

## Acid Test July 23, 2010 Conservation ScienceOff



Twenty years after the United States moved to take the sting out of acid rain, researchers are getting a clearer picture of how the pollution affected life in sensitive waters. A detailed new survey of lakes in the Adirondack mountains of New York State finds that acidification has caused species losses in every link of the food web, from bacteria to fish. But the study also provides a roadmap for evaluating how damaged lakes are recovering since Congress passed anti-acid legislation in 1990.

In the 1980s, anglers and researchers became alarmed as many of the Adirondack's 2,800 lakes became eerily clear and sterile, devoid of fish and even plankton. Scientists soon fingered the culprit: sulfur dioxide spewed by coal-fired power plants. The sulfur rose into the atmosphere, then returned to Earth as highly acidic rain, snow and soot. Some waters were protected from acidification by geological formations rich in rocks – such as limestone – that “buffered” or neutralized the acid. Other lakes and streams, such as those in the Adirondacks, weren't so lucky; pH levels plunged to levels deadly to many forms of life.

Researchers put some troubling numbers on acid rain's corrosive power in an article published online on 8 July by Environmental Science & Technology. The team, led by Sandra A. Nierzwicki-Bauer of the Rensselaer Polytechnic Institute in Troy, New York, assembled water quality and species surveys taken at 30 lakes between 1994 and 2006. Then, they examined how species numbers related to the pH of the water. The trend was crystal clear: More acid lakes had, in general, fewer types of bacteria, phytoplankton, rotifers, crustaceans, plants and fish. Indeed, the researchers were able to come up with a grim rule of thumb: For every one-digit drop in pH (from 6 to 5, for instance), there were 2.5 fewer bacterial genera, 1.43 fewer bacterial classes, and 3.97 fewer species of phytoplankton. A one-digit drop in pH also meant nearly 2 fewer crustacean species, and about 4 fewer species of plants, rotifers and fish. Even such seemingly minor losses can blow big holes in relatively simple lake food webs, the authors note.

“There had been a lot of studies that looked at the impact of acid rain at a chemical level – we took the next step of looking closely at changes in the biota,” says Nierzwicki-Bauer. The team also identified some species that seem especially sensitive to changes in pH, and so could be promising indicators of changing water quality. Those sentinels should feature prominently in the team's next study, which is looking at how lake ecosystems have changed since Congress forced power utilities to dramatically cut the amount of sulfur streaming from their smokestacks. Nierzwicki-Bauer says a very preliminary glance at the numbers suggests they might carry some good news. – **David Malakoff**

**Source:** Nierzwicki-Bauer, S., Boylen, C., Eichler, L., Harrison, J., Sutherland, J., Shaw, W., Daniels, R., Charles, D., Acker, F., Sullivan, T., Momen, B., & Bukaveckas, P. (2010). Acidification in the Adirondacks: Defining the Biota in Trophic Levels of 30 Chemically Diverse Acid-Impacted Lakes Environmental Science & Technology DOI:

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