Taking on the Storm

Late Sunday afternoon, August 28, several hundred Madisonians and I were at the annual Orton Park Festival dancing away to the infectious zydeco music of Clifton Chenier and the Red Hot Louisiana Band. Chenier—a large, muscular man who sings and plays the accordion—finished his excellent multiple-encore set with a heady boast that now he and the band were going home to take on "the storm."

Of course, the storm Chenier was talking about was Hurricane Katrina, which would make landfall the following morning near Buras, Louisiana. Within three hours of coming ashore, a 15- to 20-foot storm surge pushed its way up the Mississippi River Gulf Outlet and the Gulf Intracoastal Waterway into the Industrial Canal of New Orleans, flooding the low-lying, economically poor Lower Ninth Ward with 6 to 8 feet of water. The following day, 80 percent of the city was under water and a natural and human-made crisis of major proportions was underway—a crisis that would result in thousands of people dead or reported missing, hundreds of thousands more displaced from their homes and places of employment, the resignation of the top federal official in charge of emergency management, and the recognition that serious questions exist about the future of New Orleans and all of coastal Louisiana.

Certainly none of this came as a surprise to anyone who has studied the situation and considered the risks involved in living in coastal Louisiana during the hurricane season. In fact, several groups of scientists working for the National Oceanic and Atmospheric Administration have developed computer models of strong hurricanes striking New Orleans, and what they saw in those models very closely resembled the devastation caused by Hurricane Katrina. In a recent article in *Science*, one of those scientists, Rick Leuttich of the University of North Carolina at Chapel Hill remarked, "We've had plenty of knowledge to know that this was a disaster waiting to happen" (Scientists' Fears Come True as Hurricane Floods New Orleans. *Science* 309 (5741):1656-1659). And, yes, the Federal Emergency Management Agency and local officials were aware of these and other studies, and their implications for the safety of New Orleans' residents.

Like those Americans who live either in fire-prone areas, on geological fault lines or regions that experience periodic droughts—coastal Louisianans live on the edge; at significant risk from natural disasters, secure only as long as their luck and modern technologies hold out. Facing them are hurricanes, flooding, intense heat and humidity, and the potential for outbreaks of deadly diseases. With a modern economy that is inextricably tied to oil and natural gas extraction, the gasoline refining industry and the shipping industry, today's Louisianans have allowed the cypress forests, extensive wetlands, and barrier islands of their state to be destroyed to make their lives more economically and physically secure—or so they thought. In the past, those very ecosystems helped absorb the force of hurricanes and dampened the effect of storm surges. Today, they are nearly useless for that purpose, their composition and structure having been lost and fragmented by a highly engineered system of levees, canals, and water diversion structures.

While it is true that Louisiana still contains 30 percent of the total coastal marsh area in the lower 48 states, it has lost 1,900 mi^2 of wetlands since the 1930s—an area 25 percent larger than the state of Rhode Island. Much of this loss is the result of 1) federal efforts to protect property from flooding by building levees and 2) the commercial pumping of oil and natural gas from cavities underneath the marshes. Levee construction began in the late 1920s and while providing flood control, these levees interrupt the natural process of sedimentation within the delta by funneling sediment out into the gulf. This, combined with collapse of wetlands over emptied underground cavities, has greatly accelerated the natural process of subsidence. Canals dug for shipping or pipelines have also fragmented the marshland and destroyed cypress forests. Finally, the state's barrier islands near the mouth of the Mississippi River are either gone or greatly diminished due to longshore distribution of sediments. Their demise will leave already damaged coastal wetlands exposed to greater wave action. Although wetland loss in Louisiana slowed between 1990 and 2000 due to tougher restrictions on oil field dredging, it still totaled about 24 mi^2 annually or the loss of about one football-field section of marsh every 38 minutes!

Naturally, these ecological problems have not gone unnoticed and one of the most oft-mentioned means of correcting them is wetland restoration. As a result, restoration projects are underway throughout coastal Louisiana. These projects are funded by various means including the Coastal Wetlands Planning, Protection and Restoration Act of 1990 (federal legislation also known as the Breaux Act that has provided roughly $50 million annually for pilot restoration projects), the Parish Coastal Wetlands Restoration Program (or the "Christmas Tree Program" because of the use of Christmas trees to fill wooden cribs, called brush fences, along the coast where they dampen wave action, trap sediment, and provide a space for planting wetland vegetation), the Coastal Assistance Program (which oversees the mitigation of impacts oil and gas production), and the Louisiana DNR-Natural Resources Conservation Service and

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Soil and Water Conservation Committee Vegetation Planting Program. Funds from the United States Army Corps of Engineers for dredging are also used to create wetlands, improve wetland habitat, and protect eroding shorelines. Through the Wetlands Restoration and Conservation Authority, the United States Congress authorized the Corps to construct large-scale freshwater diversion projects, such as the one at Caernarvon, which have been successful in moving sediment-laden water into wetland areas and slowing the rate of local subsidence.

