



# Coastal Louisiana Ecosystem Restoration After Hurricanes Katrina and Rita

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## Summary

Prior to Hurricanes Katrina and Rita, the U.S. Army Corps of Engineers had been seeking congressional approval for a \$1.1 billion program both to construct five projects that would help restore specified sites in the coastal wetland ecosystem in Louisiana, and to continue planning several other related projects. The state of Louisiana and several federal agencies participated in the development of this program. This report introduces the program and more extensive restoration options that are being discussed in the wake of the hurricanes. It also discusses whether this program, if completed, might have muted the impacts of the hurricanes. Congressional consideration are being informed by new information about the extent of coastal wetland change that resulted from the hurricanes and further changes since the hurricanes struck. This report will be updated.

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## Introduction

The widespread destruction caused by Hurricanes Katrina and Rita altered the 109<sup>th</sup> Congress's perspective on coastal Louisiana restoration as it considered provisions in legislation (e.g., S. 728 and H.R. 2864) that would have authorized the U.S. Army Corps of Engineers (Corps) to implement activities to slow the rate of coastal wetlands loss. Both bills, developed before the hurricanes struck, would have authorized funding to implement a program that the Corps had recommended in a November 2004 feasibility report, including \$1.1 billion for activities to be initiated immediately, and \$0.9 billion for future work. Since the hurricanes, more expansive options, costing up to \$14 billion and requiring up to three decades before they are fully implemented, are also being considered. As no restoration legislation was enacted in the 109<sup>th</sup> Congress, the 110<sup>th</sup> Congress is again addressing this issue in Water Resources Development Act (WRDA) legislation that has passed both chambers (H.R. 1495) and was sent to the White House on October 23, 2007. The Administration has indicated that it intends to veto the bill.

Of the initial \$1.1 billion in the proposal Congress was considering when the hurricanes struck, \$828 million was to complete planning and construct five projects, called "near-term features." The remainder of this initial authorization would have been spent on monitoring program performance; building small demonstration projects (a maximum cost of \$25 million per project); exploring options to use dredged materials to create wetlands; and continued planning of 10 additional projects that would have had to be authorized at a future date. Finally, additional funding would have been provided to study six less defined possible program elements for the future, termed "large-scale, long-term coastal restoration concepts." H.R. 2864 had been approved by the House on July 25, 2005, while S. 728 had been reported by the Senate Environment and Public Works Committee on April 26, 2005.

After the hurricanes struck, Congress provided \$96 million in FY2006 Defense appropriations (P.L. 106-148) for activities to reduce threats to New Orleans by improving coastal wetlands, leaving open the potential for a wide range of legislative actions in the future. The projects and most other major elements of these proposals can be found in the current version of H.R. 1495, which has been sent to the White House. (For more information on the proposed Corps program, see CRS Report RS22110, *Coastal Louisiana Ecosystem Restoration: The Recommended Corps Plan*, by (name redacted); for information on authorizing legislation, see CRS Report RL33504, *Water Resources Development Act (WRDA) of 2007: Corps of Engineers Project Authorization Issues*, coordinated by (name redacted).)

The National Research Council was asked to review the Corps' recommended plan. It recognized that these hurricanes, which struck after the report was largely completed, will likely lead to reconsideration of some plan components. It concluded that while most of the individual projects are sound, they are not a comprehensive response to wetlands loss. It calls for the development of a detailed map showing the desired landscape of coastal Louisiana that would serve as the basis for selecting future actions. The lack of synergy among projects in this plan contrasts with another Corps large-scale ecosystem construction and restoration program in the south Florida Everglades, where success depends on completing all the interrelated program components.<sup>1</sup>

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<sup>1</sup> The full report, titled *Drawing Louisiana's New Map: Addressing Land Loss in Coastal Louisiana*, can be downloaded at <http://www.fermat.nap.edu/catalog/11476.html>.

