

# Thinking Outside the Bucket: the National Atmospheric Deposition Program (NADP) Data in the Satellite Era

Sarah Benish, NADP Coordinator

HAQAST Public Meeting

*2B: Evaluating emissions and anthropogenic activities*

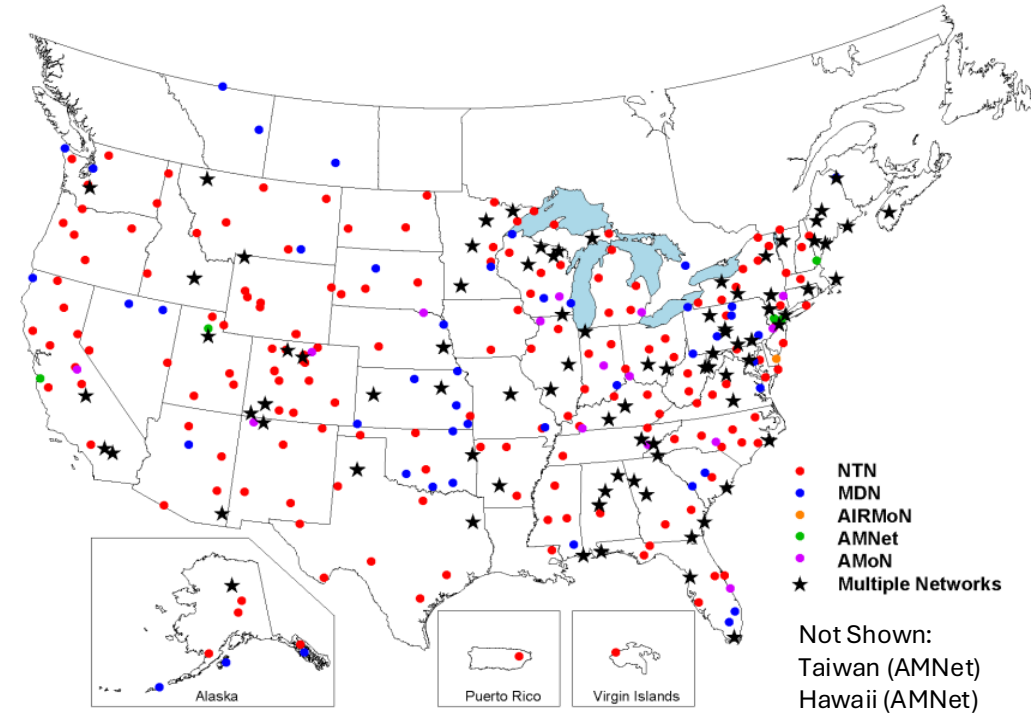
May 13, 2026

Madison, WI



# National Atmospheric Deposition Program: Overview

- ~350 monitoring locations across North America
- Operating continuously since 1978—nearly 50 years of chemical trend data
- Cooperative program hosted by the Wisconsin State Laboratory of Hygiene: Federal, Tribal, state, local agencies, universities, NGOs
- Free and publicly available data



<https://nadp.slh.wisc.edu/>

# NADP Networks

## National Trends Network (NTN)

- Wet deposition
- pH, specific conductance,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ , Na, K,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{Cl}^-$ , and  $\text{NH}_4^+$  ions
- Weekly samples
- Concentration and flux

## Mercury Deposition Network (MDN)

- Wet deposition
- Mercury ion ( $\text{Hg}^{2+}$ )
- Weekly samples, except for ~15 sites that have switched to 2-week observations
- Concentration and flux

## Atmospheric Mercury Network (AMNet)

- Gaseous elemental mercury
- Hourly samples
- Discontinued speciated measurements

## Mercury Litterfall Network (MLN)

- Autumn samples for total Hg



## Ammonia Monitoring Network (AMoN)

- Gaseous ammonia ( $\text{NH}_3$ )
- 2 week passive samples



## PFAS Subnetwork (PFN)

- Weekly samples
- Concentration and flux of 40 compounds



## Passive Hg Pilot

- Quarterly average gaseous elemental Hg concentrations using passive sampler

# NADP Precipitation Network (NPN)

- Provides fully quality-assured electronic precipitation data at **15-minute, hourly, and daily** resolution
- Data available 1-2 weeks after collection
- Coverage expands across the existing NADP site network



*ETI NOAHIV Gauge*



*Ott Pluvio2 Gauge*

# NADP Governance

## Executive Committee

Technical

Advisory

Science

Network  
Operations  
Subcommittee  
(NOS)

Education and  
Outreach  
Subcommittee  
(EOS)

