KATRINA: Unlearned Lessons

Two years on, it's clearer than ever that this was a manmade catastrophe. Is anyone getting the message?

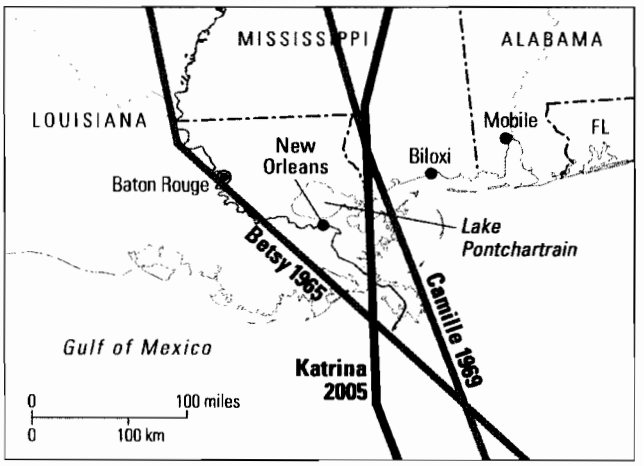
by William R. Freudenburg, Robert Gramling, Shirley Laska, and Kai T. Erikson

Hurricane Katrina, which struck New Orleans on August 29, 2005, created the costliest disaster in U.S. history, and one of the deadliest. After two years and dozens of post-mortem analyses, it makes sense to ask if we've learned anything from the experience. Sadly, our institutions seem to have had difficulty learning and applying the key lessons—even when those lessons are driven home with hurricane force.

Many media reports have discussed Katrina, first, as an example of what nature can do to people, and second, as being about the uniqueness of New Orleans—just as distinctive as Mardi Gras parades and Creole cuisine. To be fair, this isn't one of those cases where the mass media have been misquoting academics. Instead, they may have been reporting a common academic perspective a bit too accurately. The respected geographer Peirce Lewis, for example, famously proclaimed New Orleans to be an "inevitable city" in an "impossible location," and noted historian Ari Kelman of the University of California, Davis, was working in the finest traditions of geography when he described New Orleans as having an excellent "situation" (high capacity to compete with other cities) but a physical location that is "wretched." New Orleans, he decreed, "has a near-perfect situation and an almost unimaginably bad site."

Such views make it tempting to see the lessons of Katrina as being about what nature did to humans. But while New Orleans may have been the first major American city to be ravaged by natural hazards during the 21st century, it will not be the last. Vulnerability also characterizes places as different from the physical setting of New Orleans as humans can imagine—witness the tornado that recently flattened Greensburg, Kansas, or for that matter the millions of people living in California earthquake country.

At least equally importantly, though, the key lessons of Hurricane Katrina may have more to do with what humans did to nature—and how it came back to haunt us all.



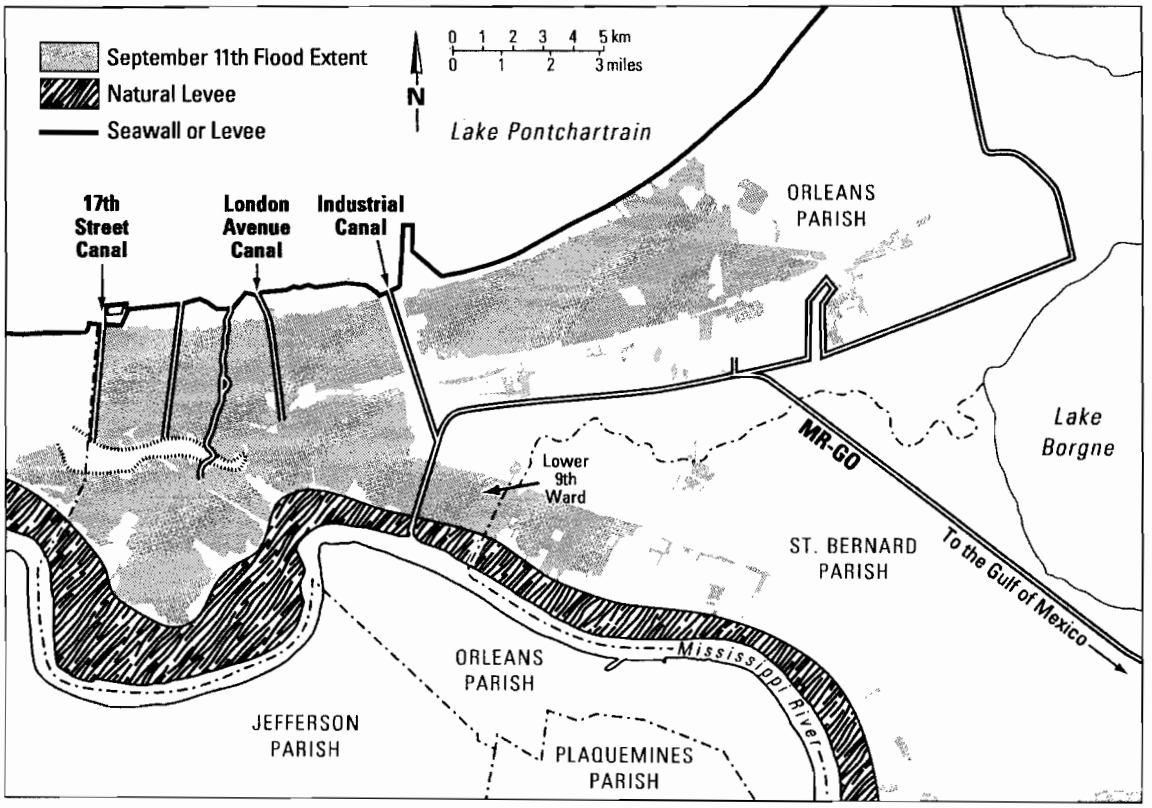
Storm tracks of hurricanes Betsy, Camille, and Katrina.

