Everglades and Chesapeake Bay, that have garnered widespread public attention, congressional support, and federal funds. Some characteristics support this comparison, including the large area that has been affected, the complex biological and physical processes, the central role of water, and potential benefits of restoration efforts for diverse biological resources. The overall restoration effort has not been opposed, but there are disagreements over specific subjects, such as project priorities and how costs should be allocated between the state and the federal government. Congress may address these disagreements through legislative actions. This report will be updated as events warrant.

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# Coastal Louisiana: Attempting to Restore an Ecosystem

## Introduction

About 15,000 acres of wetlands in coastal Louisiana are being lost each year as they are converted to open water. Some of the factors identified as causing this conversion, such as dredging channels for oil and gas pipelines, are a result of human activities, while others, such as land subsidence, are a result of either natural causes or a mix of natural and human causes. Federal public works projects for flood control and navigation have contributed to these losses, which have major ecological, economic, and social costs. While these costs are concentrated in Louisiana, they can affect the regional and national economy, as coastal Louisiana is bisected by the Mississippi River and is the site of significant commercial and recreational seafood harvests, and a substantial amount of oil and gas enters the national distribution system through this region.

Halting or reversing these trends will take time and be expensive. Since the wetland loss problem was initially recognized about 35 years ago, several federal agencies, the state, and local universities have been working to better understand why these losses are occurring, and how to effectively slow and eventually reverse this process. Numerous projects with site-specific restoration benefits have been initiated, especially since legislation increased federal funds in the early 1990s. These projects are neutralizing conditions that lead to loss at some sites, and are reestablishing some wetlands. Federal agencies and the state have started to consider these projects within the context of a more systematic approach to wetland restoration throughout the region in the past several years.

Congress continues to consider legislative options to address wetlands loss in coastal Louisiana. In these deliberations, it will be able to draw from a July 2004 U.S. Army Corps of Engineers (Corps) study that looks at the region in a more systematic fashion and identifies possible remedies. Some legislative proposals would authorize specific restoration projects or activities, or further examination of the causes and effects of loss. Other proposals would dedicate some federal revenues from offshore oil and gas development to restoration efforts. Among the many questions Congress may examine are:

- Is this wetland loss a local, state, or a national problem?
- What options are available to respond to this problem?
- How much would each option cost and what would it accomplish?
- What portion of the cost should the federal government pay?
- What roles should the federal government and the state play in restoration?

This report reviews physical changes in coastal Louisiana, emphasizing the rate of wetlands losses, and the problems that result from these losses. It reviews past

efforts to understand and respond to these physical changes. The report then reviews the U.S. Army Corps of Engineers current draft restoration plan. It discusses what success might mean in the context of coastal Louisiana and compares what is proposed to some other efforts to restore large ecosystems. It concludes by reviewing relevant legislation considered by the 108<sup>th</sup> Congress.

## The Problems in Coastal Louisiana

Coastal Louisiana is a fragile landscape where wetlands are easily altered by human actions or changes in physical processes. It is also a dynamic landscape, where large changes can occur rapidly. In recent decades, the most pronounced change has been that this area is losing coastal wetlands at a rapid but slowing rate. Wetlands have changed to open water. Open water is a far less productive ecosystem, providing less habitat for many plant and animal species and producing less biomass, including species of commercial or recreational importance, than wetlands. Wetlands also buffer inland areas and development from ocean storms, while open water increases exposure to these storms. Exposure puts personal property and community infrastructure, as well as pipelines and other energy infrastructure that is concentrated in this area, at greater risk. The parties that will participate in the restoration effort agree that the overall goal will be to stabilize and then expand the wetland acreage. This goal can be accomplished by some combination of slowing the rate of loss at some sites and reestablishing wetlands at other sites. A corollary to this goal may be that the greatest program benefits will result in the largest net increase in wetlands.

Rates of loss of wetlands have been tracked by scientists for more than 25 years. They have used information about the causes, rates, and patterns of loss to make projections through 2050. Past and projected changes are shown in a map produced by the U.S. Geological Survey (USGS). These changes include both land loss and gain.<sup>1</sup> This map shows three important characteristics of change in wetland acres. It shows that past and future land loss is not occurring uniformly across the breadth of coastal Louisiana, but rather is concentrated near the mouth of the Mississippi River. It also shows that the total loss is the sum of losses occurring at many sites that are often small and largely disconnected from each other, but that in total, add up to a significant number of acres and significant damage to the ecosystem. It also shows that there are significant gains in a few locations.

**The Landscape.** The landscape of coastal Louisiana, which is has four major elements; wetlands, barriers and beaches, uplands, and open waters.<sup>2</sup> All these landscape elements are affected not only by the ocean, but also by the Mississippi

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<sup>1</sup> This map can be found at [<http://www.coast2050.gov/pptpres.htm>], visited on September 23, 2004. The first listed presentation at this site includes a number of maps. The final map of the presentation is the entire coast of the state and shows the four variables (land loss 1932-2000; predicted land loss 2000-2050; land gain 1932-2000; and predicted land gain 2000-2050) in different colors. This color map is not included in this report because the information consists of many small areas that would not show up on a page-sized map, and would not be clearly differentiated in a black-and-white format.

<sup>2</sup> Coastal Louisiana is generally the area that the state has defined to be in its coastal zone, and encompasses almost 30% of the state.

River, which contributes sediment and fresh water (and sometimes flood waters) into many parts of coastal Louisiana. The mouth of the river, where it builds up a delta by depositing sediment from the entire watershed, has migrated several times to different locations along coastal Louisiana in recent centuries, and would likely do so again if not for the dike, levee, and flood control projects built by the Corps that combine to contain it within the current channel.<sup>3</sup>

Wetlands have been the dominant feature in coastal Louisiana. The USGS and Louisiana's Department of Natural Resources estimate that Louisiana has about 3.7 million acres of coastal wetlands,<sup>4</sup> while the Corps has calculated that wetlands occupy 3.5 million acres, or 42.3% of the restoration project study area. Coastal wetlands nearest the ocean exist in waters with high salinity. Salinity levels drop as one moves away from the ocean or closer to a source of freshwater, such as a watershed drainage. Scientists generally subdivide Louisiana's coastal wetlands into subgroups. Each supports habitat for different mixes of plant and animal species. Every type can be highly productive. In the July 2004 Corps study, six subgroups were identified: 898,000 acres of wetland forest/swamp; 107,700 acres of wetland scrub; 860,000 acres of freshwater marsh; 658,900 acres of intermediate marsh; 547,600 acres of brackish marsh; and 423,400 acres of saline marsh.<sup>5</sup>

The narrow string of coastal barriers and beaches are an insignificant amount of the total area in coastal Louisiana, certainly less than 1%, but they provide a critical buffer for the wetlands. They protect the wetlands and upland areas from the full force of ocean waves and flood waters, ocean salinity, and wind. Rather than one continuous barrier beach system along the entire coast of Louisiana, there are several distinct barrier systems. These barriers also provide important habitat. Barrier islands and beaches are composed of unconsolidated sediments and adjust rapidly in response to ocean forces. Currently, several portions are eroding rapidly, "experiencing some of the highest land loss rates in the Nation."<sup>6</sup>

Within the coastal wetlands and landward of the wetlands are more-elevated uplands, characterized by different vegetation.<sup>7</sup> These uplands are the sites of most settlement and commercial enterprise in coastal Louisiana. These more-elevated areas come in several different forms, based on the geologic processes by which they were created. Uplands total only 242,300 acres, or 2.9% of the study area.

Open water is rapidly increasing in the study area, as the 15,000 acres of wetlands being lost each year transition to this condition. Open water now

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<sup>3</sup> Unless otherwise noted, all the data used to describe this landscape come from the U.S. Army Corps of Engineers, *Louisiana Coastal Area Ecosystem Restoration Study (Draft)*, July, 2004. (Hereafter referred to as Draft Corps Ecosystem Restoration Study.)

<sup>4</sup> U.S. Department of the Interior, U.S. Geological Survey, National Wetlands Research Center, *National and Louisiana Coastal Wetlands Data*, September 9, 2003.

<sup>5</sup> Draft Corps Ecosystem Restoration Study, p. MR-39.

<sup>6</sup> *Ibid*, p. MR-41.