According to the Louisiana Office of Coastal Restoration and Management, 467 coastal restoration projects were constructed from 1986 through 2004, nearly 300 of them under the Vegetation Planting Program (Louisiana Coastal Facts). These projects have been spread out across some 2.5 million acres and "have shown some early evidence of being very effective," according to Professor Robert Twilley in a recent *Christian Science Monitor* article by Peter N. Spotts (*Christian Science Monitor,* September 7, 2005). Despite the large size of these projects, analysts project that with current restoration efforts taken into account, Louisiana will still lose about 10 mi^2 of coastal wetlands annually.

Scientists, activists, politicians, and others in Louisiana now believe that an even greater restoration effort is needed and that, based on the knowledge gained from these pilot projects, it will be successful. To that end they have developed the Louisiana Coastal Area Ecosystem Restoration Plan or Coast 2050—a $14 billion proposal that, prior to Hurricane Katrina, was turned down by the Bush Administration as too costly, but which may now see the light of day. While I don't have space to go into the plan here, those interested can read the plan on at www.lca.gov/final/main_report1.aspx. Hopefully, it will be a significant part of Louisiana's future.

Obviously, the cost of Coast 2050 is huge, but as former New Orleans native and current president of the University of Maryland Center for Environmental Science, Donald F. Boesch wrote recently, "The lesson of Katrina is that the costs of environmental restoration are dwarfed by the costs of ignoring it" (The Awful Price of Coastal Ruin, *Baltimore Sun,* September 1, 2005). Indeed, simply given coastal Louisiana's importance in terms of the nation's energy supply, $14 billion (the cost of 12 B-2 bombers or five months of the present conflict in Iraq) seems like a reasonable price to pay in terms of assuring the nation's energy security, while at the same time restoring social and natural capital.

But let's think even bigger than coastal Louisiana. Let's talk basin-wide restoration. For example, in addition to the other ecological problems in coastal Louisiana, it is well known that a large area of the Gulf of Mexico near the mouth of the Mississippi River is oxygen depleted or hypoxic every spring and summer. In effect, it's a "dead zone" caused by excess nutrients, especially nitrogen, washed into the gulf from the river. "I think it's a mistake to separate the gulf's hypoxia from the problems of wetlands losses in the Mississippi delta and throughout the Mississippi basin," says John W. Day, distinguished professor in the Department of Oceanography and Coastal Sciences at Louisiana State University. "This needs to be looked at as a basin-wide problem with solutions distributed throughout the Mississippi basin." (The Dead Zone. *Coastal Services* 8(3):4-5, 9)

I think Dr. Day is correct and would like to suggest that we have to treat the problem upstream, in addition to restoring wetlands and building sediment-enriching, soil-building water diversion structures in Louisiana. By what means can such a basin-wide restoration occur? I think that we can look to northern Europe for solutions as we begin to imagine ways to re-make the Mississippi River into a more sustainable system.

The first step is federal government ownership of the entire lower Mississippi River floodplain from Cairo, Illinois to Breton Sound, Louisiana. (Shared ownership with non-government bodies, such as local land trusts, could work, too.) The goals of such a program will be to restore the river's floodplain for water storage purposes; reduce pollution, especially of agricultural runoff; create habitat for animals and migratory birds; grow biomass for energy uses or to offset global warming; produce recreational space for people; and maintain a navigable waterway for shipping. There would be no buildings or farming in the area between the levees and the river. The area would be a working landscape, but one where the work created improves the conditions within the entire system rather than simply generating income for an individual or corporation.

The northern Europeans are doing this successfully along the Rhine River, as I observed during a recent visit to the Gelderse Poort—a 12,350-acre nature area in the Netherlands. There, farming operations have been moved behind the levees and restoration activities have replaced former agricultural fields with wetlands, woodlands, and grassland areas. Flooding is kept in the floodplain. Simple structures allow grazing animals to move freely between the restored area and the farm area. Beavers have been reintroduced. Areas of clay and gravel are removed to expose old channels and create new wetlands. Waterfowl are abundant. Birdwatchers and walkers visit frequently. Boat and barge traffic on the river is constant. People are living comfortably with nature. It can be done.

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Making sense of a catastrophe is never easy, and given all the things that went wrong in New Orleans, it may take us some time to come to terms with the lessons of Katrina. One thing is certain, we will not solve our problems by building bigger, stronger levees like we did in the 1960s after Hurricane Betsy. If the predictions of global warming and sea level rise are even close, then New Orleans and all of coastal Louisiana are in serious trouble. The solution will be expensive, will include some form of wetland and riverine restoration, and will require all the creativity we can muster in terms of finding a way to dwell in an ecologically edgy, but culturally rich, place we call Louisiana. If those zydeco-lovin' Cajuns and the rest of us can take on this "storm" and succeed, and I believe we can, then future generations will be served by our efforts.

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