Dangerous Dames

Consider the three most powerful hurricanes that have roared through New Orleans in the last half-century, all following strikingly similar tracks: Betsy, Camille, and Katrina, in 1965, 1969, and 2005, respectively (see map). By a number of measures, the two earlier storms should have caused as much or more damage to the city as Katrina, with Betsy being perhaps the most ominous. Although scientists use wind speeds as a way of measuring hurricane strength, people are most likely to be killed by a hurricane's waters. The deadliest waters are usually driven by a hurricane's "right hook," the storm surge that builds up along the right, leading edge of the storm's central eye, where the counterclockwise winds shove the ocean's waters toward land with the greatest energy and depth.

Both Camille and Betsy did create some flooding, with Betsy killing 76 Louisiana residents and flooding about 20 percent of New Orleans. Betsy also inspired what the Army Corps of Engineers called the Hurricane Protection Pro-

Original cartography by Cliff Duplechin



The extent of flooding from Katrina, plus the locations of the three major breached canals and MR-GO.

gram, which built the levees and floodwalls that failed to protect the city from Katrina. Still, they were significantly higher and stronger than the ones in place in the 1960s. Despite the "improved" hurricane protection, Katrina flooded 80 percent of the city, nearly destroying it, and killed roughly 20 times as many people as Betsy. Clearly, something changed between the 1960s and 2005 besides the building of those floodwalls—and if the change took place that quickly, it's a fairly good bet that humans had something to do with it.

A telling clue comes from one key difference across the three canals that experienced the most important failures in their floodwalls—the ones known locally as the London Avenue, 17th Street, and Industrial Canals. All three canals empty directly into Lake Pontchartrain, a large, brackish body of water on the north side of New Orleans that connects to the Gulf of Mexico. The tops of all three canals' floodwalls are roughly equal in elevation. According to basic physics familiar to any small child who has ever played in a bathtub, if the flooding actually

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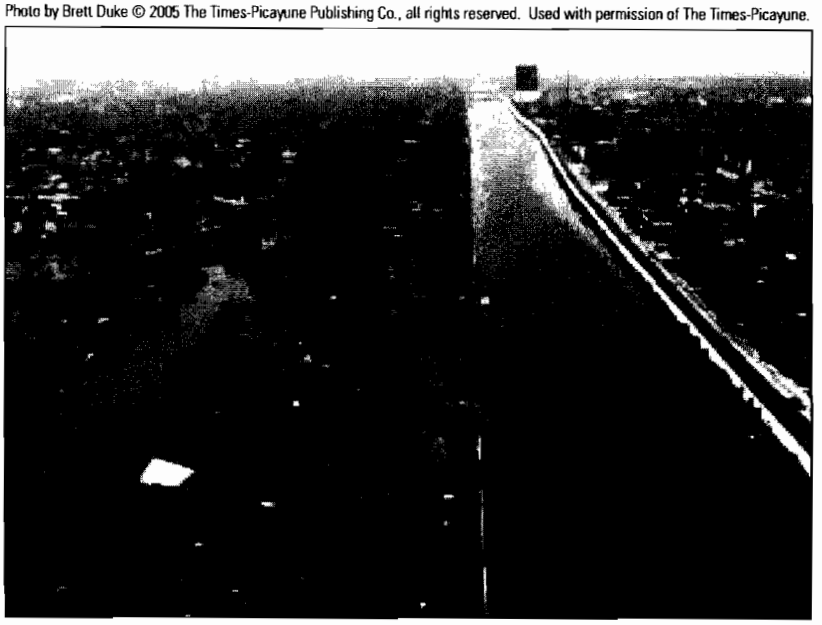

London Avenue Canal breach. Both this and the 17th Street canals failed even though floodwaters from Lake Pontchartrain never came close to the tops of the levee walls (note intact shrubbery). In the Industrial Canal, however, the additional flood-surge waters driving up MR-GO easily overtopped the floodwalls, caused their disastrous collapse and the submersion of the Lower Ninth Ward.

