UNH Research: New England Lakes Recovering Rapidly From Acid Rain

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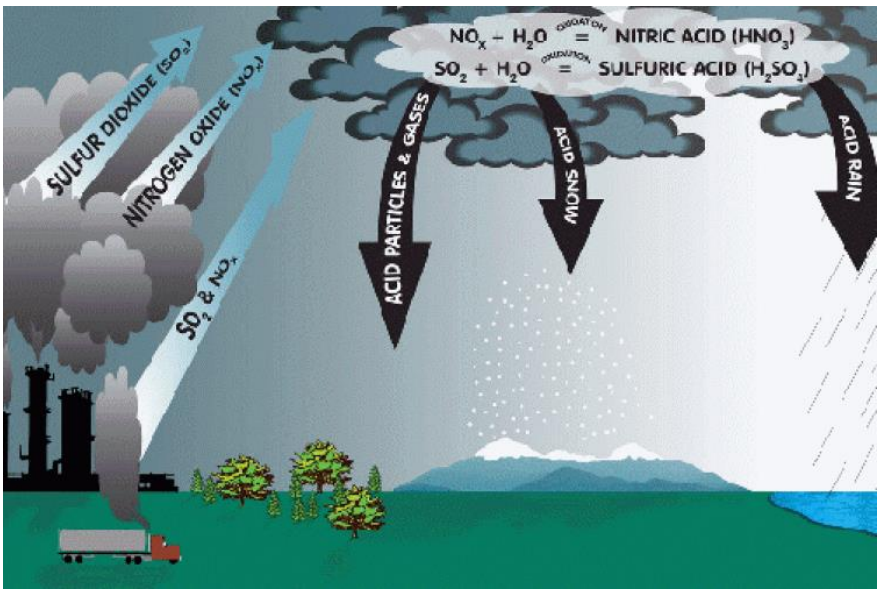

*ACID RAIN REFERS TO A MIX OF WET AND DRY MATERIALS FROM THE ATMOSPHERE CONTAINING HIGHER-THAN-NORMAL AMOUNTS OF NITRIC AND SULFURIC ACIDS. THE PRECURSORS OF ACID RAIN FORMATION RESULT FROM BOTH NATURAL SOURCES, SUCH AS VOLCANOES AND DECAYING VEGETATION, AND MAN-MADE SOURCES, PRIMARILY EMISSIONS OF SULFUR DIOXIDE AND NITROGEN OXIDE RESULTING FROM FOSSIL FUEL COMBUSTION. GRAPHIC CREDIT: **NY DEPARTMENT OF ENVIRONMENTAL CONSERVATION***

For more than 40 years, policy makers have been working to reduce acid rain, a serious environmental problem that can devastate lakes, streams, and forests and the plants and animals that live in these ecosystems. Now new research funded by the NH Agricultural Experiment Station (NHAES) at the University of New Hampshire College of Life Sciences and Agriculture indicates that lakes in New England and the Adirondack Mountains are recovering rapidly from the effects of acid rain.

Researchers found that sulfate concentration in rain and snow declined by more than 40 percent in the 2000s, and sulfate concentration in lakes declined at a greater rate from 2002 to 2010 than during the 1980s or 1990s. During the 2000s, nitrate concentration in rain and snow declined by more than 50 percent and nitrate concentration declined in lakes.

“This is really good news for New England. Lakes are accelerating in their recovery from the past effects of acid rain. Our data clearly demonstrate that cleaning up air pollution continues to have the desired effect of improving water quality for our region’s lakes,” said NHAES researcher William McDowell, professor of environmental science and director of the NH Water Resources Research Center.

In addition to McDowell, the research team included Kristin Strock, assistant professor at Dickinson College; Sarah Nelson, assistant research professor with the Senator George J. Mitchell Center and cooperating assistant research professor in Watershed Biogeochemistry in the UMaine School of Forest Resources; Jasmine Saros, associate director of the Climate Change Institute at UMaine and professor in UMaine’s School of Biology & Ecology; Jeffrey Kahl, then-director of environmental and energy strategies at James Sewall Company.

Researchers analyzed data collected since 1991 at 31 sites in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and southern New York and 43 sites in the Adirondack Mountains of New York. The results are presented in “Decadal Trends Reveal Recent Acceleration in the Rate of Recovery from Acidification in the Northeastern U.S.” in the journal *Environmental Science & Technology*.

According to the U.S. EPA, acid rain refers to a mix of wet and dry materials from the atmosphere containing higher-than-normal amounts of nitric and sulfuric acids. The precursors of acid rain formation result from both natural sources, such as volcanoes and decaying vegetation, and man-made sources, primarily emissions of sulfur dioxide and nitrogen oxide resulting from fossil fuel combustion.

In the United States, roughly two-thirds of all sulfur dioxide and a quarter of all nitrogen oxide come from electric power generation that relies on burning fossil fuels, such as

coal. Acid rain occurs when these gases react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds. The result is a mild solution of sulfuric acid and nitric acid. When sulfur dioxide and nitrogen oxides are released from power plants and other sources, prevailing winds blow these compounds across state and national borders, sometimes over hundreds of miles.

Enacted in 1970, the U.S. Clean Air Act was amended in 1990 and implemented in 1994 to regulate emissions, especially from coal-burning power plants. The Clean Air Interstate Rule issued in 2005 by the EPA sought to further reduce sulfur dioxide and nitrogen oxides by 70 percent. Following these policy changes, total emissions of sulfur and nitrogen in the United States decreased by 51 and 43 percent, respectively, between 2000 and 2010, which was twice the rate of decline for both in the 1990s.

Founded in 1887, the NH Agricultural Experiment Station at the UNH College of Life Sciences and Agriculture is UNH's original research center and an elemental component of New Hampshire's land-grant university heritage and mission. We steward federal and state funding to provide unbiased and objective research concerning diverse aspects of sustainable agriculture, aquaculture, forest management, and related wildlife and natural resources. We maintain the Woodman and Kingman agronomy and horticultural farms, the Macfarlane Greenhouses, the Fairchild Dairy Teaching and Research Center, and the Organic Dairy Research Farm. Additional properties also provide forage, forests and woodlands in direct support to research, teaching, and outreach.

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NH AGRICULTURAL EXPERIMENT STATION

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