<sup>7</sup> Uplands are but slight variations in elevation in coastal Louisiana, and only a few feet higher than the surrounding land in most cases.

encompasses 4.5 million acres, or 54.7% of the study area. Much of this expansion is in ponds that were formerly coastal fresh water or intermediate marshes. Erosion that causes shorelines of existing ponds to expand has ranged up to a distance of 1,000 feet, according to the Corps.

**Rapid Change.** Coastal Louisiana is extremely dynamic from a geological standpoint, as each of the major landscape elements can change rapidly. Change can be rapid because the forces that affect the landscape strike frequently (in geologic time) and are very powerful, and because this landscape is especially vulnerable to these forces of change. The two main forces are hurricanes from the Gulf of Mexico and flood waters draining out of the Mississippi River watershed. These forces can breach the coastal barrier and beach systems, inundate large areas of low-lying land, and destroy large wetland areas.

These natural processes and the physical changes they cause are frequently in conflict with human uses and values, which depend, in part, on a stable and unchanging coastal environment. Before the major navigation and flood control projects were built along the river, land building processes were dominant where it emptied into the Gulf and deposited sediments originating from throughout the drainage basin, while shoreline receding processes were prevalent in areas where the inflow of sediment was less than was needed to sustain the coastal land forms.<sup>8</sup> These major projects have fostered commercial development by reducing flooding and maintaining navigation. However, they also have limited the amount of sediment reaching the mouth of the river and accelerated the velocity of flow, contributing to coastal instability by reducing the amount of sediment deposited in coastal Louisiana and pushing a larger portion of that sediment beyond the delta and offshore. Part of the challenge of the restoration, then, is to create (or maintain) a coastal ecosystem that functions as a relatively stable physical environment in a dynamic setting.

Coastal barrier and beach systems are very responsive to the dynamic forces affecting coastal Louisiana. They depend on the river as a source of material to build and stabilize the coastline. These systems, which include the entire beach system from dunes on the land side to sand bars offshore, are already unstable, and any rise in sea level or additional subsidence will exacerbate these changes, especially in an extremely flat area like coastal Louisiana. Changes can show up very quickly in the condition of coastal barriers and beaches. The deterioration or loss of these buffers exposes coastal wetlands to ocean forces, such as waves, and to physical conditions, especially higher salinity levels, that hasten their demise.

**Land Losses.** Most of the land that is being lost to open water is coastal wetlands. Louisiana has 30% of all the coastal marsh, one category of coastal wetland, in the coterminous 48 states, but currently accounts for 90% of all coastal marsh losses, according to the USGS. USGS estimates that the state has lost about

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<sup>8</sup> As the mouth of the river (and the delta that forms at the mouth) has migrated several times in the past 7,000 years, many locations along the central portion of the state's coast have undergone periods of both widespread and rapid growth, followed by extensive erosion and subsidence. Geologists identify seven distinct deltas, and, within the current one, four distinct sediment complexes that have formed since 1839.

1.22 million acres of coastal wetland in the past 70 years, which is roughly equivalent to the area of Delaware. Additional studies show that the rate of loss has been slowing, averaging more than 28,000 acres annually between 1956 and 1978, about 22,000 acres between 1978 and 1990, and about 15,000 acres between 1990 and 2000. A recent USGS projection of future losses forecasts that an additional 448,000 acres could be lost by 2050 if no further actions are taken to halt or reverse current processes.<sup>9</sup> (If there were no further changes to current programs, these losses would be partially offset by gains that are estimated to total about 103,000 acres from restoration projects that are already underway and from natural processes in some locations.) One partial explanation for why the amount of loss is slowing is that much less remains to be lost than was there 70 years ago, although the average annual decline as a portion of the remaining wetlands has been falling as well.

The major causes of these losses are known in composite. Some of these are natural, others are manmade, and the remainder are natural causes amplified by human activity. These frequently articulated causes include:

- The land (a very thick layer of unconsolidated sediment deposited by the Mississippi River) is subsiding;
- Sea level is rising;
- Oil and gas deposits are being withdrawn, which can cause additional subsidence;
- Dams and diversions throughout the Mississippi River watershed have greatly reduced the amount of sediment that reaches coastal Louisiana (where it could have replenished and built up the wetlands);
- Levees along the river to provide flood protection limit periodic flooding into the marshes that had brought additional sediment and nutrients; and
- Canals and channels that provide navigation through the wetlands for oil and gas industries and others (in total, they traverse hundreds of miles) cause disruptions to the movement of water and nutrients, and facilitate salt water intrusion. Boat traffic using them generates additional shoreline erosion.<sup>10</sup>

It is difficult to allocate wetland loss among these causes. One reason for this challenge is that relationships among these factors vary from location to location. For example, the western coastal area of the state is different geologically than the central and eastern areas where the past and present deltas are located. A second reason is the considerable uncertainty as to how some of these factors relate to each other. For example, canals that traverse coastal Louisiana north-south create direct pathways that allow salt water to penetrate into the fresh and brackish water marshes, while east-west canals disrupt the hydrology by creating barriers to flows, but few of

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<sup>9</sup> All loss estimates were calculated by the USGS's National Wetlands Research Center, which has published a number of reports describing past and predicted loss rates. The Center has produced a color map of past (1932-2000) and predicted (2000-2050) land losses and gains. Information about this map and a web address are in footnote 1.

<sup>10</sup> One channel in particular, the 76 mile Mississippi River Gulf Outlet (MRGO) constructed in the 1960s to shorten the trip between New Orleans and the Gulf, is estimated to have caused the loss of almost 20,000 acres of wetlands. Modifying or even closing it will likely be an important component of any restoration plan and is in the July 2004 draft proposal.



these flow in a single direction and either due north-south or east-west. A third reason is that major changes are often dictated by periodic and unpredictable big events such as landfalls by major hurricanes or the infrequent changes in the location of the mouth of the Mississippi River. For instance, many hydrologists believe that the river is trying to change course again, so that the main stem would empty into the Atchafalaya Basin to the west of the current mouth, bypassing both New Orleans and the current delta to the south of the city.

All these natural processes and human modifications work in different combinations at different locations with a result that all of coastal Louisiana is not becoming open water at an equal pace. The few places where sediment is accreting and wetlands are slowly building are the exceptions, and encompass only a small fraction when compared to the sites that are losing land. In some areas, land loss has already been extensive and marshes and wetlands are already largely converted. According to the Corps' analysis, the areas with the greatest overall land loss are around the mouth of the Mississippi River, where most of the development that has modified the natural environment is concentrated, as are the physical processes associated with the draining river.

Scientists have a greatly improved understanding of the physical processes by which wetlands are converted into open water since they started studying them more than three decades ago. They understand how these causes combine to change the landscape of coastal wetlands in this area. They have determined, for example, that the effect of the loss varies. The narrow bands where the wetlands and the water environment intersect, called edge habitat, can be highly productive. Edge habitat temporarily increases as a marsh breaks apart, so populations that depend on this habitat temporarily increase as well. But as a fragmented marsh continues to be converted into open water, the amount of edge habitat available decreases and the populations that depend on that marsh and on the edge habitat eventually collapse.

**The Costs of Wetlands Loss.**<sup>11</sup> The losses of wetlands have costs both to the people and economic activity that depend directly on this area, and to broader ecosystems and enterprise more generally. These losses have already harmed some economic activities centered in this area, including fisheries, oil and gas industries, and facilities associated with ports and navigation more generally, and those effects are likely to grow unless industry makes additional investments to protect their facilities. Economic activity is substantial in this area; one measure of this is that investment in coastal Louisiana is estimated to total \$100 billion.<sup>12</sup> Oil and gas facilities include many production, storage, processing, and distribution facilities, and the area is bisected by numerous pipelines. Most of the nearly 3,000 miles of channels in the coastal wetlands, some for deep draft vessels and others for shallow

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<sup>11</sup> Unless otherwise noted, data in this subsection come from a 2003 report to Congress on the effectiveness of Breaux Act projects titled *Breaking New Ground in Louisiana*, prepared by the Louisiana Coastal Wetlands Conservation and Restoration Task Force, or from other sources that are summarized in this report.

<sup>12</sup> Background briefing paper prepared by committee staff for the House Transportation Committee's Subcommittee on Water Resources and Environment July 15, 2004, hearing on the Corps' proposals.

draft, are used by the oil and gas industry. More than 80% of the country's offshore oil and gas is produced off this coast, and 25% of the foreign and domestic oil used in this country comes ashore through coastal Louisiana.<sup>13</sup> In addition, part of the Strategic Petroleum Reserve is located in coastal Louisiana.

