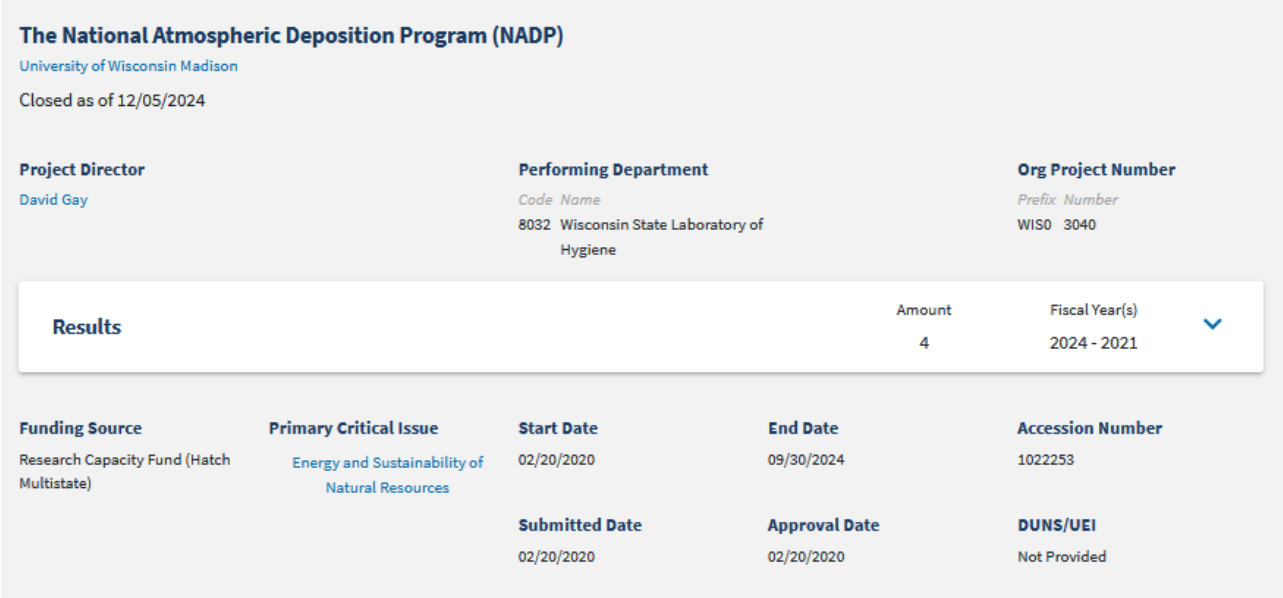

Annual Report

NRSP #3 The National Atmospheric Deposition Program (NADP)

December 4, 2024

The full web-based report can be found here: https://nrs.nifa.usda.gov/projects/1028

Section: Briefly describe the issue or problem that your project addresses.

The movement of pollution into any ecosystem, whether a managed agricultural system or a natural and unmanaged system, changes the chemical nature of this ecosystem. Many pollutants move through the atmosphere from a pollution source to an endpoint ecosystem, and this change is a very important to monitor, track, and understand.

The National Atmospheric Deposition Program (NADP) monitors the nation's precipitation and the atmosphere for a range of chemical constituents to determine the rate or flux of atmospheric pollutants moving into the biosphere as wet-deposition of pollution

(and dry deposition of pollution). With continued measurement, NADP provides the data necessary to determine whether spatial and temporal trends in concentration and wet/dry deposition exist, understand the direction and magnitude of chemical deposition trends and impacts of regulatory control measures, and understand the impacts on agricultural systems. These research measurements and data are used by researchers to study and determine the impact this pollution flow has on any/all ecosystems in North America. The NADP measures the concentration and deposition rates of the following constituents: pH (H ion), specific conductance, sulfate, nitrate, ammonium, ortho-phosphate, chloride, calcium, magnesium, sodium, potassium, and mercury in precipitation; and mercury gases and ammonia in the atmosphere (for dry deposition estimates).

This project specifically provides management and coordination of NADP's five nationwide (with some international sites) networks: the National Trends Network (NTN), the Mercury Deposition Network (MDN), the Atmospheric Mercury Network (AMNet), the Ammonia Monitoring Network (AMoN), and the Mercury Litterfall Network (MLN). This agreement also provides site support, chemical analysis, and data validation for the 48 SAES National Trends Network sites (of 259 total sites) covered in this agreement.