## Background

The Corps recommendations for projects to restore some wetlands and slow wetland losses in November 2004 is the most recent of many such proposals offered over the past four decades, shortly after the rapid rate of coastal wetlands loss was first documented. It is now estimated that more than 1.2 million acres of wetlands, an area approximately the size of Delaware, has been converted to open water since the 1930s. The remaining wetlands cover about 3.5 million acres, an area slightly larger than Connecticut. The U.S. Geological Survey estimated, before the hurricanes, that an additional 448,000 acres could be lost by 2050 if no additional restoration projects are initiated. If the Corps' program is implemented, it estimated that net wetland losses would be reduced to 170,000 acres by 2050. These estimates do not appear to account for major but unpredictable hurricane events.

These losses have been caused by a combination of human activities and natural factors that have been documented in many reports by the Corps and others. Proposals to respond to these losses have centered on rebuilding the region's coastal wetlands in ways that could reduce the ecological, economic, and social costs. One cost receiving far more attention today is the role that wetlands can play in absorbing storm surges and thereby decreasing flood elevations and muting the force of wave energy.

The Corps' current recommended program includes projects centered in the wetlands south and southwest of New Orleans. No projects are in the western portion of state where Rita struck, and few are east of New Orleans, where Katrina's damage to coastal development and the environment was most concentrated. In the Corps analysis of the selected set of options and the alternative proposals included in the November 2004 final report, there is almost no mention of hurricanes, nor an analysis comparing how these proposals might mitigate the effects of a major hurricane. The District Engineer for New Orleans did not mention hurricanes when he made his recommendations, stating: "I am convinced that the LCA [Louisiana Coastal Area] Plan would begin to reverse the current trend of degradation of Louisiana's coastal ecosystem, support Nationally significant living resources, provide a sustainable and diverse array of fish and wildlife habitats, reduce nitrogen delivery to offshore gulf waters, provide infrastructure protection, and make progress towards a more sustainable ecosystem."<sup>2</sup>

While Congress has not yet authorized any restoration program, two prototype restoration projects—Davis Pond and Caernarvon Diversions (opened in 2005 and 1991, respectively)—had been initiated under existing authorities. The primary purpose of both diversions is to introduce fresh water (bearing sediment) into the wetland areas, and thereby reduce the salinity. Both restorations are located in the greater New Orleans area along the main channel of the Mississippi River. River water is periodically introduced into these sites, which are large receptacle areas bounded by low levees. As the water sinks into the ground or evaporates, it leaves sediments and raises land elevation, which, in turn, provides an environment in which wetland habitat can be reestablished. These two diversions are planned to add about 50,000 acres of wetlands over 50 years.

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<sup>2</sup> U.S. Army Corps of Engineers, *Louisiana Coastal Area (LCA) Ecosystem Restoration Study*, Final Report, New Orleans, November 2004, p. MR 6-1.

## **Effects of Recent Hurricanes on Restoration Planning**

In the wake of the 2005 hurricane season, some supporters of restoration, especially from within the state, are calling for a more substantial program than in the current legislation. Supporters emphasize that the hurricanes caused nationally significant disruptions, especially to energy supplies and bulk transportation, and therefore the restoration would have significant national benefits. They are seeking consideration of a \$14 billion restoration effort that had been laid out in the *Coast 2050* Plan, released in 1998. This Corps-led planning effort resulted in recommendations for 77 “restoration strategies” to be completed over 50 years. The strategies would be distributed along the entire length of the Louisiana’s coastal area, but concentrated in the central coast south and southwest of New Orleans. The anticipated result from fully implementing these strategies would be to protect or restore almost 450,000 acres of wetlands.

Congress has not considered legislation authorizing the *Coast 2050* Plan. Instead, in 2000, the Corps and the state began to develop a more modest set of proposals for projects that could be initiated over a 10-year time period. A draft, completed in October 2003 included several options with estimated costs that ranged between \$4.3 billion and \$14.7 billion. However, the Administration’s Office of Management and Budget directed the Corps to come up with a less costly package of proposals in late 2003; that package is what Congress was considering when the hurricanes struck.