From an ecological perspective, these coastal wetlands are critical not only to full-time resident species, but also to much larger ecosystems. These wetlands provide wintering habitat for millions of waterfowl and other migratory species who use the Mississippi flyway; at least 20% of waterfowl in the country spend winters in this area. Also, these wetlands are the home to 11 endangered species and 13 threatened species recognized by the federal government. It should be no surprise, given the many ecological values to be found in this region, that it is the site of multiple federal designations, including 20 national wildlife refuges and one unit in the national park system, a national historic park and preserve. These federal lands total more than 192,000 acres. The loss of wetlands is reducing or compromising the natural values for which many of these sites were initially designated.

Coastal wetlands also support a large fishery by providing habitat and food. The commercial fishery is valued at \$343 million in landings. It is estimated that more than 25% of the seafood consumed in the country comes through Louisiana, and that more than 75% of the species (commercial and recreational) in the northern Gulf of Mexico spend a portion of their lifecycles in the wetlands of Louisiana. Another study estimates that commercial and recreational fisheries create more than 40,000 jobs and contribute more than \$3.5 billion to the state's economy. Estimates of the annual economic impact of recreational fishing to the state range between \$700 million and almost \$1 billion.

Other benefits that are being reduced include water quality and storm protection; for example, a 1989 study cited in *Breaking New Ground in Louisiana* estimated that the coast's 2.5 million acres of wetlands have annual storm protection values between \$520 million and \$2.2 billion. If large wetland areas are lost, the existing levee system will be more exposed to the erosive forces of storms. To reduce the risk created by these wetland losses, some levees may need to be "fortified" by adding stone or concrete to their surface to deflect these forces.

Advocates of restoration have developed scenarios of potential financial impacts should deterioration continue and a hurricane strike.<sup>14</sup> If pipelines or storage facilities are damaged, oil production could decline 625,000 barrels a day; if this were to last from three to five weeks, the cost to consumers because of higher prices for gasoline alone would be \$1.7 to \$2.9 billion. A second set of costs would result if the Mississippi River channel is closed to transportation because of storm damage or siltation. A one-week closure would cost \$50 million, while a two-week closure would cost an estimated \$200 million. A third set of costs could be incurred by commercial fisheries. Finally, in a worst-case situation with the loss of most current wetlands in the coastal area, 50% of the neotropical migratory bird population could

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<sup>13</sup> *Breaking New Ground in Louisiana*, p.8.

<sup>14</sup> All the forecasts of possible impacts come from the discussion of the future without the project in the Draft Corps Ecosystem Restoration Study, pp. MR52-MR 59.

be lost, with an economic loss to the state of \$84 million, and to the overall Mississippi and Central Flyways of \$2.45 billion per year.

Proponents of federal assistance see the losses that have already occurred and the much larger losses that might occur as national problems, deserving a strong response that would presumably include considerable federal funding and federal expertise. They may see the South Florida ecosystem restoration as a model of federal and state cooperation, where they share the costs and responsibilities (see box). Both are productive ecosystems, and have substantial ecological values reflected in large swaths of federally protected areas in units of the National Wildlife Refuge System. However, coastal Louisiana has not been viewed as a natural treasure and does not contain any federal designations that draw as much attention as the Everglades National Park. Rather, it appears to be viewed more as a working landscape that has a number of unusual attributes. This perspective about coastal Louisiana, however, has created a challenge for proponents of the restoration to demonstrate that the changes occurring in coastal Louisiana are or will become a national problem in need of significant federal involvement and financial assistance, rather than one that is primarily regional or local.

### **Comparing Large-Scale Restorations: Coastal Louisiana and South Florida**

Proponents of legislation to fund and support restoration in coastal Louisiana point to prior congressional action for South Florida. In 2000, Congress passed legislation providing \$7.8 billion for the restoration of South Florida as part of the Water Resources Development Act of 2000 (P.L. 106-541). South Florida and coastal Louisiana have many similarities; the project areas are of similar size, have similar total populations, similar proportions of public lands, and almost identical amounts of “critical” wetlands. Among the differences are that wetland conversion rates have been higher in Louisiana, where more coastal wetlands are being lost. In addition, Florida’s losses, which are mostly deterioration rather than conversion, are being caused by agricultural activities, urban development, and modification to the hydrologic system. Also, Louisiana is portrayed as a “working coast,” while South Florida is largely a protected landscape centered on the Everglades.

Current protection programs have important differences. Florida projects require a 50% nonfederal cost share while Louisiana projects currently require 15%. Total Florida spending is authorized at \$11 billion while total Louisiana funding is authorized at \$600 million. Under authorized efforts, Florida will restore or preserve 217,000 acres of wetlands, while Louisiana will restore or preserve about 142,000 wetland acres. Greater political success in “selling” the Florida program is attributed to (1) a meaningful process for gathering input and resolving disputes among stakeholders, and (2) building a shared commitment to address a central issue, providing municipal water supply benefits.

**Source:** R. H. Caffey and M. Schexnayder, *Coastal Louisiana and South Florida: A Comparative Wetland Inventory*. National Sea Grant Library (2003), 8 pp.

## **Prior Responses to Wetland Losses in Louisiana**

Managing the dynamic natural processes in south Louisiana has been a collage of piecemeal efforts. These efforts have involved individual projects or activities at specific sites to address identified problems or needs with little attention to implications for the greater landscape. Most projects have centered on large-scale construction to maintain or improve navigation, move water in more desired patterns,

or protect development from floods and ocean storms. Other activities have improved habitat.

Interest has been growing in looking at projects from a broader perspective, and the Corps has developed a set of proposals that continue that evolution to look at coastal Louisiana more as a system. Nonetheless, the projects that were considered for this set of proposals, and the smaller subset that have been put forth for funding, are presented by the Corps as being largely independent of each other. Earlier responses to resource deterioration in this part of Louisiana are reviewed in this section with emphasis on federal initiatives; the set of proposals that have been proposed by the Corps and are currently being reviewed by the public are discussed in the next section.

Federal and state efforts to address the coastal wetlands loss and related coastal management issues can be traced back to the early 1970s, when the rate, extent, and distribution of the coastal wetland loss problem was initially documented and publicized. Subsequent research was conducted to better document the sites and rates of loss, and to learn more about the causes. Later in the 1970s, the state developed a coastal management plan that was federally approved in 1978, making the state eligible for modest federal grants. This plan further addressed the wetland loss issue in the context of state and local planning and resource management.

**Act 6.** Louisiana enacted a wetland law known as Act 6 in 1989.<sup>15</sup> More correctly referred to as the Louisiana Coastal Wetlands Conservation, Restoration, and Management Act, Act 6 made the state's Department of Natural Resources (DNR) the lead agency to develop and implement coastal restoration projects. It requires the DNR to prepare and update annually a plan to guide spending on restoration projects. This plan was completed in 1994. In its capacity as lead agency, it received a one-time federal allocation of \$26.4 million from the Coastal Impact Assistance Fund in 2001 to fund a variety of state and local activities.<sup>16</sup> Act 6 also created a state Wetlands Conservation and Restoration Fund, which receives a portion of revenues from severance taxes on mineral production. This fund is used to finance approximately \$25 million in coastal restoration projects and activities.

**National Estuary Program.** The National Estuary Program (NEP), established in section 320 of Clean Water Act amendments enacted in 1987 (P.L. 100-4), provides federal funds and coordination for a portion of the Louisiana coast. Governors nominate sites, and EPA has accepted 28 into this program. After sites are accepted, EPA awards grants to develop comprehensive management plans to restore and protect estuaries that are threatened by pollution, development, or overuse.

Congress designated the Barateria Terrebonne site for priority consideration in 1988, and it was nominated in 1989 and admitted in 1990. It is bounded by the Mississippi River and Atchafalaya River, and is bisected by Bayou Lafourche. The

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<sup>15</sup> Louisiana R.S. 49: 213-214.

<sup>16</sup> This fund was authorized in Section 903 of the FY2001 Commerce, Justice, State, the Judiciary, and Related Agencies Appropriations Act (P.L. 106-553), and funded only that single year.

program for this site is operated under a comprehensive management plan adopted in the early 1990s. One goal of this plan is to preserve and restore wetlands and barrier islands. A 1993 conference identified more than 250 actions that might be initiated to achieve the program goals, many of which are being implemented.

