BP Deepwater Horizon oil spill exacerbated existing environmental problems in Louisiana marshes

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The BP Deepwater Horizon oil spill temporarily worsened existing manmade problems in Louisiana's salt marshes such as erosion, but there may be cause for optimism, according to a new study.

A study appearing online in the *Proceedings of the National Academy of Sciences* found the 2010 spill killed off salt marsh plants 15 to 30 feet from the shoreline and this plant die off resulted in a more-than-doubled rate of erosion along the marsh edge and subsequent permanent marsh habitat loss. Vegetation farther from shore was relatively untouched by the incoming oil.

"Louisiana is already losing about a football field worth of wetlands every hour, and that was before the spill," said Brian Silliman, a University of Florida biologist and lead author of the study. "When grasses die from heavy oiling, their roots, that hold the marsh sediment together, also often die. By killing grasses on the marsh shoreline, the spill pushed erosion rates on the marsh edge to more than double what they were before. Because Louisiana was already experiencing significant erosive marsh loss due to the channelization of the Mississippi, this is a big example of how multiple human stressors can have additive effects."

Marshes are the life's blood of coastal Louisiana because they act as critical nurseries for the shrimp, oysters and fish produced in these

waters while helping to sequester significant amounts of carbon. They also protect coastlines from flooding and guard estuarine waters from nutrient pollution.

But the marshes have been suffering for decades as a result of the channelization of the Mississippi River, which has starved them from needed sediments to deter erosion.

Then came the oil spill.

Researchers observed minimal oil on the surfaces of grasses located more than 45 feet from the shoreline, indicating that significant amounts of oil did not move into interior marshes.

Instead, the researchers found that the tall grasses along the marsh edge acted as wall-like trap to incoming oil slicks, concentrating oil on the marsh edge. This concentration of oil on the shoreline protected interior marshes from oiling but worsened already extreme erosion on the shoreline. As oiled plants died, their roots that hold tight to the sediment perished as well. Already eroding sediment was now exposed to wave action without the effect of the gripping plant roots.

The result: elevated erosion rates for 1.5 years that averaged more than 10 feet of shoreline loss per year -- double the natural rate for this area.

The encouraging results, Silliman said, included significant declines in the oil concentration on the marsh surface over 1.5 years and that unaffected, healthy marsh plants in the marsh interior quickly grew back into marsh die-off areas that had not yet been lost due to heightened erosion.

When the new marsh plant growth grew into the erosive edge of the marsh, Silliman said, the recolonization of the area by the gripping plant

roots shut down the oil-elevated erosion rates and returned them to those seen at marsh sites where oil coverage did not occur.

The researchers also found that polyaromatic hydrocarbons, or PAHs, a carcinogenic byproduct of oil, was 100 percent greater at the Barateria Bay testing site than in reference marshes. This finding provides chemical evidence to support their visual observations that marshes in the affected areas were laden with oil while those in reference areas did not receive significant oiling.

By adding Biochar, a charcoal-based substance, to marshlands, Silliman's team is also using new bioremediation tactics to try to break down PAHs into organic material. If this method is successful, he said, it could be used to supplement naturally occurring microbes in the marsh mud that already oxidize the oil carcinogen. The team is soon to publish those findings.

"This is a new idea applied toward cleaning up PAHs," said UF chemistry professor Andrew R. Zimmerman, a co-author on the paper. "It's possible there's a bunch lurking at the bottom of the bay."

Provided by University of Florida