

Study explores long-term water quality trends in near-pristine streams

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A researcher gathers stream data at Mack Creek, on the H.J. Andrews Experimental Forest in Oregon. Credit: Tom Iraci, U.S. Forest Service

For the first time, a study has compared water quality trends in forested streams across the country that are largely undisturbed by land use or land cover changes.

The study, which draws on decades' worth of data from reference



streams in six U.S. states and Puerto Rico, underscores the value of longterm data in understanding the patterns and causes of <u>water quality</u> changes in streams and rivers. It is published in the current issue of the journal *Environmental Research Letters*.

"Much of what we know about changes in stream water quality comes from studies where basins have been impacted by human activity," said Alba Argerich, a postdoctoral research associate with Oregon State University and the study's lead author. "Our work intentionally focused on relatively undisturbed streams, the very reference sites that serve as benchmarks for evaluating water quality trends."

In the study, Argerich and colleagues analyzed concentrations of stream nitrogen, which, despite regulations, have been on the rise across the country as energy and food production release reactive forms of the compound into waterways. Once there, reactive nitrogen—nitrate and ammonium—can alter stream function and cause substantial changes in stream communities.

The study focused on sites that are part of the USDA Forest Service's Experimental Forest and Range network, a system of 80 locations across the country that provide settings for long-term science and management studies. Many of the sites have long-term monitoring programs and data sets spanning decades and so provide unique opportunities to evaluate long-term trends.

"These long-term water quality data from experimental forests are a treasure," said Sherri Johnson, a research ecologist with the <u>Pacific</u> <u>Northwest Research Station</u> and a co-author of the study. "Some sites have over 40 years of weekly data."

The researchers analyzed 559 years of stream nitrate and 523 years of stream ammonium data from 22 streams in 7 experimental forests across



the country. They found that even these near-pristine forested streams are subject to change, as stream nitrate has declined in the Pacific Northwest, in the Northeast, and in Puerto Rico, but has increased in the Mountain West and the South. They also observed that, within a forest, trends were not always in sync—at some sites, two streams within an <u>experimental forest</u> had opposing trends for the same type of nitrogen for the same period of time, suggesting that the controls on stream nitrogen concentrations may vary among and within sites.

"Understanding how nutrient concentrations are changing over time in reference streams is vital for informing best management practices that are aimed at protecting water resources," Argerich said.

More information: iopscience.iop.org/1748-9326/8/1/014039

Provided by USDA Forest Service

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