**Breaux Act.** The federal government has been involved in major projects in south Louisiana for more than a century, mostly centered on navigation improvements or flood control. Federal involvement in the large-scale projects to restore coastal wetlands started with funding provided by the Breaux Act (P.L. 101-646, Title III), enacted in 1990. This act, formally called the Coastal Wetlands Planning, Protection, and Restoration Act, created a task force that consists of representatives from the state of Louisiana and five federal entities: the Corps, EPA, and the Departments of the Interior, Agriculture, and Commerce. This task force adopted a comprehensive wetland restoration plan in 1993 to guide its efforts. It adopts a priority project list each year, and projects are selected on their merits. However, the plan does not include any overall strategy to identify project priorities.

Each year, this task force allocates approximately \$50 million to implement the priority projects. A summary compiled by Corps staff in August 2003 showed that the Corps alone had spent more than \$208 million under the Breaux Act, with spending trending upward from year to year. The Corps has stated that it is spending about \$50 million annually to construct protection and restoration projects and \$5 million annually for project planning.<sup>17</sup>

Since 1990, 142 projects have been authorized, and Breaux Act funds have been used to initiate more than 120 of them. According to the draft Corps study, 61 projects have been completed. (The task force stated that 68 had been completed by November 2003.<sup>18</sup>) Most of the projects and about three-quarters of the spending have been in the central coastal area. These projects use four coastal restoration and protection techniques: planting vegetation, dedicated dredging, protecting shorelines, and diverting flowing waters. A benefit attributed to this program is that predictable funding from year to year has allowed the Corps and others to experiment with innovative restoration techniques, and to learn more about the positive and negative attributes of alternative methods. All projects are maintained and monitored for 20 years. These projects will create, restore, or protect approximately 71,000 acres in total (equal to between four and five years of losses at the current rate), and when all the 142 authorized projects are completed, the wetland benefits are projected to double to more than 140,000 acres.

**Prototype Diversions.** Two ongoing Corps projects to create marshes, the Caernarvon Diversion and the Davis Pond Diversion, are pointed to as possible prototypes for future restoration efforts. Construction at the Caernarvon Diversion, near the east bank of the Mississippi River and just below New Orleans, was completed in 1991, while the Davis Pond Diversion, along the west bank of the river and above New Orleans, was completed in 2002. After construction to permit and control the diversions was completed, fresh water (bearing sediment) is periodically

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<sup>17</sup> Draft Corps Ecosystem Restoration Study, p. MR-15.

<sup>18</sup> *Breaking New Ground in Louisiana*, cited above.

redirected from the river to improve wetland habitat and reduce salinity levels to create more brackish conditions. At Caernarvon, which has been operating far longer, marsh losses have been reversed, and habitat improvements center on higher fisheries production, especially of oysters, and expanded waterfowl use. Davis Pond has been operating for a much shorter time, with little information yet on what is being accomplished. Over the next 50 years, the Corps estimates that the Caernarvon Diversion will add 16,000 acres of wetlands and the Davis Pond Diversion will add almost 34,000 acres of wetlands.<sup>19</sup> (These gains will be equal to a little more than three years of losses at current rates.)

**Coast 2050.** In the next major federal-state initiative, an interagency group representing federal, state, and local interests and led by the Corps completed a long-range plan called *Coast 2050 — Toward a Sustainable Coastal Louisiana*, often referred to as *Coast 2050*, in 1998. This study looked at the land loss problem from a broader ecosystem perspective than earlier studies. It compiled available information about the problems and provided a comprehensive overview of all planning efforts to date. It subdivided coastal Louisiana into four subregions, based on hydrologic boundaries, a planning organization that has been retained with limited modified boundaries in the current Corps proposal (and is presented below with that proposal). For each subregion, general strategies and projects that could be implemented to attain those strategies were identified for three time periods: 1-5 years, 6-15 years, and 16-50 years.

The general strategic goals for each subregion respond to three goals related to desired natural processes. These goals, stated in scientific terms, were to (1) build up sediments on which wetlands can reestablish themselves; (2) maintain the transition between fresh and higher ocean salinity levels to achieve diversity; and (3) allow the hydrology of the area to operate as a system. The study report proposed 77 restoration strategies, many of them construction projects, to be implemented over the next 50 years. It estimated that implementing these strategies would cost a total of about \$14 billion and protect or restore almost 450,000 acres of wetlands. It concluded that if current efforts were to continue without expanding it, the “current program would address only 22% of the land loss problems.”<sup>20</sup>

## The Corps' Current Proposal

Shortly after the *Coast 2050* plan was completed, it became increasingly apparent to those federal agencies and state interests most directly involved in this effort that additional development of a systemwide restoration program as the basis for authorizing additional federal spending was needed. The Corps and the state initiated development of a comprehensive ecosystem restoration study in March 2000. The product of this effort, the *Louisiana Coastal Area (LCA) Ecosystem Restoration Study* issued by the Corps, is frequently referred to as the “near-term study” because it focused on actions that could be initiated over the next 10 years.

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<sup>19</sup> Draft Corps Ecosystem Restoration Study, pp. MR 43-44.

<sup>20</sup> Louisiana Coastal Wetlands Conservation and Restoration Task Force, *Coast 2050: Toward a Sustainable Coastal Louisiana*, p. 144.

An initial version of the draft was completed in October 2003, but was never officially released for general review. It was widely anticipated that the Corps would have recommended an option that included numerous projects ranging from small restorations to major diversions. Several alternatives reportedly ranged between \$4.3 billion and \$14.7 billion, with the likely preferred option costing about \$8 billion. It was widely reported in the press that the Administration, represented by the Office of Management and Budget (OMB), reviewed this draft and the cost estimates, then directed the Corps to reduce the estimated cost of this program.

The Corps released for public review its revised draft study, which responded to OMB's concerns, in July 2004. The projects it identified were combined in 15 different ways, then compared for meeting four "critical needs criteria:" (1) preventing future land loss; (2) restoring deltaic process; (3) restoring geomorphic structure (creating marshes and protecting the shoreline are examples provided); and (4) protecting vital community and socioeconomic resources. The Corps concluded that only one of these 15 combinations would meet all four criteria, and it was therefore identified as the preferred option. It estimated that implementing this option would cost slightly less than \$2 billion.

### Types of Restoration Projects

Restoration projects in a coastal wetland environment can take numerous forms, and they are referred to in many different ways. Types of projects include the following:

*Freshwater Diversions* channel water (and sediments and nutrients) into wetlands to slow saltwater intrusion and promote marsh expansion.

*Outfall Management* regulates freshwater diversion flows to ensure that water reaches the target areas most effectively.

*Sediment Diversions* are created by opening a levee so that water and sediment flow into nearby wetlands, replicating natural processes for building land.

*Dredged Material / Marsh Creation* places sediment at specified elevations in a deteriorating wetland to encourage revegetation.

*Shoreline Protection* includes all techniques used to diffuse wave energy at the beach or stabilize the shoreline.

*Sediment and Nutrient Trapping* includes techniques, usually used in dunes behind beaches, to accumulate sediment or slow water flow rates.

*Hydrologic Restoration* restores natural drainage patterns by altering past modifications, including levees, navigation channels, and dredged canals.

*Marsh Management* reestablishes vegetation and habitat by controlling water elevations and salinity in contained marsh areas.

*Barrier Island Restoration* stabilizes and better protects these islands through diverse methods such as planting vegetation and constructing breakwaters.

*Vegetation Planting* establishes flood and salt-tolerant marsh plants to stabilize soils.

**Source:** Adopted from Table 2 in *Breaking New Ground in Louisiana*, p. 20.

The Corps anticipates that it will complete a final version of this plan soon. The final plan, with the selected option, is intended to be the basis for subsequent congressional action to authorize appropriations, and where necessary, specific projects. One vehicle for such action might be the next iteration of a Water Resources Development Act (WRDA). A WRDA passed the House in 2003 (H.R. 2557); a separate WRDA bill was reported by the Senate Environment and Public Works Committee in August 2004 (S. 2773), but further action appears unlikely during the lame-duck session following the elections. An alternative vehicle in the Senate might be FY2005 appropriations legislation to fund the activities of the

involved agencies. A more detailed description of considerations by the 108<sup>th</sup> Congress is presented below.

