Study finds restoring wetlands can lessen soil sinkage, greenhouse gas emissions

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Jaclyn Hatala Matthes is an assistant professor in Dartmouth College's Department of Geography. Credit: Dartmouth College

Restoring wetlands can help reduce or reverse soil subsidence and reduce greenhouse gas emissions, according to research in California's Sacramento-San Joaquin River Delta by Dartmouth College researchers and their colleagues.

The study, which is one of the first to continually measure the fluctuations of both carbon and methane as they cycle through wetlands, appears in the journal by *Global Change Biology*.

Worldwide, agricultural drainage of organic soils has resulted in vast soil subsidence and contributed to increased atmospheric carbon dioxide concentrations. The California Delta was drained more than a century ago for agriculture and human settlement and has since experienced subsidence rates that are among the highest in the world. It is recognized that drained agriculture in the Delta is unsustainable in the long-term. To help reverse subsidence and capture carbon, there is interest in restoring drained agricultural land-use types to flooded conditions, but flooding may increase methane emissions. Carbon dioxide is the primary greenhouse gas emitted through human activities, but pound for pound, methane's impact on climate change is more than 20 times greater than carbon dioxide.

Researchers at Dartmouth, UC-Berkeley and UC-Davis installed monitoring equipment on three moveable four-meter towers, measuring carbon dioxide and methane concentrations above a pasture and a cornfield that had been drained and a flooded rice paddy, a newly restored wetland and a wetland that underwent restoration in 1997. They found that the drained sites were net carbon and greenhouse gas sources. Conversely, the restored wetlands were net sinks of atmospheric carbon dioxide, but they were large sources of methane emissions, says co-author Jaclyn Hatala Matthes, an assistant professor an assistant professor in Dartmouth's Department of Geography. "However, we do expect that the methane emissions will stabilize over time," she says. "We've seen that emissions tend to increase for the first few years, and that this increase is correlated with the increase in wetland plant growth and spread during this time."

In another recent paper published in the *Journal of Geophysical*

Research–Biogeosciences, Matthes and her co-authors analyzed the correlation between wetland methane emissions and vegetation around the towers, where more plants resulted in an increase in the methane emissions. Where the vegetation patches had more "edges"—convoluted borders—the methane emissions were lower. "We are looking at the structure of vegetation patterns that might help to inform management goals for a restored wetland, how big do you want the vegetation patches to be, how much edge they should have," Matthes says. "It's a little bit tricky in ecosystem engineering, but we are hoping to learn some things about how people might plan wetland vegetation in order to maximize carbon dioxide uptake but to minimize methane release."

Provided by Dartmouth College

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