## **Effects of Recent Hurricanes on Coastal Louisiana**

Documenting the full effect of the 2005 hurricane season on coastal Louisiana will be a long process. Coastal Louisiana is an extremely flat and dynamic physical environment where major storm events can greatly alter the surface features, especially wetlands, beaches, and barrier islands. Some portion of the losses caused by both storms were only temporary, as wetland vegetation was flattened by storm surge and strong wind, and coastal beach sand and sediment was redistributed by these same forces. In addition, in some locations where the storm deposited sediment, wetlands and beaches may emerge or expand. A U.S. Geological Survey summary of wetland changes, released in October 2006, estimates that almost 140,000 acres of wetlands were converted to open water throughout the state’s coastal areas. Losses were most extensive in Breton Sound, southeast of New Orleans. This summary also points out that this loss is about 42% of the total losses previously predicted to take place between 2000 and 2050 (periodic storms were included in making the calculation).

The wetlands were partially protected from ocean storms in central and eastern portions of coastal Louisiana by a thin ribbon of coastal sand barriers and beaches along the shoreline. These barrier systems were heavily damaged. These barrier systems already had been deteriorating for many of the same reasons, human and natural, as the wetlands. Stabilization and restoration of them is critical to successfully restoring the wetlands that they protect. It may be particularly challenging to reestablish wetlands landward of where barriers were overtopped, flattened, or bisected by new inlets that allow an influx of salt water. Over time, some of these barriers may stabilize or rebuild in new locations; others will require extensive restoration.

## **What If the Restoration Program Had Been Completed Before the Hurricanes Made Landfall?**

If the entire first phase of the restoration program had been completed, that is, if Congress had authorized and the Corps had completed the five initial projects recommended in the November 2004 Corps report, it may be that these investments would have had little effect on the pattern or extent of flooding or other storm damage around the city of New Orleans, with the possible exception of modifications to the Mississippi River Gulf Outlet (MRGO). These projects likely would have had some mitigating effects on flood elevations and water flow velocities close to the projects sites, but the magnitude of the effect would decline quickly as one moved away. The stability of the levees and floodwalls around the city would not have been directly enhanced by any component of the restoration program, so none of these projects would have reduced the flooding in the city. Where the most severe damage occurred to the east of the city from Hurricane Katrina and in the western portion of the state from Hurricane Rita, the restoration program would have had little activity. Relationships between the hurricane impacts on New Orleans and coastal communities and the proposed restoration may help decision makers identify future restoration priorities, if they choose to follow the recommendations in the 2005 NRC report.

The potential damage from any storm event, and the role the restoration would play in muting those damages, depends on specific characteristics of the storm event (e.g., the storm's intensity, track, and speed of moving), the components of the restoration effort, and the status of each component. Damage generally is most extensive along the east side of a hurricane storm track in the Gulf of Mexico, where the wind blows from south to north and the storm surge is most pronounced. In the case of Katrina, the storm track was just east of New Orleans, and the highest storm surge and greatest damage was documented to the east of that track. By contrast, within 100 miles of New Orleans west and northwest—for example, in the nearby Baton Rouge area—the damage was far less extensive.

Some scientists have offered generic support for the restoration effort by pointing out that coastal wetlands cause friction to dampen storm surge, and estimate that for every 2.7 miles of marsh this surge passes over, its elevation is reduced by a foot. They also estimate that storm surge is reduced by a foot in adjacent inland areas for every square mile (640 acres) of wetlands that are restored. Other scientists caution that these general relationships mask a wide variability, based on site-specific and storm characteristics. A possible conclusion is that some restoration projects could have a great beneficial effect in mitigating the damage to coastal Louisiana from storm events with certain characteristics, and these benefits would be greatest near the projects. However, for hurricanes with many combinations of characteristics, this specific set of projects may have done little to reduce the storm's impacts in much of the greater New Orleans area.