**Dividing Up the Coast.** The Corps analysis of the proposed projects is subdivided among four regions, similar to the earlier *Coast 2050* report. The four regions, termed subprovinces by the Corps, are outlined in **Figure 1** on the top of the next page.<sup>21</sup> **Figure 2** on the bottom shows major roads, larger communities, and physical features in coastal Louisiana. The Corps considered each subprovince independent of the others, so there is no analysis of how projects in one subprovince might affect the natural resources or physical processes in the adjoining subprovinces. The physical landscapes in subprovinces 1 through 3 are similar to each other in many ways, as they encompass present or past Mississippi River deltas, and are called the Deltaic Plain. Subprovince 4 is different, with more upland and freshwater wetland acreage and less open water, and is called the Chenier Plain.<sup>22</sup> The subprovinces are as follows:

- **Subprovince 1** is bounded by the Pearl River along the Mississippi state boundary to the east and the Mississippi River channel along most of the west. It includes the city of New Orleans, Lake Pontchartrain, and Breton Sound.
- **Subprovince 2** is bounded by the Mississippi River along most of the east and Bayou Lafourche along most of the west. It is protected from the Gulf by a string of coastal barriers. Larger communities include Gretna (adjacent to New Orleans), Grand Isle, and Port Fourchon (at the mouth of Bayou Lafourche).
- **Subprovince 3** is bounded on the east by Bayou Lafourche and on the west by Freshwater Bayou. The Atchafalaya River drains through the center of this subprovince near Morgan City. The other large community is Houma.
- **Subprovince 4** lies between Freshwater Bayou and the Sabine River along the Texas state line. It is being called the Chenier Plain because the cheniers provide much more pronounced boundaries between coastal salt marshes on the ocean side and freshwater marshes and lakes inland. Cameron is a large town in this subprovince.

Each subprovince has distinct physical characteristics and a different array of problems to be addressed. Subprovince 1 has already suffered extensive land loss. The rate of loss is expected to decrease in the future as the remaining area dwindles and there will be much less to lose. Subprovince 2 is currently losing the greatest number of acres, and the rate is projected to remain high. Subprovince 3 is accreting in portions of the Atchafalaya basin, and is losing less land than subprovince 2. In Subprovince 4, erosion continues along the edges of marshes and lakes, but overall land loss is projected to be far slower here than in the other three subprovinces.

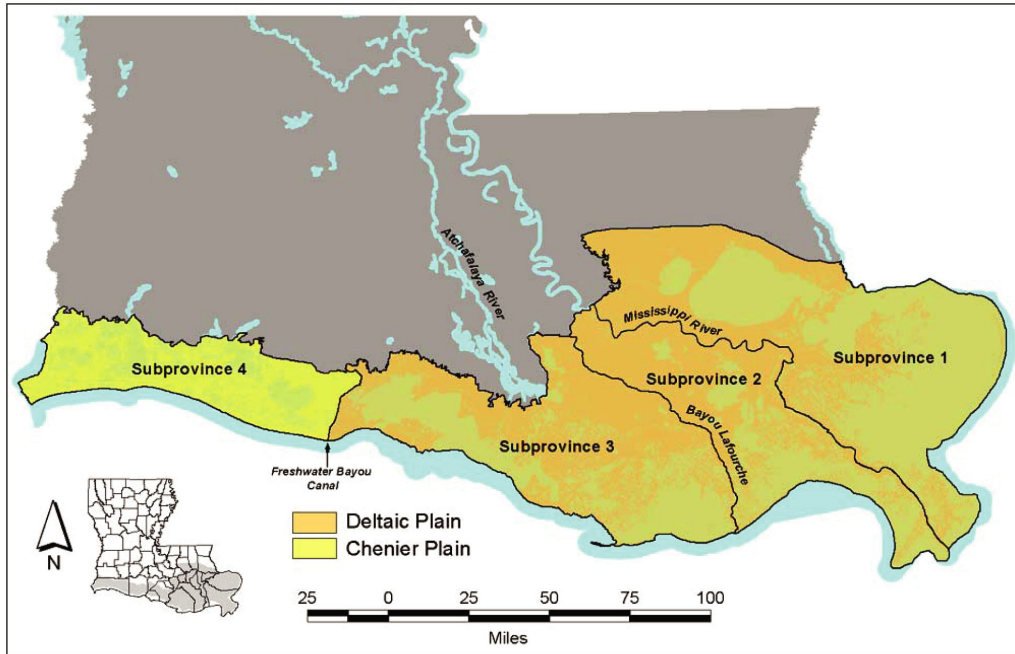
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<sup>21</sup> The upland boundary of the study area generally follows the line drawn by the state to delineate its coastal zone, which is one of the requirements for participating in the federal Coastal Zone Management Program.

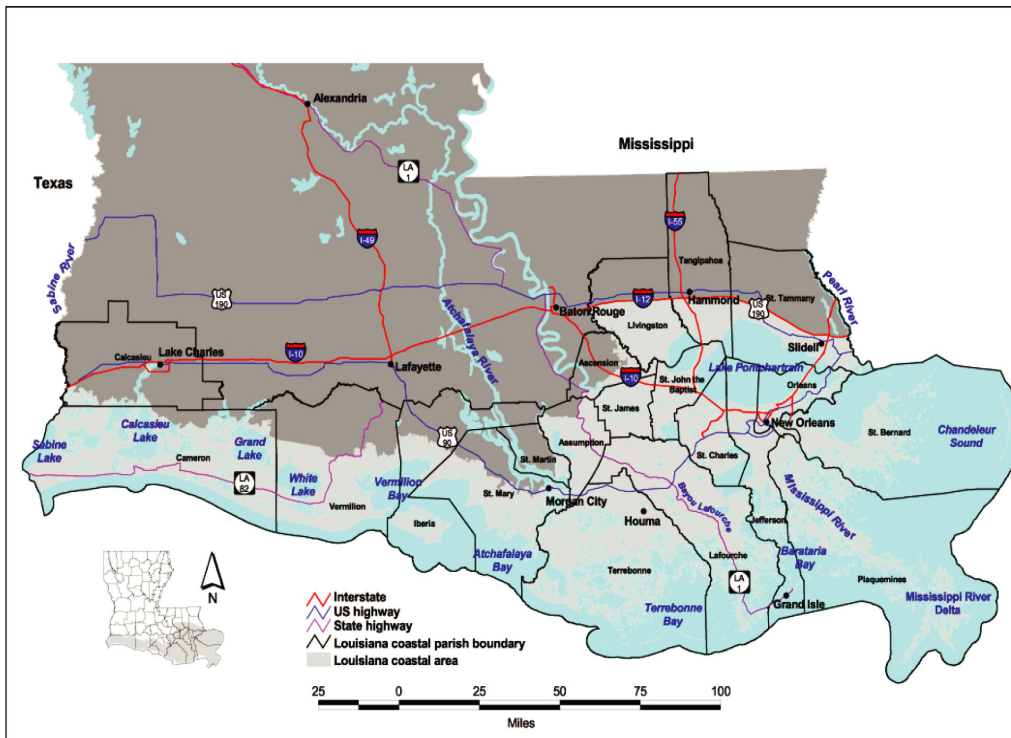
<sup>22</sup> A chenier is an elevated ridge running parallel to the shoreline vegetated with live oaks and other deciduous plants and trees.



**Figure 1. Louisiana Coastal Area Study Area and Subregion Boundaries**



**Figure 2. Major Cultural and Physical Features in Southern Louisiana**



Source: Draft Corps Ecosystem Restoration Study, p. MR-6.

**The Proposed Plan.** The proposals in this draft, shown in **Figure 3**, would cost an estimated total of \$1.96 billion to implement over the next 10 years. It is thought that authorizing legislation would require the federal government to pay 65% of the total, based on legislation authorizing other large-scale restoration projects, although some in the state believe that the federal share should be greater since past federal navigation and flood control projects have been so central to the wetland losses. The state has several possible sources to fund its share.