Budget  
Advisory  
Committee

Quality  
Assurance  
Advisory Group

Data  
Management  
Advisory Group

Critical Loads  
of Atmospheric  
Deposition  
(CLAD)

Total  
Deposition  
(TDEP)

Aeroallergen  
Monitoring  
(AMSC)

Mercury in the  
Environment  
and Links to  
the  
Environment  
(MELD)

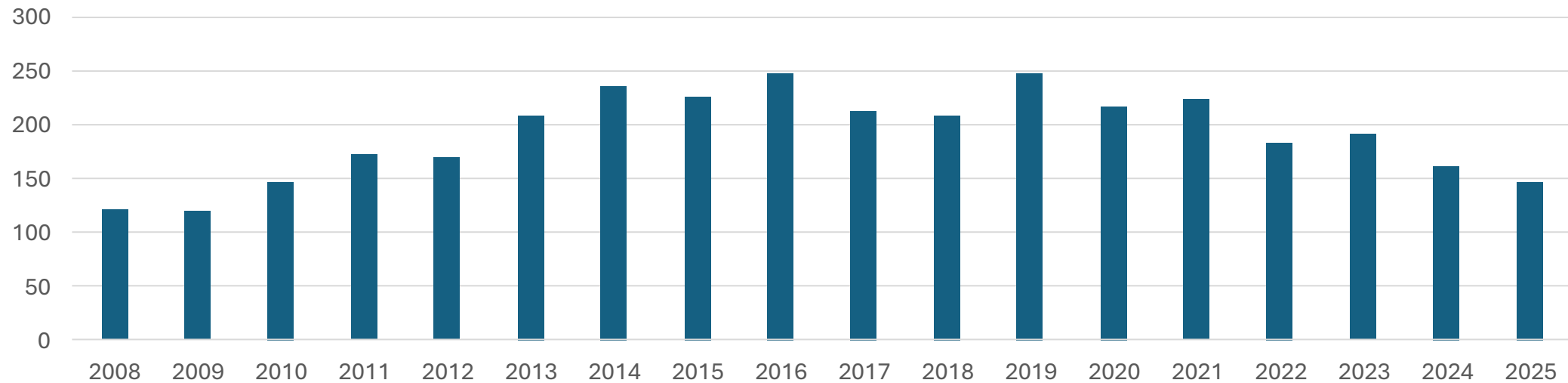
# The NADP Cooperators

(100+ total agencies)



# NADP Research Publications cross many disciplines

Annual Number of Journal Publications using NADP Data



Deposition  
Measurements  
and Trends

Mercury: Cycling,  
Transport, &  
Contamination

Ecosystem  
Impacts & Critical  
Loads

Satellite retrieval  
validation

Air and water  
modeling

Resource  
Management

Agriculture, Land  
Use, & Water  
Quality

# Special Project: Black carbon in precipitation

Article  
**Understanding the Origin of Wet Deposition Black Carbon in North America During the Fall Season**

Piyaporn Srirachoenvech<sup>1,\*</sup>, Ross Edwards<sup>2</sup>, Müge Yaşar<sup>1</sup>, David A. Gay<sup>2</sup> and James Schauer<sup>1,2</sup>

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<sup>2</sup> Wisconsin State Laboratory of Hygiene, University of Wisconsin-Madison, Madison, WI 53706, USA; pedwards5@wisc.edu (R.E.); dgay2@wisc.edu (D.A.G.)  
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## Investigation of Black Carbon Wet Deposition to the United States from National Atmospheric Deposition Network Samples

List of Issues Articles in Press 22 November 2023 Reach: 303

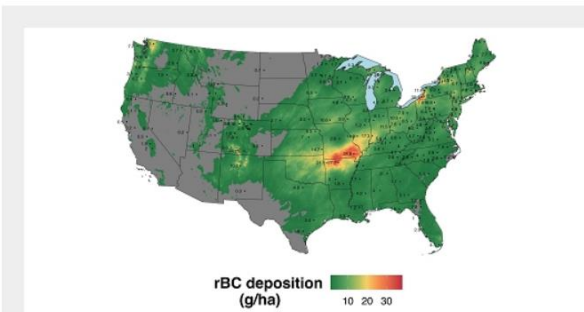
Aerosol and Atmospheric Chemistry USA

Piyaporn Srirachoenvech<sup>1</sup>, Ross Edwards<sup>2</sup>, Müge Yaşar<sup>1</sup>, David Gay<sup>2,3</sup>, James J. Schauer<sup>1,2</sup>