The goals of the NADP are to:

1. Using best practices, conduct measurements of atmospheric and precipitation chemistry;
2. Use standard methods and procedures to ensure that the measurements are made with the utmost quality and are equivalent between sites and over time;
3. Make these measurement freely available to all users, with a particular emphasis on the research community and educators; and
4. Strive to advance environmental measurement science through discussion, testing of new methods, assisting others making similar measurements, general outreach, and data accessibility.

The NADP operates in a cooperative manner with technical and administrative guidance from the NADP Executive Committee and from cooperators (researchers, etc.) and subcommittees. All work described here is conducted in accordance with the NADP Quality Management Plan (https://nadp.slh.wisc.edu/quality-assurance/). All NADP data are available free of charge to any and all users.

This report is the 5th year of a 5-year multistate project (National Research Support Project #3). The project was approved for an additional 5 year agreement (2025-2029).

Section: Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The National Research Support Project – No. 3 (NRSP-3) provides a framework for cooperation among State Agricultural Experiment Stations, the USDA-NIFA, and other cooperating governmental and non-governmental organizations. The NADP provides quality-assured data and information on the exposure of managed and natural ecosystems and cultural resources to acidic compounds, nutrients, base cations, and mercury in precipitation and through dry deposition of several of these compounds.

Specifically, researchers use NADP data to investigate the impacts of atmospheric deposition on the productivity of managed and natural ecosystems; the chemistry of estuarine, surface, and ground waters; and the biodiversity in forests, shrubs, grasslands, deserts, and alpine vegetation. Researchers also use NADP mercury data to examine the link to environmental and dietary mercury and human health (agriculture research priority of food safety).

In support of our measurement goals, the NADP's principal output is the collection of samples from its constituent networks. During this reporting period, analytical data was reported for 12,660 NTN samples, 4,200 MDN samples, 2,400 AMON samples, and 100 MLN samples. AMNet sites operate very differently from these networks, and use onsite instruments. Each NTN sample has ten separate analytes (pH {H ion}, specific conductance, sulfate, nitrate, ammonium, o-phosphate, chloride, calcium, magnesium, sodium, potassium). All analytical results undergo an extensive quality assurance review before release, and all data are released when completed.

As a National Research Support Project, our principal goal/responsibility is to produce data that the research community uses. To track performance of this goal, the NADP counts the number of research journal and report publications each year that use NADP data. During calendar year 2023, we identified 191 publications (including many dissertations and theses) that used NADP data in some important way to further their research (183 articles in 2022). These publication counts will continue over the life of the program (complete lists here: https://nadp.slh.wisc.edu/pubs/nadp-bibliography/). This year, we added a searchable database of all NADP related publications, which will continue for all subsequent years.

For researchers to use and trust our data, quality assurance of this data is necessary. The NADP uses standard operating procedures for all sampling, laboratory, and data

processes. The NADP has established best practice methods over the 47 years of program existence (https://nadp.slh.wisc.edu/siteops/). The NADP continually evaluates and updates these standard methods and procedures through guidance of the NADP Network Operations Subcommittee (NOS). We have quality assurance staff (1.3 FTEs) that continually review methods and data to ensure quality, and ongoing performance. Copies of any SOP and available upon request (https://nadp.slh.wisc.edu/quality-assurance/).

NADP laboratories and Program Office (PO) typically undergo external biannual review to identify systemic problems, improve performance, and provide external program checks. The PO and laboratories were audited in a combined approach on October 1-2, 2024 (just after this project year). As of this writing, we have not yet received the official report, and we will fully discuss this audit in next year's report.

To support the research data use goals of NADP and the NRSP program, NADP provides data access and availability to everyone at no charge from the NADP website (http://nadp.slh.wisc.edu). This website offers online retrieval of all individual data points (weekly and biweekly), seasonal and annual averages, trend plots, concentration and deposition maps, reports, manuals, etc. Downloads of data remained strong during 2023, with ~20,000 comma-delineated data file downloads (12,000 from the NTN), and about 25,000 pdf map images downloads. Internet availability of NADP data is the primary dissemination route. A NADP website redesign is now essentially complete.

In October 2022, the Executive Committee made a decision to release precipitation measurements as a new and independent data set (without chemistry, ~350 sites). This new database is almost complete, although there are issues with the website and distribution. However, this task should be completed during early 2025, and will essentially be a new product available without additional funding.

The NADP annual map series of atmospheric concentrations, wet deposition fluxes, and report was developed and compiled in the fall of 2024 for the 2023 data and maps. The 2023 Map Summary was released in October 2024. For each summary, NADP produces a series of 23 national maps of wet deposition concentration and flux for all analytes, and summary figures for each gaseous network. Individual maps are filed by network, year, and constituent, and can be downloaded in several formats (http://nadp.slh.wisc.edu/data/annualmaps.aspx, http://nadp.slh.wisc.edu/lib/dataReports.aspx).