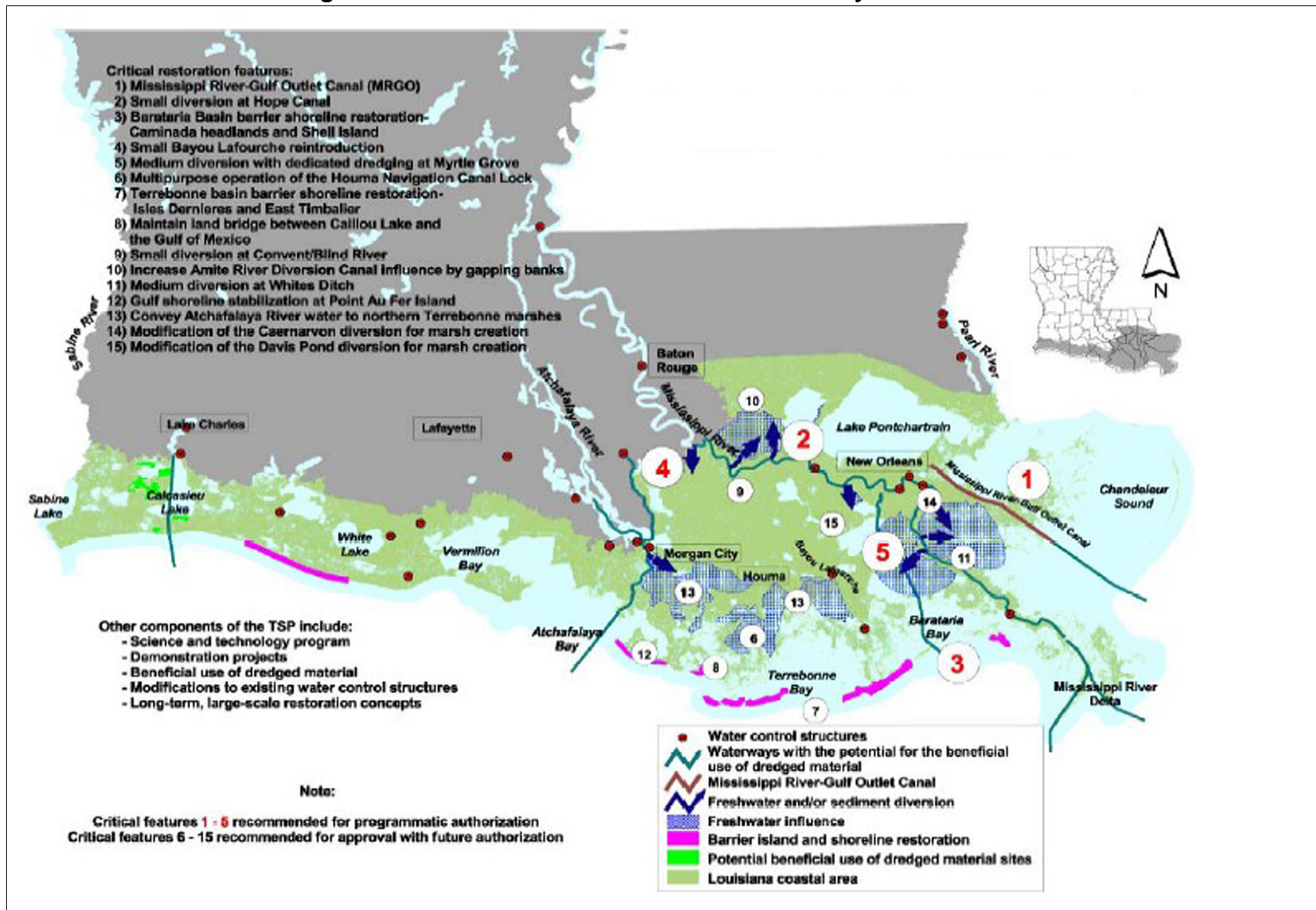
Elements of the draft plan for which the Corps would seek authorization are:<sup>23</sup>

- Implementing five “features”: (1) the Mississippi River Gulf Outlet ecological restoration, which includes constructing breakwaters along several lengths of shoreline; (2) Hope Canal small diversion to place between 1,000 and 2,000 cubic feet of water per second into the Maurepas Swamp; (3) barrier island restoration along 14.5 miles of shoreline in the Barataria Basin; (4) small Bayou Lafourche reintroduction of up to 1,000 cubic feet of water per second; and (5) medium Myrtle Grove reintroduction by depositing dredged sediment and diverting up to 15,000 cubic feet of water per second into Barataria Bay. These features are estimated to cost \$786 million; preliminary engineering has already been initiated on four of them.
- Developing a better understanding of the south Louisiana coastal ecosystem and the effectiveness of the restoration effort by acquiring additional data, monitoring projects, and modeling the behavior of elements of the ecosystem, at a total cost of \$100 million.
- Constructing five demonstration projects (creating wetlands, conveying sediments by pipeline, restoring pipeline canals, protecting shorelines from further erosion, and protecting the Terrebonne barrier islands) to test methods and try to resolve scientific or engineering uncertainties, at an estimated cost of \$175 million.
- Taking sediment from proximate navigational dredging projects to create approximately 21,000 acres of wetlands, at an estimated cost of \$100 million.
- Modifying existing structures to assist in the restoration, at an estimated cost of \$10 million.
- Initiating 10 additional restoration “features” within the next 10 years, including: (1) multipurpose operation of Houma Navigation and Canal lock; (2) shoreline restoration at East Timbarlier and Isle Dernieres; (3) maintenance of the land bridge between Caillou Lake and the Gulf; (4-6) freshwater diversion along the Blind River, the Amite River, and at White’s Ditch; (7) shoreline stabilization at Pointe Au Fer Island; (8) conveying water from the Atchafalaya River to the northern Terrebonne marshes; and (9-10) additional marsh creation at Caernarvon and Davis Pond. These features are estimated to cost a total of \$730 million.
- Assessing six promising large-scale restoration concepts identified as this plan was being prepared, at a cost of \$60 million.

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<sup>23</sup> Summaries of the proposals have appeared in several places. This list is adapted from a background paper prepared by the staff of the House Transportation and Infrastructure’s Committee’s Subcommittee on Water Resources and Environment prior to the July 15, 2004 hearing on this topic.

Figure 3. Restoration Features in the Tentatively Selected Plan



Source: Draft Corps Ecosystem Restoration Study, p. MR-156. (Undated corrected copy)

This set of proposals is drawn from a much larger list of 166 possible restoration features that are identified in the plan. This larger list of possible features is not distributed equally among the four subprovinces. Of this total, 37% are in subprovince 1, 33% are in subprovince 2, 16% are in subprovince 3, and 14% are in subprovince 4. The differences in both the physical environment and rates of loss are reflected in the frequency and type of restoration features that the Corps identified in each subprovince. Features in subprovinces 1 and 2 emphasize freshwater diversions and sediment diversions to rebuild marshlands. The most common feature in subprovince 3 is hydrologic modification or restoration, while in subprovince 4, it is salinity control.<sup>24</sup>

While most of the features deal directly with wetland restorations, stabilizing and rebuilding coastal barrier islands also will be critical to the success of this program since they protect wetlands, marshes, and lagoons from the full force of tidal action and ocean storms. In addition, by keeping out ocean waters, they maintain the current balance between salt and fresh waters in the marshes. The salinity level of the water is a major factor in determining which plant and animal communities will thrive. Extensive surveys have been conducted to locate sand reservoirs that could be mined to rebuild coastal barriers. Sand of the necessary texture may not be very common in a geologic environment like the Mississippi River delta, where most of the materials are much finer. Sand is expensive to transport because of the bulk, and is uncommon in the necessary concentrations within the Mississippi River delta. The USGS has identified 14 potential sand reservoirs offshore that contain about the estimated volume that will be needed and concentrations and depths that are economically feasible based on criteria developed by the Corps.<sup>25</sup>

**The National Academy of Sciences Study.** In addition to the Corps efforts that has culminated in the restoration plan, the National Academy of Engineering, National Academy of Sciences, is conducting a study, begun in late 2002, to explore four broad questions associated with the draft restoration plan:

- Are the strategies based on sound analysis, appropriate for the plan goals, and an adequate list;
- Are implementation priorities appropriate, and can they be phased in;
- What major questions need to be answered to implement the plan, and how can these needs be met; and
- Given the high cost of the plan, what are its potential benefits to the national economy and national interest?

The Academy has not released any product from this study. Some believe that implementation of any plan should be delayed until the Academy and others have fully examined these four questions, because of the uncertainty raised by not having complete answers. Calls for delay are countered by others who live in, work in, or represent coastal Louisiana and fear that inaction will result in even greater losses.

