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Water quality trade-offs of wetlands under a changing climate

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Installing in situ nutrient sensors at the outlet of the wetland-pond system in Wytham, UK. Photo

Installing in situ nutrient sensors at the outlet of the wetland-pond system in Wytham, UK. Photo by Helen Jarvie.

There is increasing interest in using wetlands, including ponds, as "nature-based solutions" for flood mitigation and soil and water conservation. However, wetlands can also become sources of nutrients to downstream water bodies, impairing water quality.

In a recent *Journal of Environmental Quality* article, researchers examined nutrient cycling in a lowland wetland-pond system in southern England over a 20-year period. The team used hydrochemical monitoring, high-resolution in situ sensor measurements, and meteorological observations to explore the climatic and biogeochemical drivers of wetland nutrient retention and release.

During years with warm, dry summers and high solar insolation, the wetland switched from being a net nutrient sink to a net source of highly bioavailable nutrients over prolonged periods in late summer and fall. Primary production drove nutrient release, providing a carbon source for microbial mineralization of organic matter, releasing soluble phosphorus, ammonium, and silicon. The highest-intensity nutrient release events appeared to reflect antecedent climate drivers of legacy organic matter accumulation from the previous year's biomass production.

Climate change scenarios predict hotter, drier summers and wetter winters in southern England, which are expected to increase biomass delivery, production, and turnover. The changing climate has the potential to tip the balance towards greater nutrient release from wetlands, increasing downstream eutrophication risks.

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Jarvie, H.P., Pallett, D.W., Schäfer, S.M., Macrae, M.L., Bowes, M.J., Farrand, P., … & Fisher, N. (2020). Biogeochemical and climate drivers of wetland phosphorus and nitrogen release: Implications for nutrient legacies and eutrophication risk. *Journal of Environmental Quality*, *49*, 1703–1716. **https://doi.org/10.1002/jeq2.20155**

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