



ECOSYSTEM SERVICES RESEARCH PROGRAM

RESEARCH FOCUSES ON NITROGEN AND ITS IMPACTS ON ECOSYSTEM SERVICES

Issue:

Reactive nitrogen is a pollutant of national and global significance because its use is widespread and dramatically increasing.

Nitrogen is a particularly intricate pollutant. While it is one of life’s essential nutrient elements, providing a valuable service in the production of food and fiber for human use, it also can degrade ecosystems and the services they provide. As a result, it has the potential to impact human health and wellbeing.

Nitrogen is released during combustion by motor vehicles and industry and by the application of fertilizers. This nitrogen is then taken up and stored in rivers, estuaries and other water bodies by a range of biological processes.

The consequences to ecosystem services from this sequestered nitrogen are not fully understood. A new generation of observation and

assessment tools are needed to inform decision makers about the trade-offs between releases of nitrogen, the use of ecosystems to sequester the element, and the effects of nitrogen-containing pollutants on human well-being. The insights gained will provide critical information for use by EPA, states, and partners to meet requirements under the Clean Water and Clean Air Acts.

Science Objective:

The Ecosystem Services Research Program (ESRP) in EPA’s Office of Research and Development (ORD) applies the expertise and knowledge of its scientists to study and assess reactive nitrogen. The research will improve understanding of how nitrogen, a regulated pollutant, impacts ecosystem services in both positive and negative ways.

The objectives of this research are to:

- Identify nitrogen-responding ecosystems and services
- Assess ecosystems and services affected by changing nitrogen loads
- Quantify the response of ecosystem services to alternative nitrogen loadings from multiple sources
- Determine loads or exposure to nitrogen that conserve, enhance or restore the delivery of ecosystem services
- Determine the value of changes in ecosystem services affected by changes in nitrogen loads

Application and Impact:

Nitrogen research is providing new data and tools for EPA and others that can be used to make decisions that will protect air and water

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ECOSYSTEM SERVICES RESEARCH PROGRAM

continued from front

quality, two vital services provided by ecosystems.

The research is advancing the ability to protect human health in many ways. Applications include:

- Directly supporting EPA's development of nitrogen oxide standards to protect air quality
- Supporting nutrient criteria development for the nation's lakes, streams, rivers, wetlands, and estuaries.
- Guiding decisions on the development of load limits of nitrogen in waterways as part of EPA's regulations for Total Maximum Daily Loads (TMDLs)
- Contributing to development of best management practices for controlling nutrient pollution from non-point sources such as agricultural runoff.

The research conducted by the Ecosystem Services Research Program is offering tools that will enable states, communities and others to develop sustainable

solutions to the use of ecosystem services. With the aid of science, good stewardship can be practiced to protect the environment and human health and well-being.

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