

# CRS Report for Congress

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## Hurricanes Katrina and Rita and the Coastal Louisiana Ecosystem Restoration

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### Summary

Hurricanes Katrina and Rita caused widespread damage and destruction along the central Gulf Coast. Prior to these hurricanes, the U.S. Army Corps of Engineers had been seeking approval from the 109<sup>th</sup> Congress for a \$1.1 billion multi-year program to both construct five projects that would help to restore portions of the coastal wetland ecosystem in Louisiana and continue planning several other related projects. The state of Louisiana and several federal agencies have participated in the development of this program. This report introduces this program, and discusses whether it might have muted the impacts of hurricanes of the magnitude and paths of Katrina or Rita and whether the devastation caused by both hurricanes might cause the Corps to consider different restoration options. The National Research Council issued a report in November 2005 that may help inform the current debate over restoration. This report will be updated.

### Introduction

The widespread destruction has altered the congressional perspective as it considers provisions in legislation (S. 728 and H.R. 2864) that would authorize the U.S. Army Corps of Engineers (Corps) to implement numerous activities to slow the rate of coastal wetlands loss in Louisiana over the next decade. Both bills would authorize funding to implement a program that the Corps recommended in a November 2004 feasibility report. The Corps recommended \$1.1 billion for activities to be initiated immediately, and estimated an additional cost of \$0.9 billion for future work. Of the initial \$1.1 billion, \$828 million is to complete planning and construct five projects, called “near-term features,” where the planning process is well along, and construction could be completed in about a decade. The remainder of this initial authorization would be 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 to be authorized at a future date. Finally, additional funding would be provided to study six less well defined possible program elements for the future, termed “large-scale, long-term

coastal restoration concepts.” H.R. 2864 was approved by the House on July 25, 2005, while S. 728 was reported by the Senate Environment and Public Works Committee on April 26, 2005. (For more information on the proposed Corps program, see CRS Report RS22110, *Coastal Louisiana Ecosystem Restoration: The Recommended Corps Plan*, by Jeffrey Zinn; and to track the legislative process, see CRS Issue Brief IB10133, *Water Resources Development Act (WRDA): Army Corps of Engineers Authorization Issues in the 109<sup>th</sup> Congress*, by Nicole T. Carter, coordinator.)

The National Research Council was asked to review this plan, addressing specific questions about: (1) the scientific underpinnings of the Corps study; (2) major questions that need to be answered to support implementation; (3) the national benefits of the restoration; and (4) the plan as a first step toward comprehensive coastal restoration. In its prepublication report, issued in November 2005, it comments on the projects that are proposed and on the effects of the hurricanes on these plans. It concludes that while the individual projects are sound, they do not provide a comprehensive approach to addressing loss of wetlands over such a large area. It calls for the development of a detailed map showing the desired landscape of coastal Louisiana that would serve as the basis for future actions. The full report, titled *Drawing Louisiana's New Map: Addressing Land Loss in Coastal Louisiana* can be downloaded at [<http://www.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 numerous sets of proposals offered over the past four decades since a 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 that an additional 448,000 acres could be lost in coastal Louisiana by 2050 if no additional restoration projects are initiated. If the Corps' program is implemented, it estimates that net wetland losses would be reduced to 170,000 acres by 2050. These estimates do not appear to account for major hurricane events.

These losses have been caused by a combination of human activities and natural factors that have been frequently documented in many studies 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 in the wake of the hurricanes is the diminished role that the remaining wetlands can play in reducing the impact of hurricanes by absorbing storm surges and thereby decreasing flood elevations and wave energy. However, given the large expanse of coastal Louisiana, it seems most likely that each project would have benefits on the site and perhaps in the immediate surrounding area. This lack of interconnection among projects that make up the program is in contrast to the Corps' other large-scale ecosystem construction and restoration programs around the country, such as the south Florida Everglades restoration, where component projects are interrelated, and success depends on completing all the pieces in the program.

The Corps' recommended program includes projects centered in the wetlands south and southwest of New Orleans. None of these projects are in the western portion of the

Louisiana coast where Rita struck, and few are east of New Orleans, where Katrina's damage was most concentrated. In its analysis of the selected set of options and the many alternative proposals included in the November 2004 final report, there is almost no mention of hurricanes or an analysis which compares how these proposals might mitigate the effects of a major hurricane. In making these recommendations in the final report, the District Engineer for New Orleans states, in the general introduction to the recommendations, that "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>1</sup>

While Congress has not yet authorized any restoration program, two prototype projects, the wetland restorations at Davis Pond and Caernarvon Diversions, had been initiated under other authorities. Both restorations are located in the greater New Orleans area along the main channel of the Mississippi River. Fresh water from this river bearing sediment is periodically introduced into the diversion sites, which are large receptacle areas bounded by low levees. As the water sinks below the surface 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.

## **Effects of Katrina and Rita on Restoration Planning**

In the wake of the hurricanes, some supporters of restoration are calling for a more substantial (and expensive) program than the current proposal before Congress. They are seeking consideration of a \$14 billion restoration effort, as laid out in the *Coast 2050* Plan, which was released in 1998. This planning effort, which was led by the Corps and involved numerous federal and state agencies, resulted in 77 "restoration strategies" recommendations, 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. The anticipated result of these strategies, if fully implemented, was to protect or restore almost 450,000 acres of wetlands.