The NADP also strives to advance environmental measurement science (another goal) through discussion, testing of new methods, assisting others making similar

measurements, and new approaches. Here are a few examples to meet this goal.

The NADP hosted and organized three meetings where these ideas were discussed: the Fall Scientific meeting, the Spring Business meeting, and the Summer Budget meeting. A diverse group of participants attended these meetings, including university researchers, SAES researchers, NIFA, a variety of federal agencies (EPA, USGS, NPS, Forest Service, FWS, BLM, and NOAA), many state government organizations, and Native American tribes. All meeting proceedings, minutes and most presentations are available on our website (https://nadp.slh.wisc.edu/conferences/).

Here are a few specific examples of new measurements/procedures being considered by NADP.

- PFAS Subnetwork: at the Fall 2023 meeting, a new pilot network was approved for the monitoring of Per- and Polyfluoroalkyl Substances (PFAS) in NTN precipitation. Discussion for this network has occurred over the last several project periods, building on several years of PFAS initiatives. The network is currently running with 20 sites. Weekly samples are analyzed for 34 specific compounds. Planning continues, but the analytical procedures are complete and meet the quality assurance objectives, and field operation seems to be proceeding well. This network will be of particular interest to USDA/SAES since atmospheric loading of PFAS to agricultural lands can be substantial (e.g., Lesmeister et al., 2021, Science of the Total Environment 766: 142640). During the year, three ARS sites in Colorado were funded, and should begin operation in the next few months. Full network acceptance should occur sometime in 2025. Specifics about the network are here: https://nadp.slh.wisc.edu/pfas-sub-network/.

- New MDN Collection Bag: work continues on the redesign of the MDN sample train which is currently silicon glass and requires expensive weekly re-cleaning. We are determining whether MDN samples can be collected in an entirely plastic sampling train, which will be easier, much less expensive, and potentially even "cleaner" (lower blanks). We experienced significant difficulty finding a reasonable priced Teflon bag. However, we recently found a new supplier (IMPAK, Florida) that has quoted a very reasonable price on a special designed bag. We should make significant progress on this change during this next project period.

- Total Nitrogen and Total Phosphorus Sampler (TNTP): the effort continues to add total N and total P capability (and by subtraction, organic nitrogen (ON) and phosphorus (OP)) to the regular NTN analyses. This required the development of a supplemental sampler that works with the standard NTN sampler. A pilot field

study is scheduled for March of 2025 to provide real samples, along with quality assurance data. This study is a combined with the NPS and Colorado State University. Analytical performance of the TN measurement is good, with ongoing work on the TP measurement. Difficulties remain with low volumes and low pH, but work on possible solutions continues. This TNTP data will interest agricultural scientists, since N and P are such important agricultural compounds. TNTP measurements are also important who study algal blooms/eutrophication in lakes and rivers and the connection to agricultural activities.

- Black Carbon (BC) in precipitation: During the current project year, BC measurements are being made at 12 western US sites (with EPA support) over two spring summer periods. This project will be used to measure the basic BC variability over time and space, and will be used to further define a clear wildfire wet deposition signal.

Section: Briefly describe how your target audience benefited from your project's activities.

The NADP's target audience is primarily researchers (research support), but we have three general target audiences: researchers, policy professionals; and educators and students. Beyond our stated research support mission, we provide data to help make informed decisions on environmental and agricultural issues, as well as promoting better science measurement and understanding (educators and students).

In brief, here are a list of specific products:

<u>Research data support</u>

- 12,200 NTN measurements/observation of wet deposition of 10 analytes (pH {H ion}, specific conductance, sulfate, nitrate, ammonium, o-phosphate, chloride, several cations);
- For all years (1978 - 2023), approximately 480,000 samples for 10 analytes;
- ~20,000 data sets (12,000 from the NTN) downloaded and distributed;
- ~10,000 pdf files of flux maps and map summaries downloaded and disturbed;
- Longer-term averages, in data format and in map products, including trends graphics by site and chemical component;
- Strict quality assurance of all data records, with each record classified as valid or invalid;

- Unrestricted data access to all.