William R. Freudenburg

Looking into the Lower Ninth Ward through a levee breach. Until August 2005, this was a densely populated neighborhood. The house in the middle of the photograph is roughly four city blocks away. The rusted metal on the ground is "sheet pilings" normally just below the concrete portions of the floodwall. Surging floodwaters drove the wall itself more than 50 meters into the neighborhood.

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Remnants of the Industrial Canal floodwall, October 2005. Note the "ditch" scoured by overflow (foreground) and the large breach in the distance at upper right. The Lower Ninth Ward is immediately to the right of this spot.

did come in from Lake Pontchartrain, then the floodwaters should have been roughly equal in depth across the three canals. In reality, although estimates vary, even the deepest floodwaters in the London Avenue and 17th Street Canals, which contributed to the slow flooding of the main part of the city, stopped roughly two meters below the tops of the walls. In the Industrial Canal, the water came surging right over the top, leading not only to the catastrophic failure of the floodwall but to the stunning destruction that engulfed the Lower Ninth Ward.

The obvious explanation for the difference is that the water surging into the Industrial Canal came not from Lake Pontchartrain to the north, but from someplace else. The obvious suspect involves the connections to the Gulf of Mexico that were created by another Corps of Engineers project—and from what that project did to the surrounding wetlands. The key reasons for the differing water depths across the three canals, in short, has less to do with the floodwalls themselves than with what took place outside of them.

Degraded Defenses

From the city's founding in 1718, up through the era when a New Orleans bar made "The Hurricane" famous as a drink in the 1940s, New Orleans was protected by two layers of defense: a thin ring of levees, constructed by humans, and a broader band of wetlands, built by the Mississippi River over the last 7,000 years. At least until relatively recently, the wetlands have provided an important shock absorber for storm surges: a widely quoted 1963 estimate from the Corps of Engineers is that a band of grassy coastal marshes stretching 12 kilometers inland from salt water can lower storm surges by about a meter. More recent estimates suggest that healthy cypress swamps can reduce storm surges about three times better, about one meter of reduction for each four kilometers of cypress swamps. As recently as 40 or 50 years ago, Louisiana still had the vast majority of the wetlands that greeted early French explorers four centuries earlier. But by 1960, coastal Louisiana was losing land at a rate of 25–40 square kilometers per year. By the end of the 1960s, the losses were adding up

more than three times that fast.

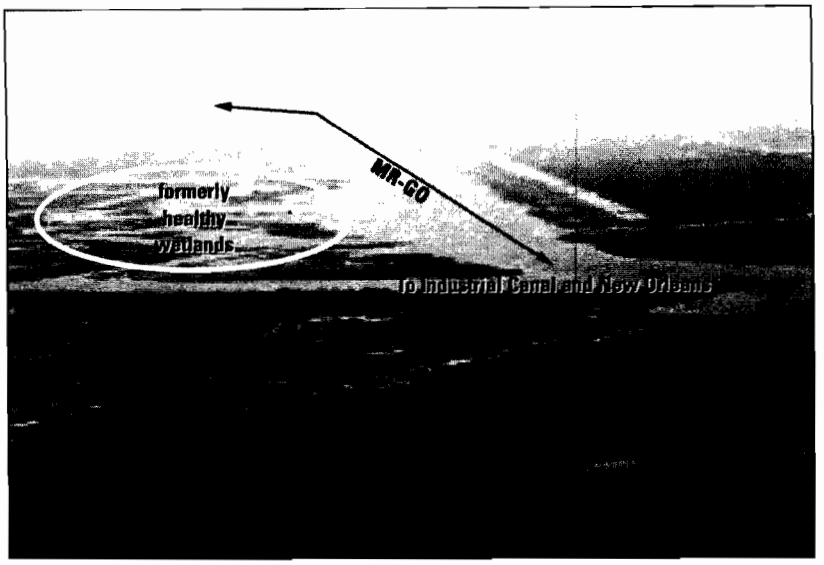
Overall, Louisiana lost an estimated 4,000 square kilometers of wetlands by the end of the 20th century. This represents about one-fifth of the roughly 2 million hectares present at the start of the century, or roughly as much land as had been built up by the Mississippi over the previous millennium. In recent years, land has continued to disappear at the rate of about one U.S. football field (about half a hectare) every 30 to 45 seconds, five to eight square kilometers every month, and a Manhattan Island or more—80 square kilometers—every year. By the time Katrina hit, the state's once-thick band of wetlands was in tatters.