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<sup>24</sup> The size or magnitude of features vary greatly, so comparing the number of features in each subprovince is not necessarily a good comparison of the relative level of effort.

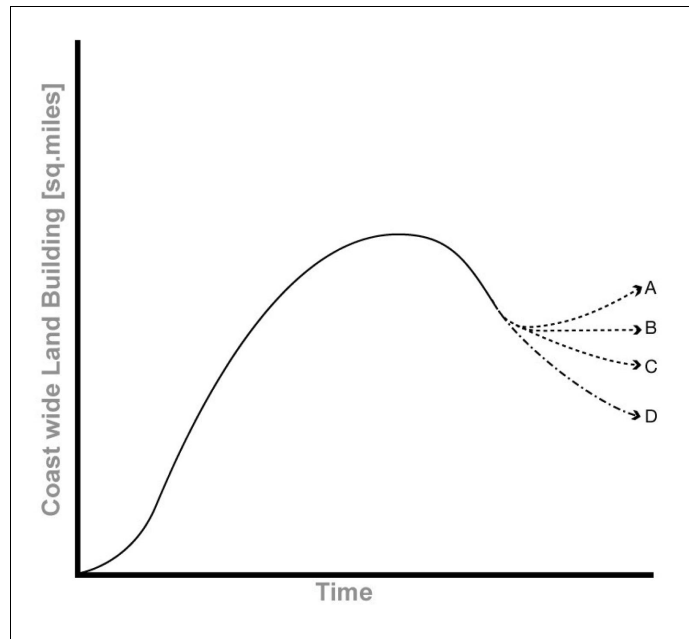
<sup>25</sup> U.S. Department of the Interior, Geological Survey, *Identifying Offshore Sand Resources to Restore Louisiana's Barrier Shoreline* (draft) (St. Petersburg, FL: Jan., 2004), 4 pp.

## Defining Success

Change in the rate of land loss, which will likely be based on a comparison of the overall number of wetland acres in coastal Louisiana at different times, will be used by the Corps and others to measure the accomplishments of the restoration effort. This accounting will probably compare wetland losses and gains over spans of time with baseline forecasts of losses and gains if no restoration program existed. These differences, including its magnitude and the location of the changes, may then be used to assess changes in other ecosystem variables, such as overall productivity, plant or animal populations of interest, or socioeconomic changes.

Charts that show changing rates of loss in the past and predictions for the future have been staples of recent analyses of changes. An example of such charts, from the recent Corps analysis, is reproduced in **Figure 4**. The Corps calls this figure “conceptual outcomes for restoration.” The past is shown by the solid line; the future by the four dashed lines. The figure shows, without providing any dates or scale, that land was being added from year to year until the apex of the curve, which probably equates with some time in the early or mid 20<sup>th</sup> century. The rate of loss more recently would likely slow in the future, even if no remedial actions are initiated (D). Various restoration proposals could slow the rate of loss further (C), stabilize the total amount of land at about the current level (B), or increase the land area, resulting in a net gain (A).

**Figure 4. Wetland (or Ecosystem) Trends Over Time**



**Source:** Corps Ecosystem Restoration Study, p. MR-77.

Most of the Corps’ charts and the accompanying analyses measure total acres of all wetlands. Such measures, while easy to grasp, may be insufficient for at least two reasons. First, not all wetlands provide the same values. Wetland scientists and others recognize many distinct types in coastal Louisiana; the Corps recognized five in its description of the restoration study area.<sup>26</sup> These different types occur in response to variations in salinity levels, the height of the water table, and other physical factors. Some types are more common than others, but these more common

<sup>26</sup> The five types, as shown in a table on page MR-43, are fresh marsh, intermediate marsh, brackish marsh, saline marsh, and swamp.

ones may not have always been so, and may not provide the desired or most concentrated benefits. Also, the types that are easier to create or restore may not be the types that provide the desired ecological benefits. Second, location in coastal Louisiana is critical to defining the benefits that each wetland provides. Wetlands that have virtually identical physical properties may provide different values because of where they are located and the functions they serve in a broader environmental or ecosystem context.

A more sophisticated assessment of coastal Louisiana restoration would measure wetland losses and gains for each major type of wetland. Such an assessment could provide more information on the condition of the remaining wetlands, and of the wetlands that would be created by each of the proposed projects. The Corps analysis has statistics by subprovince, on current conditions and past net loss. It also has projections, by percentage for each of the five wetland types in each subprovince comparing conditions today with conditions in 50 years, assuming that no additional projects are initiated and ones currently underway are completed. These projections show, not surprisingly, that the percentage of open water area would grow in all four subprovinces at the expense of different types of wetlands, with saline marsh probably suffering the greatest decline. The Corps analysis does not compile the number of wetland acres that would be added or other benefits that would accrue if the tentatively selected plan were implemented.

The Corps and others who support a restoration effort have tied success to an aggregate wetlands in the coastal Louisiana landscape, and not to either a specific wetland area beyond the four subprovinces or a specific type of wetland. The restoration area actually is composed of numerous smaller water basins that are largely independent of each other. Therefore, there is considerable flexibility in where projects can be undertaken and what they must accomplish to slow and eventually reverse the rate of loss. In this setting, the proposed program includes eight elements that will work in concert. Three elements involving more than half the proposed projects would introduce river water or deposit sediment into areas where the sediment can build up to an elevation where wetland vegetation gradually is reintroduced. The water introductions will help keep salinity at desired levels. Other elements will deal with the stabilization and restoration of barrier islands and beaches to protect the wetlands from the forces of the ocean, and with alterations to the current channelization of the river. All these changes will protect the remaining wetlands as well as expand wetlands. As these projects are put in place, the definition of success may well evolve to reflect accomplishments and changing perceptions of priorities for the restoration effort.

It will take many years to reverse the current trend of loss, even if these efforts are successful. If no action is taken, the rate of land loss is forecast to decline but continue in the future. This decline would not necessarily reflect improved conditions, but rather that the amount of past loss has left much less wetland to be converted. One expert has stated, "Rather than indicating that the problem is less severe, the declining rate of loss shows us how much damage we've suffered

already.”<sup>27</sup> It is also estimated that restoration projects that are already approved could reduce future losses by up to 25%, but even with this slowing of the process, USGS has forecast that the coastal Louisiana could lose as much as an additional 448,000 acres of wetlands by 2050.<sup>28</sup>

## **Ecosystem Restoration: A Context for Considering the Coastal Louisiana Effort**

The coastal Louisiana restoration is one of several federal programs proposed or initiated to restore ecosystems and improve environmental conditions over large geographic areas.<sup>29</sup> While these programs are in diverse settings, have diverse goals, and include many different types of construction and resource management activities, they have a number of common elements. One common element is that each of these efforts is presented as a national, rather than regional or local, issue that justifies significant federal financial and technical involvement in the restoration. Some other common elements are:

- working in a coordinated manner with many public and private participants over a large area;
- understanding complicated science, and focusing on interrelated physical and biological parts (and how they work together) rather than specific components (such as a single species of plant or animal);
- altering the results of earlier federal programs and projects that contributed to creating conditions that are now viewed as needing to be remedied;
- maintaining and improving benefits in ecological components;
- creating self-sustaining systems that minimize the need for additional intervention in the future;
- using the flexibility of an adaptive management approach;
- developing extended partnerships and widespread support for the effort; and
- involving multiple federal agencies and federal programs.

Coastal Louisiana restoration has several additional features in common with many other large-scale efforts. For example, almost all of them have been centered on water. They usually attempt to improve water quality, improve hydrology (surface and subsurface flow patterns), or provide other water-related benefits, such as more productive habitat in coastal areas and estuaries, in watersheds, or in the marine environment. Examples of other water-centered projects to which the label of ecosystem restoration has been applied are occurring in the Florida Everglades, the

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<sup>27</sup> Rex Caffey, professor at Louisiana State University, Agricultural Center and Louisiana Sea Grant, statement, *Water Marks*, no. 24 (New Orleans District, U.S. Army Corps of Engineers, Jan. 2004), p. 6.

<sup>28</sup> James Johnson and Sijan Sapkota, *Highlight: Coastal Louisiana: America's Vanishing Wetlands and Potential Societal Catastrophe*, prepared for EPA's Second National Coastal Condition Report, scheduled for publication 2004. No date, no pagination.