To date, 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 implemented over a 10-year time period. A draft was completed in October 2003, but never officially released. It included several options for implementation with estimated costs that reportedly ranged between \$4.3 billion and \$14.7 billion. However, the Administration, represented by the Office of Management and Budget, reviewed these recommendations and cost estimates, then reportedly directed the Corps to come up with a less costly proposal; that is the proposal which Congress is currently considering.

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<sup>1</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 Katrina and Rita on Louisiana's Coastal Wetlands and Barrier Islands**

Documenting the full effect of the hurricanes 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 "before and after" photographs showing the damage caused by Hurricane Katrina, such as those on the U.S. Geological Survey's website [<http://www.nwrc.usgs.gov/hurricane/post-hurricane-katrina-photos.htm>] indicate that wetlands (and coastal barriers and beaches) have been replaced by open water over large areas. By contrast, Hurricane Rita made landfall where coastal landforms are dominated by cheniers, which are slightly elevated ridges that parallel to the coast and are vegetated by shrubs and trees. Cheniers block the flow of salt water from the ocean and have led to extensive fresh water basins on the landward side, and brackish water and salt water marshes on the ocean side. The U.S. Geological Survey estimates that about 65,000 acres of wetlands were converted to open water by the two hurricanes, with far greater loss resulting from Katrina and concentrated south and east of New Orleans, according to a November 1, 2005 press release.

Some portion of the losses caused by both storms may only be 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 may emerge. More information on wetland losses should start to become available as scientists can access both storm areas and survey the physical changes.

The wetlands were 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 barriers provide what is sometimes characterized as a speed bump which creates friction that helps to break up and slow down storm surge. They also provide a barrier preventing salt water in the Gulf from reaching freshwater wetland plants and disrupting the ecology of this wetlands-based ecosystem.

The coastal barrier system in Louisiana has also been deteriorating for many of the same reasons as the wetlands, both human and natural. Stabilization and restoration of some of these barriers was recognized as critical to any successful effort to protect the wetlands behind these barriers. Hurricane damage to these barriers may greatly affect the overall restoration effort. It may be particularly challenging to reestablish wetlands landward of where they were overtopped, flattened, or bisected by new inlets because of the influx of salt water. Over time, some of these barriers may stabilize or rebuild in new locations, but these changes will not be clear for some time. Initial observations show heavy damage, but it is only slowly becoming clearer which changes will be permanent, and which islands will start to recover in calmer conditions.

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

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 was documented to the east of that track, with the greatest damage near the Louisiana-Mississippi state line. By contrast, within 100 miles of New Orleans west and northwest, such as in the nearby Baton Rouge area, the damage is far less extensive. The same general configuration of damage occurred with Hurricane Rita, with the worst damage in western Louisiana, just to the east of the storm's track.

If the entire first phase of the restoration program had been completed, that is, if Congress had authorized and the Corps had spent the entire \$1.1 billion, as recommended in the November 2004 Corps report, for that combination of construction and further investigations, 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 in the immediate areas around the projects, but little effect further 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 this investment would not have affected a floodwall breaching or 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. Perhaps these relationships between the two hurricanes and the proposed restoration (and the two existing prototype diversions) should be examined to help inform any debate over future priorities for a restoration program.

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, including such factors as the storm's intensity, its precise track, the speed at which it is moving, and the tidal elevation at land fall. Some scientists have offered 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 can vary widely, based on site specific and storm characteristics. A possible conclusion is that some restoration projects could have a great beneficial effect mitigating the damage to coastal Louisiana from storm events with some characteristics and especially near the coast. However, for hurricanes with many combinations of characteristics, this specific set of projects may have limited or no positive effect on reducing the storm's impacts in much of the greater New Orleans area.

### **Possible Effect of Hurricane Katrina and Hurricane Rita on Restoration Efforts**

Katrina may have had some adverse effects on the two diversions that have already been initiated to restore wetlands at Caernarvon and Davis Pond. However, no post-hurricane damage assessments have been issued; such assessments may help the Corps in designing future diversion projects.

The hurricanes may greatly expand 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 the Louisiana state boundaries,

neither hurricane respected those boundaries, and caused extensive damage in coastal Mississippi and Alabama, and less extensive damage in Texas. The pattern of impact of these storms may cause lead to greater interest in considering that a restoration program can be more effective if it includes components that would provide damage-mitigating benefits in coastal areas of adjoining states. A second aspect is projects that would result in larger changes. 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.

Even if Congress authorizes either the pending legislative proposal or some larger amount for restoration, 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 are not anticipated to be completed for about a decade. For diversion projects, construction is but the first step, and actual reestablishment of wetlands require many additional years. Most of the other construction projects are much earlier in the planning process, and therefore completion will be further into the future. The time required for planning and engineering work that precedes actual construction can be completed could also be extended if the engineering resources of the Corps have to also address the many other project needs, such as New Orleans levee enhancements and navigation features, generated by Katrina. Under the best of circumstances, the array of projects in a complex program like *Coast 2050* could not be completed for decades.

In the aftermath of the hurricanes, the ecosystem restoration goals will be in competition with other goals in coastal Louisiana for federal resources. Two of these goals are hurricane protection including mitigation, and economic development generally associated with navigation. While these three goals have some, and perhaps considerable, overlap, it may be too expensive to fully support all of them 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? As stated earlier, little that is proposed in the current legislation 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. It does not appear that the many additional projects that were in the *Coast 2050* Plan would have a significant mitigating effect on the flooding associated with this specific natural disaster.

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. But such a decision could reduce the restoration efforts that would reduce the magnitude of threat 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 that it authorizes. 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.