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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 multi-year program to both construct five projects that would help to 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 have participated in the development of this program. This report introduces this program and 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 these hurricanes. Congressional consideration will also be informed by slowly emerging information about the location and extent of change that resulted from these hurricanes. This report will be updated.

Introduction

The widespread destruction caused by Hurricanes Katrina and Rita has altered the congressional perspective on coastal Louisiana restoration as it considers provisions in legislation (e.g., 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. Both bills, developed before the hurricanes struck, would authorize funding to implement a program that the Corps had recommended in a November 2004 feasibility report. The Corps recommended $1.1 billion for activities to be initiated immediately and completed over the next decade, and estimated an additional cost of $0.9 billion for future work. As a result of the hurricanes, more expansive options, costing up to $14 billion, are also being considered.

Of the initial $1.1 billion in the proposal being considered when the hurricanes struck, $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. After the hurricanes struck, Congress provided $96 million in FY2006 Defense Appropriations (P.L. 106-148) for activities that would reduce threats to New Orleans by improving coastal wetlands, leaving open the potential for a wide range of legislative actions in the future. (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 109th Congress*, by Nicole T. Carter, coordinator.)

The National Research Council was asked to review the Corps' recommended 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. It commented on the proposed projects and recognized that the hurricanes, which struck after the report was largely completed, will likely lead to reconsideration of some plan components. It concluded that while the most of the individual projects are sound, they do not constitute 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 selecting future actions. The lack of synergy among projects in this plan is in contrast to another Corps' large-scale ecosystem construction and restoration program, the south Florida Everglades restoration, where success depends on completing all the interrelated program components. 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 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 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 but unpredictable hurricane events.

These losses have been caused by a combination of human activities and natural factors that have been frequently documented 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 reduced role that the remaining wetlands can play in absorbing storm surges and thereby decreasing flood elevations and wave energy.

The Corps' 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 or an analysis which compares how these proposals might mitigate the effects of a major hurricane. In making his recommendations in the final report, the District Engineer for New Orleans states 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."[1]

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 existing 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 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.

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 impacts of the hurricanes demonstrated that the restoration would have significant national benefits, and is far greater than a state issue. They are seeking consideration of a $14 billion restoration effort that had been laid out in the *Coast 2050* Plan, which was 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. The anticipated result from fully implementing these strategies was 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 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 options, then reportedly directed the Corps to come up with a less costly proposal in late 2003; that is the proposal which Congress is currently considering.

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[1] 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 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 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 and beaches may emerge. A U.S. Geological Survey summary of wetland changes, released in February 2006, estimates that about 76,000 acres of wetlands were converted to open water in eastern and central coastal areas. Far greater loss resulted from Katrina and was concentrated south and east of New Orleans, with almost half the total loss from Plaquemines Parish.

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, heavily damaged by the hurricanes, help to dampen the full force of the storm surge. They also prevent ocean waters in the Gulf from reaching freshwater wetland plants and disrupting the ecology of this wetlands-based ecosystem. These barrier systems have been deteriorating for many of the same reasons, human and natural, as the wetlands. Stabilization and restoration of them is critical to any successful effort to restore the wetlands that they protect. 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 it is only slowly becoming clearer which changes will be permanent, and which islands will recover in calmer conditions.

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 5 initial projects that it 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 in the immediate areas around the projects, but little effect at greater distances. 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 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, as called for 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 (the

storm's intensity, its precise track, the speed at which it is moving, and the tidal elevation at land fall) and the components of the restoration effort. 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, such as in the nearby Baton Rouge area, the damage is 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 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 done little to reduce the storm's impacts in much of the greater New Orleans area.

Possible Effect of these Hurricanes on Restoration Efforts

Katrina had some adverse effects on the wetlands being created at the diversions at Caernarvon and Davis Pond, but little detailed information has been released on its extent. This damage may lead some to question how diversions should fit into the restoration strategy, including where they should be located.

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 Louisiana, neither hurricane respected political boundaries. Katrina caused extensive damage in coastal Mississippi and Alabama, and Rita caused less extensive damage in Texas. These distributions of impact may lead to greater interest in considering a restoration program that includes components that would provide damage-mitigating 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 that there 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."[2] This report endorses the development of a detailed project map that had been recommended in the NRC report.

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[2] *A New Framework for Planning the Future of Coastal Louisiana after the Hurricanes of 2005* (Final Draft), Working Group for Post-Hurricane Planning for the Louisiana Coast.

Notwithstanding whether the 109th 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 is not anticipated to be completed for about a decade if fully funded. For diversion projects, construction of the diversion structures 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 even further into the future. The time required for the planning and engineering work that precedes actual construction could be extended if the engineering and other resources of the Corps also have to address the many other 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. If it is decided to follow the recommendation of the NRC, the time line for this effort could be further extended.

In the aftermath of the 2005 hurricanes, the ecosystem restoration goals may be in competition with other demands for federal resources in coastal Louisiana. These demands include flood protection, economic development associated with navigation, 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? As stated earlier, it appears that 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 Hurricane Katrina.

If Congress makes the protection or "fortification" of New Orleans its highest and immediate 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 that it authorizes and funds. 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.

Congress directed the Corps to develop a 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 identifies 4 combinations of structural and non structural measures that would protect coastal Louisiana against a category 5 storm. Central issues include (1) what role(s) would restoration projects play in such a plan, (2) how would restoration projects be integrated with structural measures, and (3) how could projects to protect the New Orleans urban area and to restore coastal Louisiana be most effectively integrated to minimize damage from future storm events.