

# National Research Support Project Impacts National Atmospheric Deposition Program

NRSP-003 (2009-2014)

## Tracking Atmospheric Deposition and its Effects

Gases and particulates released into the atmosphere eventually settle to the ground as dry deposition or fall to the earth in rain and snow as wet deposition. The chemical pollutants and biological pathogens in atmospheric deposition can accumulate in soils and bodies of water and make their way into plants and animals, including the foods we eat. The National Atmospheric Deposition Program (NADP) provides continuous national-scale measurement of atmospheric deposition amounts, geographic distribution, and trends across North America. By monitoring the flow of pollutants into the biosphere, NADP data support research and education about the effects of deposition on ecosystems, agricultural systems, cultural artifacts, and human populations. Through this work, the NADP helps foster environmental stewardship, ensure food safety and human health, and improve agricultural productivity.



An NADP site was recently set up at North Carolina Agricultural & Technical State University.

## National Research Support Project Provides Integral Support to NADP

Since 1993, the NADP has been designated a National Research Support Project (NRSP-3). As such, the NADP has been able to bring together scientists, educators, and policymakers from Agricultural Experiment Stations (SAES), universities, government agencies, national forests and laboratories, Native American tribes, environmental institutes, private companies, and other organizations into a cohesive monitoring network. NRSP-3 provides a framework for sharing financial, human, and technological resources.

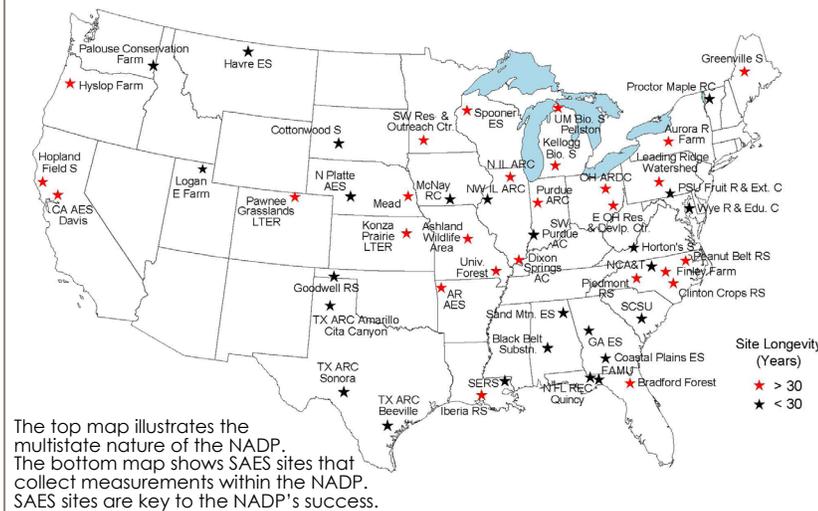
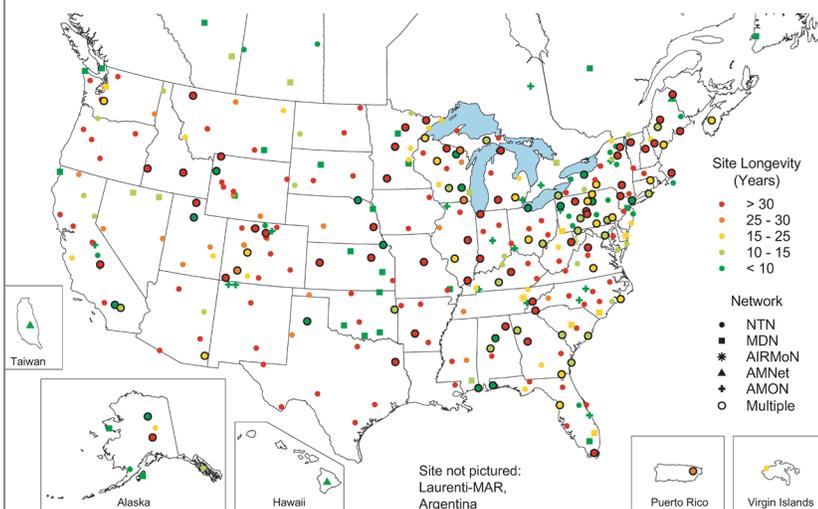
The NADP operates five monitoring networks (see table below): the National Trends Network (NTN), the Atmospheric Integrated Research Monitoring Network (AIRMoN), Mercury Deposition Network (MDN), Atmospheric Mercury Network (AMNet), and Ammonia Monitoring Network (AMoN). With multistate, multidisciplinary participation, the NADP is able to efficiently manage these networks and quickly respond to emerging needs. For example, the NADP:

- Facilitated conversion of precipitation gages to an all-digital network
- Developed new monitoring networks for mercury in litterfall (leaves, twigs, etc.) and pathogen spores (in partnership with the USDA Cereal Disease Laboratory)
- Added the ability to detect the analyte bromine (a strictly regulated, ozone-depleting substance) in precipitation
- Tracked wet deposition from the Fukushima nuclear incident in Japan

NRSP status leverages considerable federal and state funding and much lower costs for NADP site sponsors. SAES provide \$50,000 in direct support to the NADP, resulting in a 70 to 1 leverage of direct support dollars (approximately \$3.5 million). Loss of NRSP-3 funding and coordination would likely result in the shutdown of monitoring at many sites.