Across the broader region, the key factors in the wetlands losses include the building of upstream dams and downstream levees, which reduced the Mississippi's sediment loads by 70 percent and prevented most of the remaining silt from rebuilding the marshes. To the southeast of New Orleans, however—the direction from which Katrina's deadliest storm surges attacked the city—the key factor in wetlands loss was far more local and specific.

This is the location of one of the most damaging pork-barrel projects ever: a canal known as the Mississippi River-Gulf Outlet, or MR-GO. This giant ditch is usually pronounced as "Mister Go," but at least since Hurricane Betsy in 1965, it has also been known to locals as "the hurricane highway." Few people outside of the region had heard of MR-GO before Katrina struck, but at least locally, it was the focus of considerable controversy even before the storm.

New Orleans has known canal-digging projects for as long as it has been inhabited by Europeans, but not until the 20th century, and perhaps not until MR-GO, did the projects become large enough to do truly serious damage. The basic idea behind MR-GO was to build a "tidewater" or sea-level canal directly from the Industrial Canal, in the heart of New Orleans, down to the Gulf of Mexico. The channel is some 120 kilometers long, running parallel to the Mississippi but nearly as straight as a gun barrel, with no freshwater flow to keep out salt water. Local promoters promised that it would be incredibly busy—a wet version of

Robert Gramling



Aerial view of MR-GO through coastal haze, looking southeast toward the Gulf of Mexico. Hurricane Katrina drove surge waters up the channel and across the adjacent, previously intact wetlands, ultimately flooding parts of New Orleans.

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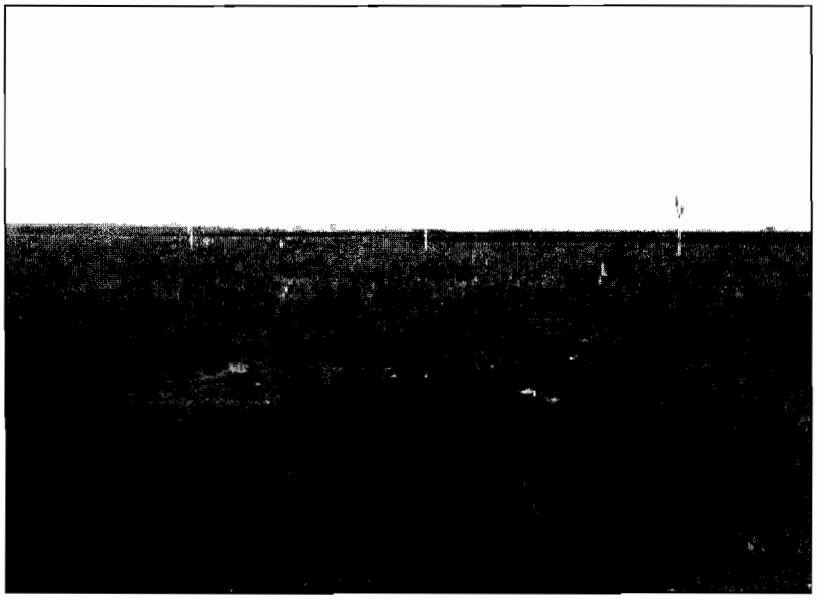

Ghost swamp: what's left of a formerly dense and healthy cypress grove, killed by saltwater introduced by MR-GO.

Jocelyn Augustino/FEMA

The Lower Ninth Ward, a few days after Katrina.

U.S. Army Corps of Engineers

MR-GO, 1983. By allowing salt-water intrusion, the channel destroyed thousands of hectares of storm-buffering cypress trees, even as projections of large-vessel traffic through it proved wildly optimistic. Hurricane Katrina caused such extensive siltation that the channel is no longer deep enough for large ships. After $580 million spent on building and dredging MR-GO, the Corps of Engineers has recommended closure.

an urban freeway at rush hour—because it would allow ships to bypass the last 190 kilometers of what a local editorial called a "crooked, fog-covered, silt-bearing, temperamental" Mississippi River. Environmental groups, on the other hand, expressed grave concerns about carving such a large channel through previously healthy wetlands. Unfortunately, the boosters were almost completely wrong in their claims, while the environmentalists' concerns were largely on-target.