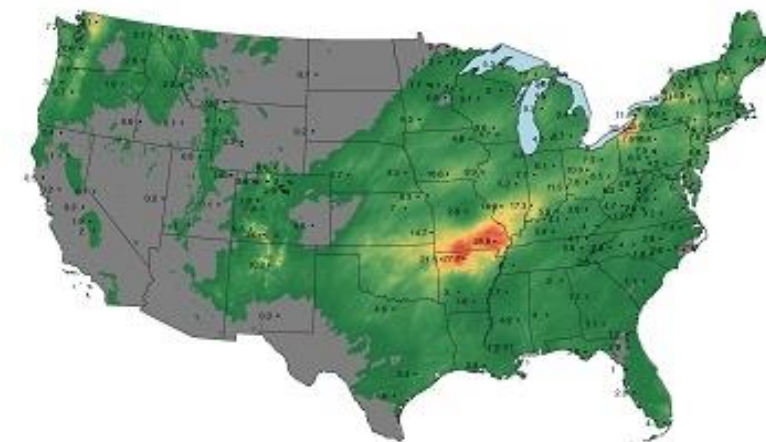
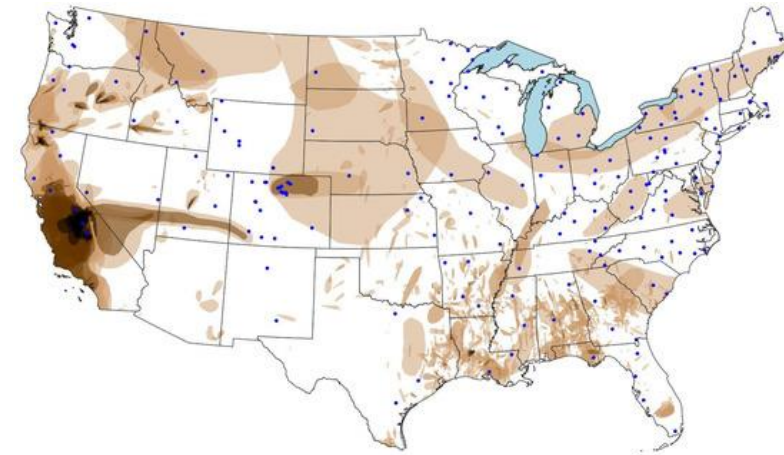
+ Show author affiliations

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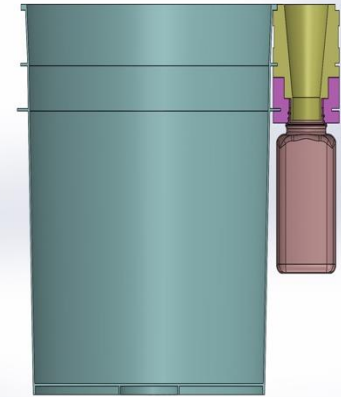


## HMS Smoke Map for Study Period



# Special Project: Total Nitrogen and Total Phosphorus in Precipitation

- Sampler would accompany normal NTN sample
- Analyze for total nitrogen (nitrate+ammonium+organic N) and total phosphorus (orthophosphate + organic P)
- Early testing at WSLH found this design collects an appropriate sample and works consistently in side by side comparisons
- National Parks Service and Colorado State University are continuing preliminary testing

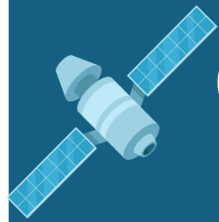


# NADP & Satellite Data



## What NADP offers satellite data:

- NTN & MDN: 48 years of wet deposition records for trend validation and budget closure—with archive samples
- AMoN: 2-week  $\text{NH}_3$  concentrations at ~70 sites — a ready-made validation network for satellite  $\text{NH}_3$  retrievals
- Deposition science community working to expand measurements, such as Total N/P and black carbon in precipitation



## What satellite data offer NADP:

- Spatial coverage between our point measurements; opportunities to be merged with CTMs
- Pathway for estimating dry deposition — a critical gap in NADP's total deposition picture
- Source attribution: connecting what we measure in the bucket to where it came from

*Bridging scientific communities: ground networks, satellite retrievals, and modeling working together as a complete observing system for air quality and ecosystem and health impacts*

# Spring Scientific Symposium

*THEME: THINKING OUTSIDE THE  
BUCKET: INNOVATION IN A  
CHANGING ENVIRONMENT*

- Location: Madison Concourse Hotel in Madison, WI
- Date: June 9-12, 2026
- More details  
<https://nadp.slh.wisc.edu/nadp2026/>



# Contact Information



NADP website:  
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