Study indicates agriculture adds more phosphorus to streams than to lakes

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Quantifying the biggest sources of phosphorus to U.S. waterways, such as Hazel Creek in North Carolina, is important for informing effective policy aimed at restoring these waters. Credit: Jerry Ackerman, U.S. EPA

Phosphorus is an important nutrient, but too much of it in lakes and streams can diminish water quality and lead to eutrophication, resulting in harmful algal blooms and dead zones. To restore waterways degraded by excess phosphorus, decision-makers must understand which sources

of the nutrient could be reduced to make the biggest impact on water quality.

Agricultural runoff from fertilizers and manure is a common source of phosphorus, but the impact of agriculture is not uniform across different bodies of water.

A research team applied several statistical approaches to analyze data from the U.S. EPA's National Lakes Assessment and the National Rivers and Streams Assessment to determine the most influential drivers of phosphorus levels in the country's lakes and streams and better understand how these systems differ in their responses to changing inputs from various phosphorus sources.

The study, titled "Comparing Drivers of Spatial Variability in U.S. Lake and Stream Phosphorus Concentrations," was published in the *Journal of Geophysical Research: Biogeosciences*.

They found that phosphorus levels in streams were most strongly influenced by the amounts of fertilizer and manure introduced to nearby farmland, as well as by legacy sources of agricultural phosphorus released by erosion. Lake phosphorus levels, meanwhile, were determined by a more complex mix of variables—agricultural runoff played a role, as did historic inputs from erosion, internal recycling, and other factors.

The study indicates that in the short term, efforts to mitigate agricultural runoff would have the greatest impact on reducing phosphorus surpluses in U.S. streams. However, higher temperatures and more precipitation also correlated with increased phosphorus levels in the data set, and the authors note that these factors could contribute to greater phosphorus loading in surface waters in the future due to climate change.

More information: Robert D. Sabo et al, Comparing Drivers of Spatial Variability in U.S. Lake and Stream Phosphorus Concentrations, *Journal of Geophysical Research: Biogeosciences* (2023). DOI: 10.1029/2022JG007227

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