<sup>29</sup> It is important to note that a federal role is not required for ecosystem restorations, although the scale and scope of the most prominent of these efforts mean that it will almost always be the case.

Chesapeake Bay watershed, and the Pacific Northwest (for salmon recovery). Others are being planned or proposed, such as in the Upper Mississippi River, the California Bay-Delta, and the Great Lakes. Supporters of these other projects are likely to press just as hard for federal funds and support.

From the federal and congressional perspective, these restoration initiatives can be divided into two broad groups. One group of programs has large engineering components, and includes expensive construction projects. In this group, exemplified by the Florida Everglades restoration, construction-based programs usually are attempting to alter the hydrology to provide additional environmental improvements while maintaining existing flood control and navigation benefits. Where large engineering components are at the center of the restoration, the lead federal agency will be one with a strong construction mission, such as the Corps or the Bureau of Reclamation (BuRec).

In the second group, construction is less important or not a part of the program. In this group, exemplified by the Chesapeake Bay Program, the overall restoration budgets tend to be smaller and are spread among more participants, with a greater emphasis on broad partnerships. In these programs, providing financial and other incentives to modify landowner behavior through activities such as installing best management practices to limit water pollution are often more central to providing additional environmental benefits. In this group, other federal agencies, such as the Environmental Protection Agency (EPA), the National Oceanic and Atmospheric Administration, or the Fish and Wildlife Service, may lead the program.

Congressional endorsement in the forms of authorizations and appropriations are central to initiating and supporting large scale restorations with significant federal involvement, especially when they include expensive construction components. For efforts that are not centered on construction, many activities may be done under existing authorities and through established programs. For example, in Chesapeake Bay, only the EPA has specific authorizing legislation under which it coordinates the program. Many other federal agencies, such as the Natural Resources Conservation Service in the Department of Agriculture, support the Chesapeake Bay effort by providing additional staff and additional funding under existing programs in the bay watershed to carry out their missions under existing authorities. In seeking congressional support, proponents try to build a substantial record of endorsements and justifications through the hearing process. Such an effort is currently underway on behalf of the coastal Louisiana restoration.

The federal government is rarely the sole participant. These efforts involve partnerships with state and local government, who provide financial resources and local perspectives, and with other parties, including university researchers in and near the project area and businesses and industry who may be affected by the effort. In the Chesapeake Bay Program, many individual interests, which number in the hundreds, work through coordinating groups that provide forums for communication and deliberation. The Chesapeake Bay Alliance, a private group that receives funds from EPA, performs this function, and appears to have been important to the overall program. The Chesapeake Bay Foundation performs a similar function representing the environmental community, and is the most visible and prominent voice for the environmental perspective.



Success has been defined in many different ways in these efforts. The Chesapeake Bay Program, which has been operating for more than 25 years, has adjusted its goals against which success could be measured several times by agreement among the major participants. The Chesapeake Bay Foundation recently questioned whether the Bay Program has overstated its accomplishments, according to press reports. Three Senators from bay states sought an assessment of the accuracy of this claim when they requested that the Government Accountability Office (GAO) investigate the overall progress, how progress is measured, and the effectiveness of efforts to ensure that the proper measures are being used. It may be that the same trio of topics could usefully be explored about wetland restoration in coastal Louisiana or any of the other large scale restorations. The Chesapeake Bay Program experience does suggest that clear goals should be articulated early on, measures should be established to determine the degree to which those goals are being attained, and goals should be periodically reviewed and adjusted.

## **Congressional Considerations**

The 108<sup>th</sup> Congress has given time both to gaining a fuller understanding of the problems of coastal Louisiana and exploring options for a federal role in any solutions. Several House and Senate committees have held hearings. In the most recent hearing, the House Transportation and Infrastructure Committee's Subcommittee on Water Resources and Environment received testimony on the Corps' recently released draft ecosystem restoration study on July 15, 2004. In this and other hearings on this restoration, almost all witnesses have endorsed the overall goal of restoration and a strong federal role in working toward that goal. Some areas of disagreement have emerged as more specific subjects are being discussed in these hearings, as well as in public meetings in Louisiana, including specific project priorities; levels of effort and the size of the federal and state expenditures; how costs should be shared between the federal government and project beneficiaries; and relationships between the federal community and state and local interests.

Proponents have been trying to authorize actions that would support the restoration through Water Resources Development legislation, which authorizes Corps of Engineers projects. In the House version of this legislation (H.R. 2557, which passed the House on September 24, 2003), §5058 would establish a ten-member task force of federal and state entities to develop a comprehensive protection and restoration plan and programmatic environmental impact statement for the coastal Louisiana ecosystem. The task force would report on its activities to the House Transportation and Infrastructure Committee and the Senate Environment and Public Works Committee. The task force would coordinate ongoing activities. The federal government and the state would share equally the costs of this planning activity.

The Senate version of this legislation (S. 2773, which is a substitute bill prepared after the Senate Committee on Environment and Public Works had ordered the bill to be reported on June 23, 2004) has numerous coastal Louisiana provisions in §3421. It would establish a nine-member task force (eight federal officials and one state official) to make recommendations to the Secretary of the Army about all efforts to protect and restore the coastal Louisiana ecosystem. It would submit a biennial report to Congress summarizing its activities. In addition, the Secretary would

develop a comprehensive plan to protect and restore the south Louisiana ecosystem and submit it to Congress by July 1, 2008.

This bill also has provisions authorizing feasibility studies and specific activities. The Secretary would review authorized federal water resource projects in coastal Louisiana for their compatibility with the restoration effort. The bill also would authorize a science and technology program, with total appropriations of \$50 million, to provide a forum for experts to interact with the restoration program and make recommendations. In addition, \$85 million would be authorized for demonstration projects. All demonstration projects would be approved by the Secretary. Other provisions would authorize \$140 million for the Bayou Lafourche sediment reintroduction project and \$50 million for a program to use dredge spoil in a beneficial manner. All projects implemented under this section would have a 35% nonfederal cost share, and operation and maintenance for all projects would be the responsibility of the nonfederal interest. The Secretary would ensure that nonfederal interests provide their proportionate share. If the Secretary determines that an activity would be justified based on predicted environmental benefits and would be cost effective, no further economic justification would be required.

In addition to legislation that is specific to south Louisiana, Congress has been considering other proposals since the 105<sup>th</sup> Congress that would provide a portion of federal offshore oil and gas revenues to the state that could be used for restoration. These proposals (H.R. 4100 and S. 2590 in the 108<sup>th</sup> Congress) would dedicate amounts annually to specified federal natural resource programs and grants to states. A major portion of these funds would be used to set up coastal impact assistance programs to offset local and state costs associated with offshore oil and gas activities, with most money going to the six states adjacent to federal waters where these activities are occurring. Most of the proposals in prior Congresses would have provided approximately \$3 billion a year; the proposals in the 108<sup>th</sup> Congress would provide smaller amounts. Under all the proposals that have received consideration, Louisiana would have received more money than any other state, largely because of the large scale of the offshore development and onshore support. This legislation came closest to being enacted in the second session of the 106<sup>th</sup> Congress, when the House passed a bill (H.R. 701) and the Senate Energy Committee reported an amended version of that bill.<sup>30</sup>

## Concluding Observations

As conclusion of the 108<sup>th</sup> Congress nears, it seems highly probably that it will not act on any coastal Louisiana restoration legislation. Meanwhile, the Corps anticipates that it will complete a final set of recommended elements soon that would likely be the basis for further congressional deliberations in the 109<sup>th</sup> Congress. Whether coastal restoration legislation in the 109<sup>th</sup> Congress would be similar to the bills that were introduced in this Congress is unclear. Many questions may be addressed in such legislation, including:

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<sup>30</sup> For more information, see CRS Report RL30444, *Conservation and Reinvestment Act (CARA) (H.R. 701) and a Related Initiative in the 106<sup>th</sup> Congress*.

- how quickly should losses end and how rapidly should wetlands be restored;
- where along the Louisiana coast should restorations be concentrated;
- which restoration elements are authorized; and
- what portion of the total cost would the state be required to pay?

Also, any potential appropriations to implement coastal Louisiana restoration legislation may have to compete for funding with restorations in other places such as the Great Lakes; these debates could be particularly contentious in light of the anticipated budget deficit. In the meantime, Louisiana will likely continue to lose wetlands and the Corps will likely continue to design and implement some restoration projects.