## **Possible Effect of the Hurricanes on Restoration Efforts**

Katrina had greater adverse effects on the wetlands being created at the diversion at Caernarvon than at Davis Pond. The Caernarvon area is estimated to have lost about 25,000 wetland acres. As the diversion is currently operated, it would take many decades to offset the lost acres. If the diversion was enlarged or its operation modified to increase the inflow of sediments, the restoration period could be shortened. Some are talking about a goal of restoring 1,000 to 2,000 acres a year.



The impact from the hurricanes has greatly expanded the range of thinking about restoration options. One aspect of that expansion is that while all past restoration planning has been in response to wetland losses and coastal degradation within Louisiana, neither hurricane respected political boundaries. Katrina caused extensive damage in coastal Mississippi and Alabama, and Rita caused less extensive damage in eastern Texas. These distributions of impact may create interest in considering a restoration program that would provide benefits across the central Gulf Coast. A second aspect is renewed discussion of projects that would result in larger changes across coastal Louisiana. The National Research Council report, for example, discusses both the third delta and the abandonment of the current delta in the context of providing more sediment for restoration. A third aspect is a renewed interest in determining which projects would be most effective. A January 2006 report by a group of recognized experts, primarily from academia, states that project priorities should be based on storm damage reduction and ecosystem restoration to develop a “sustainable coastal landscape.”<sup>3</sup> This report endorses the development of a detailed project map that had been recommended in the NRC report.

Even if the 110<sup>th</sup> Congress authorizes a substantial restoration effort, many of the physical changes on the ground will not be in place for decades. Construction of the five projects for which authorization is currently pending is not anticipated to be completed for about a decade after it is fully funded. For diversion projects, actual reestablishment of wetlands requires many additional years after the diversion starts to operate. Beyond the initial five projects, most of the others are much earlier in the planning process, and therefore completion would be even further into the future. If it is decided to follow the recommendation of the NRC, the time line for this effort could be further extended.

Ecosystem restoration goals may be in competition with other demands for federal resources generally, and Corps resources specifically, in coastal Louisiana. These demands include flood protection, navigation improvements, and housing. It may be too expensive to fully support all these goals at the same time. For example, how will policy and program responses to the flooding in New Orleans be viewed in relation to the restoration effort? It appears that little that was proposed in the water resources legislation in the 109<sup>th</sup> Congress would have had much effect on alleviating the causes behind the levee failures or moderating the rate or pattern at which the city was subsequently flooded, nor would the many additional projects that were in the *Coast 2050* Plan be likely to have had a significant mitigating effect on the flooding associated with Hurricane Katrina.

If Congress makes the protection or “fortification” of New Orleans its highest priority, then some financial and agency resources may be drawn away from other projects, such as those in the restoration efforts, that would contribute only indirectly to protecting the city. Such a decision could reduce restoration efforts that could have a more significant moderating effect on hurricane-related threats to communities and resources south of the city and closer to the Gulf. If Congress wishes to address both goals at the same time, then it may also want to consider setting priorities among the protection activities it authorizes and funds, which pending legislation does not do. At a minimum, Congress might consider asking the Corps to examine how each of the restoration projects might mute future storm damage, and whether there are some modifications that could be made to pending projects that would further protect the city or other south Louisiana communities.

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<sup>3</sup> Working Group for Post-Hurricane Planning for the Louisiana Coast, *A New Framework for Planning the Future of Coastal Louisiana after the Hurricanes of 2005* (Final Draft).



Congress directed the Corps to develop options for a post-hurricane rebuilding plan called the Louisiana Coastal Protection and Restoration Plan. In this plan, announced in the March 3, 2006, *Federal Register*, the Corps identified four combinations of structural and nonstructural measures that would protect coastal Louisiana against a category 5 storm. Central issues include (1) what role(s) restoration projects would play in such a plan, (2) how restoration projects would be integrated with structural measures, and (3) how projects to protect the New Orleans urban area and to restore coastal Louisiana could be most effectively integrated. Both versions of the pending legislation would create a federal-state task force to examine these types of questions.

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