The Corps originally designed the canal to be about 190 meters wide on the surface, on the theory that this would permit a channel 12 meters deep and 150 meters wide at the bottom. Even the initial excavation meant removing more dirt than the Panama Canal, but that was just the start of a vicious, self-reinforcing cycle. Almost as soon as the narrow "interim channel" of MR-GO reached the Gulf in 1963, salinity levels shot up. The salt soon killed the plants that held together the fragile soils, which then slumped into the channel. Digging out that silt meant additional dredging, which meant in turn that MR-GO grew wider and wider, with its banks eroding at a rate of 9–12 meters per year. That, of course, brought still more salt water into the marshes, destroying still more of the remaining plant life, causing the loss of still more land, and so on.

When Hurricane Betsy struck in 1965 and flooded 20 percent of New Orleans, many locals were incensed, blaming MR-GO. At that time, the channel was not even finished to its full width. It would have been close to its original design width by the time Camille struck in 1969, but when Katrina arrived in 2005 some stretches were nearly a kilometer wide. At least equally significant, however, was the damage that MR-GO did to the surrounding wetlands. Even before Katrina, the Corps of Engineers concluded that MR-GO had helped to convert more than 4,500 hectares of fresh/intermediate marshes and cypress swamps to brackish marshes (those with intermediate levels of salinity).

That is no small consideration. Cypress trees are some of the most effective obstacles to hurricane winds and waters ever invented by nature, strong enough to survive hurricanes almost unharmed and able to live well over 500 years in natural conditions. Exposure to the salt water, unfortunately, meant that thousands of hectares of once-sturdy cypress trees were dead by the time Katrina crashed ashore, replaced by scattered skeletons of former trees in what locals call "ghost swamps." Much of the water that drowned New Orleans came straight up MR-GO or across the adjoining wetlands, which no longer had enough cypress trees to slow the storm waters roaring into the Industrial Canal, the Lower Ninth Ward, and adjacent St. Bernard Parish.

In the aftermath of Katrina, one complaint was that the Corps had not received enough money to build flood protection projects. But Louisiana actually received more money for Corps projects from 2000 to 2005 than any other state: about $1.9 billion, well ahead of the $1.4 billion for second-place California, which covers roughly three times as much territory and has seven times as many people. Instead, in a pattern that is also common in other states, the political system chose to "invest" largely in projects that, like MR-GO, were seen as promoting "economic development." Former Louisiana Senator John Breaux (D), for example, told the *Washington Post* that "we thought all the projects were important, not just levees." Although hindsight might have pointed to different priorities, he said, navigation projects such as MR-GO "were critical to our economic survival."

The Lower Ninth Ward, awaiting cleanup.

Perverse Priorities

Actual numbers tell a different story. Traffic on MR-GO started below official predictions—and then dropped. By 2004, a year when taxpayers would spend another $13.4 million to dredge MR-GO yet again, the channel would be used by only about a dozen ships that actually needed the dredging to accommodate their deeper drafts. Even before considering MR-GO's larger human and environmental costs, this "economic development" project was in fact a sad case of water welfare, involving a taxpayer subsidy of over a million dollars per round trip.

Since Katrina, many reconstruction investments have continued to overlook the environmental realities of this site, going largely to rebuild the inner ring of floodwalls, not the broader ring of wetlands. But the need for more rational recognition of the value of natural surroundings is by no means limited to New Orleans. Political leaders everywhere often seek taxpayer dollars for so-called economic development projects, which often create actual environmental harm but only hypothetical economic benefit. For many such projects, as in the case of MR-GO, actual connections to "economic survival" ultimately prove to be imaginary.

MR-GO showed that our technological capacities have risen to the point where we can create some truly spectacular environmental damage. Katrina showed, unfortunately, that we do not seem to have the same level of technological capacity to undo the damage we create—to nature, to humans, or both. Two years after Katrina, the Corps of Engineers recommended that MR-GO be sealed off, but noted that backfilling the channel would require around 200 million cubic meters of material and might take more than 40 years. In practical terms, even though it is now clear that MR-GO was a costly mistake, it is one that may never be undone. It has created a hole in the wetlands, as well as in the life of a great city, that may never be filled.

When Katrina hit New Orleans, what came through the levees was more than just a rush of floodwaters. It was tragically graphic evidence that scientists' warnings about the risks of environmental damage need to be taken seriously, and that boosters' claims of economic benefits need to be subjected to equally serious scrutiny. The leaders of New Orleans ignored that evidence, and the city suffered the consequences. The rest of us watched the painful learning experience. The question is whether we will actually learn from it.

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