

Study reveals air pollution is causing widespread and serious impacts to ecosystems

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The Chesapeake Bay, like other East Coast estuaries, suffers from pollution by excess nitrogen. © David Dorner/BigStockPhoto.com

If you are living in the eastern United States, the environment around you is being harmed by air pollution. From Adirondack forests and Shenandoah streams to Appalachian wetlands and the Chesapeake Bay, a new report by the Cary Institute of Ecosystem Studies and The Nature Conservancy has found that air pollution is degrading every major ecosystem type in the northeastern and mid-Atlantic United States.

The report, *Threats From Above: Air Pollution Impacts on Ecosystems and Biological Diversity in the Eastern United States*, is the first to analyze the large-scale effects that four air pollutants are having across a broad range of habitat types (see inset). The majority of recent studies

focus on one individual pollutant. Over 32 experts contributed to the effort; the prognosis is not good.

"Everywhere we looked, we found evidence of air pollution harming natural resources," comments Dr. Gary M. Lovett, an ecologist at the Cary Institute and the lead author of the report. "Decisive action is needed if we plan on preserving functioning ecosystems for future generations."

Pollutants poison areas far from their point of origin

The pollutants assessed – sulfur, nitrogen, mercury, and ground-level ozone – largely originate from smokestacks, tailpipes, and agricultural operations. While initially airborne, these pollutants eventually return to the landscape, where they contaminate the soil and water.

Airborne emissions can travel long distances before making their way back to the ground. Because the eastern United States is downwind from large industrial and urban pollution sources, it receives the highest levels of deposited air pollution in North America. This is bad news for vulnerable wildlife, forest productivity, soil health, water resources, and ultimately, economies.

Co-author Dr. Timothy H. Tear, of The Nature Conservancy, comments, "Deposited pollutants have tangible human impacts. Mercury contamination results in fish that are unsafe to eat. Acidification kills fish and strips nutrients from soils. Excess nitrogen pollutes estuaries, to the detriment of coastal fisheries. And ground-level ozone reduces plant growth, a threat to forestry and agriculture."

New air quality standards are critical to protecting natural resources

At the heart of the report is a call to action. Currently, U.S. air quality standards are determined by direct impacts to human health, with regulations targeting emission levels – what leaves tail pipes and smoke stacks. They do not take into account where airborne pollution is actually deposited in the landscape or how this pollution compromises our soil and water resources and resident plants and animals.

"To safeguard ecosystem health, we need a new way of thinking about air pollution – one that moves beyond measuring what is put up in the air, and captures actual impacts to natural areas, wildlife, and the services they provide," Lovett notes.

The authors urge U.S. policymakers to establish air quality standards that are based on critical loads. This is defined as the maximum level of deposited pollution that ecosystems can tolerate before harmful effects occur. By establishing thresholds, pollutants can be regulated in a way that preserves functioning ecosystems. In some areas, such as Rocky Mountain National Park, federal agencies have already adopted this approach to evaluate the threat from air pollution. It is also being used to regulate air pollution throughout Europe.

Monitoring is an essential tool

Establishing critical loads will require renewed investment in monitoring programs for air pollution and the ecosystems it affects. "We can't assess if ecosystems are harmed by air pollution if we don't monitor them. While some good pollution monitoring programs exist, our current system is fragmented, underfunded, and has serious gaps," remarks Lovett.

While there may be initial costs to ramping up monitoring efforts, consider the alternative. The fishless lakes of the Adirondacks are a

harsh reminder that air pollution does not recognize property lines. Tear concludes, "In the absence of critical loads, there is a false security in conventional land conservation. We can manage natural areas with the best possible protocols, but we can't really 'protect' the land if it is continually exposed to air pollution."

View the report at www.ecostudies.org/Threats_from_Above.pdf .

View interactive on-line content about the report (including a Q&A):
www.nature.org/tncscience/misc/art25400.html

Source: Cary Institute of Ecosystem Studies

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