

Salt marshes' capacity to sink carbon may be threatened by nitrogen pollution

26 August 2019



Great Sippewissett Marsh in Falmouth, Mass. Salt marshes sequester carbon at rates more than an order of magnitude greater than their terrestrial counterparts. Credit: Daniel Buckley

Deep in the waterlogged peat of salt marshes, carbon is stored at much greater rates than in land ecosystems, serving as an offset to climate change due to carbon dioxide (CO₂) build-up in the atmosphere.

However, a new study indicates that a common pollutant of coastal waters, nitrate, stimulates the decomposition of organic matter in [salt](#) marsh sediments that normally would have remained stable over long periods of time. This increase in decomposition, which releases CO₂, could alter the capacity of [salt marshes](#) to sequester carbon over the long term. The study, led by scientists at the Marine Biological Laboratory (MBL), Woods Hole, and Northeastern University, is published in *Global Change Biology*.

"Traditionally, we have viewed salt marshes as resilient to nitrogen pollution, because the

microbes there remove much of the nitrogen as gas through a process called denitrification," writes first author Ashley Bulseco, a postdoctoral scientist at the MBL.

"But this research suggests that when nitrate is abundant, a change occurs in the microbial community in salt marsh sediments that increases the microbes' capacity to degrade organic matter. This potentially reduces the ability of the marsh to store carbon," Bulseco writes.

As [global temperatures](#) continue to rise, a number of carbon capture strategies have been proposed, including sequestering CO₂ in "blue carbon" habitats such as salt marshes, mangroves and seagrass meadows. However, coastal [nitrogen pollution](#) is also still rising in many areas due to agricultural and urban runoff, and sewage.

"Given the extent of nitrogen loading along our coastlines, it is imperative that we better understand the resilience of salt marsh systems to nitrate, especially if we hope to rely on salt marshes and other blue carbon systems for long-term carbon storage," the authors write.

The next phase of this research, already in progress, is to analyze the microbial community responsible for degrading carbon in a salt marsh ecosystems, especially when exposed to high concentrations of nitrate.

More information: Ashley N. Bulseco et al, Nitrate addition stimulates microbial decomposition of organic matter in salt marsh sediments, *Global Change Biology* (2019). [DOI: 10.1111/gcb.14726](https://doi.org/10.1111/gcb.14726)

Provided by Marine Biological Laboratory

APA citation: Salt marshes' capacity to sink carbon may be threatened by nitrogen pollution (2019, August 26) retrieved 14 October 2019 from <https://phys.org/news/2019-08-salt-marshes-capacity-carbon-threatened.html>

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