## NADP Monitoring Networks & Sites

	NTN	AIRMON	MDN	AMNet	AMON
First Sampling Year	1978	1992	1996	2009	2010
Years of Operation	38	24	20	7	6
# Active Sites	265	6	115	24	99
Collection Frequency	weekly	event-based	weekly	continuously	two-week
Analytes	SO <sub>4</sub> <sup>2-</sup> , NO <sub>3</sub> <sup>-</sup> , NH <sub>4</sub> <sup>+</sup> , pH, Ca <sup>2+</sup> , Mg <sup>2+</sup> , K <sup>+</sup> , Na <sup>+</sup> , Cl <sup>-</sup> , Br <sup>-</sup> , PO <sub>4</sub> <sup>3-</sup>		Hg wet deposition	gaseous elemental and oxidized Hg, particulate bound Hg	ammonia gas
Approximate # of Historical Samples	410,000	30,000	95,000	1,000,000	11,000



The top map illustrates the multistate nature of the NADP. The bottom map shows SAES sites that collect measurements within the NADP. SAES sites are key to the NADP's success.

# NADP Data Help Protect Ecosystems, Resources, Food Security & Human Health

The NADP has provided free and easy access to all of its data, seasonal and annual averages, trend plots, deposition maps, reports, manuals, and educational brochures through the NADP website (<http://nadp.isws.illinois.edu>). Consistent screening procedures have assured the quality of NADP data.

NADP data are used frequently to inform and evaluate environmental policies. For example, NADP maps were used by the EPA in support of the *Clear Skies Initiative*, and the EPA Clean Air Markets Division uses NADP data in its annual reports. The International Joint Commission uses NADP data in periodic evaluations of the US-Canada Air Quality Agreement. NADP data can be used track pollutants and discern sources, important information for policy and legal actions.

NADP data is critical to public safety. In 1996, only 39 states had advisories to limit consumption of fish because of mercury contamination. Today, the count has risen to 49 states. NADP data played a key part in understanding the impact of the 2011 Japanese nuclear incident on US lands and populations. The NADP could also assist surveillance for biological, chemical, or radiological agents spread by terrorists.

NADP data is also important for food security and safety. Monitoring data on plant pathogens is used to inform decisions about cropping practices and pesticide applications and to assess the overall effectiveness of innovative technologies for reducing the impact of agriculture on the environment.

As an NRSP, some of the NADP's most important impacts are the journal articles that are produced using NADP data. The use of NADP data in multiple theses and dissertations demonstrates the educational role NRSP-3 and the NADP play. During the 2014 calendar year alone, 236 publications, including 23 dissertations and theses, used NADP data in some way.

## Want to know more?

### NRSP-3 Administrative Advisors:

Dr. Douglas Buhler ([buhler@anr.msu.edu](mailto:buhler@anr.msu.edu))  
Dr. Larry Curtis ([larry.curtis@oregonstate.edu](mailto:larry.curtis@oregonstate.edu))  
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National Research Support Projects support research by collecting, assembling, storing, and distributing materials, resources, and data; developing enabling technologies; and/or sharing facilities. NRSPs have a unique capacity for encouraging multidisciplinary, multistate collaboration and leveraging investments from far-ranging funding sources in order to meet stakeholder needs and tackle important issues facing U.S. agriculture, the environment and natural resources, food and nutrition, and family and rural community development. NRSPs are initiated by off-the-top funding drawn from the total federal Hatch Act allocation prior to formula distribution to state Agricultural Experiment Stations. Additional funds are provided by contracts and grants to participating scientists. In 2014, NRSP-3 was renewed through 2019.



<http://nadp.isws.illinois.edu>  
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## Studies & Findings That Used NADP Data Ecosystems

- In mid-latitude forests, nitrogen deposition has enabled species that are more nitrogen-efficient to out-compete native legumes
- In northern forests, atmospheric deposition increases correspond with decreases in biomass of fungi and microbial communities
- Accumulated rainwater is the primary source of water for bison

## Agriculture

- Multiple researchers found correlations between ammonia, nitrogen, and phosphorous deposition with proximity to livestock operations
- Multiple researchers measured changes in atmospheric deposition due to litter amendments for poultry, diet changes for cattle, use of cover crops, crop rotation, and reduced chemical fertilizer use
- Researchers developed a new model of plant pathogen spore distribution

## Air Quality

- Air pollution is a major factor in tree mortality in the eastern US
- Researchers improved an EPA air quality model with respect to ammonia

## Climate Change

- Multiple researchers evaluated and predicted climate change impacts

## NADP Website & Data Usage



In 2014, the number of users totaled  
**>37,000**

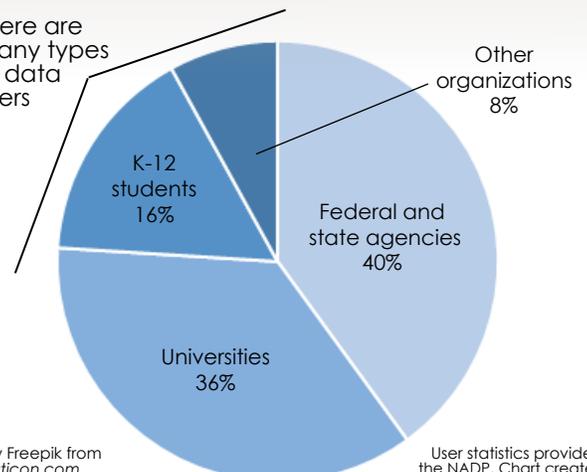


from  
**150+ countries**  
on every continent  
except Antarctica



These users made  
**>27,000**  
data downloads

There are many types of data users



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User statistics provided by the NADP. Chart created by Sara Delheimer.