GEOLOGY: Katrina Study Stirs Debate on Coastal Restoration

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GEOLOGY

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A maverick ecologist is suggesting that some of the massive and costly engineering fixes being used to restore coastal wetlands in Louisiana will barely make a dent in the problem.

In a paper published online by *Science* this week (www.sciencemag.org/cgi/content/abstract/1129116), Eugene Turner of Louisiana State University in Baton Rouge and three LSU colleagues report the first coastwide study of sedimentation from hurricanes Katrina and Rita. They conclude that hurricanes are by far the most important source of inorganic sediments in the wetlands, dumping so much that, in comparison, costly schemes to channel sediment-bearing Mississippi River water back to the wetlands will have a "trivial" effect. Instead, they argue, restoration efforts should focus on restoring the buildup of organic material.

Many of Turner's counterparts in the ecological community disagree, however, saying that although the researchers have marshaled useful new data, the measurements don't justify their conclusions. "It would be very unwise to use this study to overthrow the thinking about coastal restoration," says physical geographer Torbjörn Törnqvist of Tulane University in New Orleans, Louisiana. "We need to be extremely careful" about interpreting the new results.

Most experts trace Louisiana's coastal degradation in large part back to the levees that were built in the 20th century to control the Mississippi River (*Science*, 25 November 2005, p. 1264). They contend that the levees prevented floods from delivering the necessary silt to delta wetlands. As a remedy, the state of Louisiana and the federal government spent $145 million to construct a pair of prototype structures in 1991 and 2002 to divert river water into wetlands. Several more structures are proposed in a bill before Congress.

But hurricanes also dump mud and debris onto wetlands, and Turner had long suspected that hurricanes might be an even bigger source of sediment than the mighty Mississippi. Katrina and Rita gave him a chance to find out.

Using a rapidly awarded grant from the National Science Foundation, Turner and his colleagues chartered a helicopter in early November 2005 and took samples of storm-surge deposits from 186 sites across 38,588 square kilometers of coastal wetlands. They found plenty of muck. On average, the muddy sediment was 5 centimeters thick; that means Katrina and Rita left a combined 130 million metric tons of sediment on the wetlands, Turner and his colleagues calculate.

Muck galore. Hurricane Katrina covered coastal wetlands with an abundance of silt. Based on new measurements, some researchers argue that hurricanes provide almost all the inorganic sediment the ecosystem needs.

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Other ecologists welcome these new measurements, but they take exception to Turner's next, critical, assumptions. Based on a scanty historical record, Turner and his colleagues estimate that storms with a surge as big as Katrina's hit the Louisiana coast on average every 7.9 years. At that frequency, hurricanes deposit about 26 million metric tons of sediment a year on wetlands and associated open water—more than five times the amount contributed by the Mississippi River floods before the levees were constructed, Turner and his colleagues calculate.

Turner says his analysis bolsters his contention that Louisiana's wetlands don't face a shortage of inorganic sediment. The major cause of wetland loss, Turner has long argued, is canals dug for oil and gas drilling that changed the hydrodynamics of the region. This, in turn, he believes, stunted and killed plants and retarded the buildup of organic materials. He favors filling these canals and restoring adjacent marshes.

Many other experts, however, suspect that Turner has overestimated the sedimentation rate of hurricanes. First, they say, surges probably eroded shallow bays and then dumped the silt on the marsh. "It's robbing Peter to pay Paul," says Joseph Kelley of the University of Maine, Orono. In addition, they believe that major storms such as Katrina strike much less often than Turner and his colleagues estimate.

They also point out that diversion projects not only supply sediment but also help reduce salinity and provide nutrients. In fact, Denise Reed of the University of New Orleans and others advocate constructing an even larger diversion of the Mississippi River, to build substantial new land south of New Orleans. "If you don't have diversions as a major part of your restoration efforts, you can't save the coast," says John Day of LSU, who has studied one of the diversions for a decade. **–ERIK STOKSTAD**

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