CityDep: Filling gaps in understanding Atmospheric Nitrogen Pollution to Urban Ecosystems

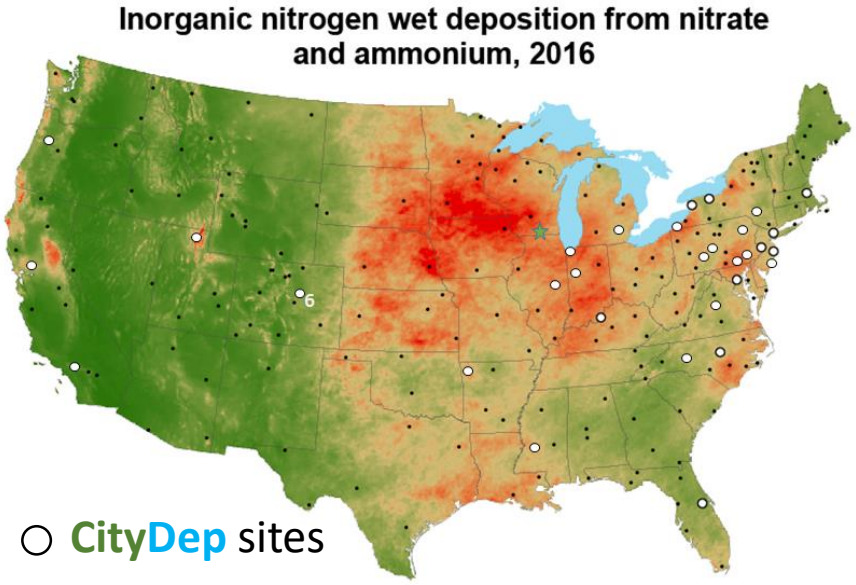
Why study atmospheric nitrogen pollution?

Nitrogen deposition can lead to a series of negative consequences:

- Nutrient contamination of surface waters,
- Acidification of soils and waterways,
- Harmful algal blooms,
- Harmful effects on human health, and
- Reductions in plant diversity.

Nitrogen emission sources to deposition by snow and rain:

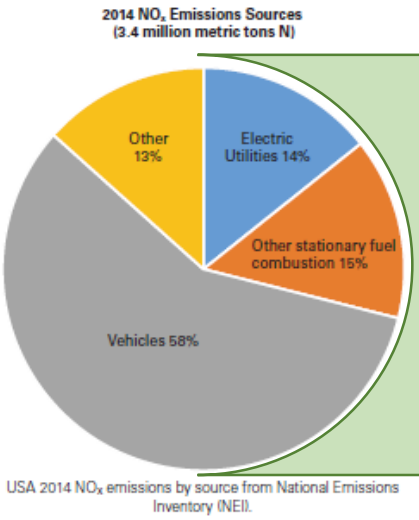
- Electric generation plants,
- Automobile exhaust,
- Fertilizers, and
- Livestock operations



What is the NADP and the National Trends Network?

Since 1978, the National Atmospheric Deposition Program (NADP) has measured precipitation chemistry and wet deposition of pollutants at over 275 locations across North America. NADP results indicate the effectiveness of regulatory actions (Clean Air Act and Amendments) and management practices to reduce environmental impacts of air pollution. All data are publicly available (nadp.isws.illinois.edu/NTN/). NADP is a cooperative, with sites funded independently by a variety of organizations, including municipalities, federal, state, and tribal governments, research organizations, universities, and private companies. NADP provides long-term atmospheric deposition values needed to build, refine, and evaluate air-quality transport and deposition models as well as aquatic and terrestrial ecosystem assessment models.

The National Trends Network (NTN) of the NADP was designed to monitor changes in regional rainwater chemistry, primarily in rural areas, far from cities where multiple sources can impact precipitation chemistry. **However, recent research indicates that cities are subject to much higher nutrient loads in precipitation than nearby rural monitoring sites. There is now a great desire by municipal stakeholders and researchers of urban air quality, water quality, and human health to determine exactly how much nitrogen is raining onto urban watersheds.** Now, NADP has launched CityDep, a new subnetwork of urban NTN sites!



USA 2014 NO_x emissions by source from National Emissions Inventory (NEI).

Why measure atmospheric nitrogen pollution in cities?

- More than half of the Earth's population currently lives in cities.
- Pollution in urban ecosystems important for human and environmental health.
- Nitrogen deposition remains significantly elevated (more than ten times over pre-industrial levels) and occurs as hot spots in urban areas.
- Nitrogen deposition in cities occurs because of the concentration of NO_x from transportation and industrial point sources.
- Recent work in Denver, Pittsburgh and Boston indicates that rates of nitrogen deposition are two- to three- times higher than nearby rural sites!

National Atmospheric Deposition Program

For more information or to help:
http://nadp.slh.wisc.edu/
Contact: Greg Wetherbee (USGS) at 303-236-1837
or David Gay (NADP) at 608-263-9162

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What are the benefits of joining CityDep?

CityDep monitoring sites can serve as a platform for co-located research efforts, ancillary measurements, and create synergy with other stakeholders interested in air and water quality, aeroallergens and public health.

Data collected at CityDep sites can be used to help manage:

- Urban stormwater,
- Regional parks,
- Urban forests and watersheds, and
- Urban agriculture.

Chronic deposition of excess nutrients contributes to:

- Tree mortality,
- Acidification of urban soils, and
- Leaching harmful metals from soils.

Episodic deposition of excess nutrients may contribute to:

- Total Maximum Daily Loads in streams and
- Harmful algal blooms.

How do I start a new CityDep site in my city?

CityDep needs new site sponsors and operators! Site operators collect samples and rainfall data on a weekly basis. Chemistry of rainwater from your sponsored site will be analyzed by the Central Analytical Laboratory (Madison, WI). All results are subject to stringent QA/QC measures. Data from your site will be made available on the NADP Web site: http://nadp.slh.wisc.edu/.

Contact us to become a If CityDep, site sponsor!

How much does a CityDep site cost?

The capital cost for equipment is approximately $10,000, but a limited amount of preowned equipment is also available at a greatly reduced rate.

Sponsors pay an annual fee for chemical analysis of samples, QA/QC, data processing and dissemination. Pricing information can be obtained by contacting the NADP Program Office using the contact information below. **Site operation requires approximately 1 hour per week every Tuesday morning.**

A poor air quality day in Pittsburgh, PA on August 17, 2009. Nitrogen dioxide (NO_x) is one of the main precursors to the smog shown here.

Streams and rivers in many cities like Pittsburgh, PA are in violation of the Clean Water Act Section 303(d). Shown here in red are Pittsburgh area streams and rivers in violation of 303(d) for nutrient impairment. Nitrate and ammonium in rainwater contribute to this nutrient impairment.

Installation options at CityDep sites include rooftop or ground-based instrumentation. Ground-based instrumentation may have added public outreach and educational benefits.

CityDep site instrumentation Includes NADP-approved electronic precipitation collector and rain gage.

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