All of this data is currently being used to do research and make better policy decisions

- 191 research publications during 2023 (182 in 2022, with 2024 coming soon);
- This total includes 11 dissertations and 7 theses, and 1 undergraduate thesis;
- 23 agricultural connected articles (includes 3 extension documents);

Education

Although we still need to improve our tracking of educational uses, we do have some indications:

- 11 dissertations and 7 theses, and 1 undergraduate thesis; and
- NADP data was used in a Chemistry textbook: Mosher, M., & Kelter, P., 2023. Acids and Bases. In An Introduction to Chemistry (pp. 693-742). Cham: Springer International Publishing (ISBN 978-3-030-90266-7).

Here are several examples of the use of this SAES funding to support agriculturally-relevant research journal articles (NRSP goal), from 2023, the last full year of publications:

- Cao, P., Lu, C., Crumpton, W., Helmers, M., Green, D., & Stenback, G., 2023. Improving model capability in simulating spatiotemporal variations and flow contributions of nitrate export in tile-drained catchments. Water Research 244: 120489.

Cao et al. built a numerical model to estimate the hydrological nitrate as nitrogen (NO3-N) losses in tile-drained agricultural watersheds. Several models like this exist, but the authors attempt to improve the spatial and temporal variability among watersheds. They applied the model to four Iowa tile-drained catchments with very different management practices and landscapes. The model more accurately predicted water discharge, NO3-N concentration and flux/load for these catchments over 4 years (2015-2019). Subsurface flow dominates the transmission of NO3-N to water (70-85%). Tile drainage water was highly variable in the systems. Agricultural management type and catchment characteristics (e.g. soil properties, farmed potholes, and tile drainage) were also very important to the overall N loading. The authors used NADP nitrate concentration and deposition data for multiple Midwest sites over the 4 study years.

- Dangol, S., Zhang, X., Liang, X. Z., & Blanc-Betes, E., 2023. Advancing the SWAT model to simulate perennial bioenergy crops: A case study on switchgrass growth. Environmental Modelling & Software 170: 105834.

Dangol et al. sought to improve the Soil and Water Assessment Tool (SWAT) model for the prediction of switchgrass growth and production (bioenergy) by including better prediction of shoot/root biomass and leaf area index (i.e., growth). The authors built two added submodules for growth and production to improve predictions. The improved SWAT model generally outperformed the original model for biomass yield and seasonal leaf area. It also improved root growth prediction, improving the nutrient pool estimates (above and below ground). The authors used NADP nitrogen data over three states (WI, MI, IL) as model input for the 8 field sites. These data were used for multiple years (2006-2021) at the sites.

- Delgado, J. A., Halvorson, A. D., D'Adamo, R., Stewart, C. E., Floyd, B., & Del Grosso, S., 2023. Long-term nitrogen balance of an irrigated no-till soil-corn system. Nutrient Cycling in Agroecosystems 126: 229–243, doi.org/10.1007/s10705-023-10287-9.

Delgado et al. (all ARS scientists) studied the long-term nitrogen budget of a fertilized no-till corn system, evaluating N application rates to the N losses, efficiency, and soil N content for multiple years (2006-2018). N losses varied between 19 and 57 %. The authors concluded that the major N loss pathways were leaching and atmospheric emission. Soil N was reduced in all treatments, and was -15 kg N ha^{-1} y^{-1} in the top 30 centimeters of soil. Therefore, even no-till systems have very significant N losses from many compartments. The authors accounted for atmospheric wet deposition of N from the NADP observations over the 13 years of study at the Colorado State University experiment station.

- Hinckley, E. L. S., & Driscoll, C. T. (2023). Sulfur fertilizer use in the Midwestern US increases as atmospheric sulfur deposition declines with improved air quality. Communications Earth & Environment 3(1): 324.

Hinckley and Driscoll evaluate the relationship between increasing sulfur fertilizer use in agricultural applications with the reduction in atmospheric deposition of sulfate pollution compounds. This trend has been occurring over many years, particularly in the Midwest, which was a high depositional environment for sulfate. The authors note that crop acreage, yield and sulfur fertilizer application has substantially increased between 1985

and 2015, and the rate of increase of use is 7 times greater than the increase of nitrogen, phosphorus and potassium fertilizers just since 2009. The authors call for increased agricultural management practices of sulfur in fertilizer. Hinckley and Driscoll use the Midwestern NADP sites over 12 states (50+ sites) over 40 years of NADP measurement (~1985 to present).

- Leytem, A. B., Walker, J. T., Wu, Z., Nouwakpo, K., Baublitz, C., Bash, J., & Beachley, G., 2023. Spatial Distribution of Ammonia Concentrations and Modeled Dry Deposition in an Intensive Dairy Production Region. Atmosphere 15(1): 15.

Leytem et al. (an ARS scientist) focused their study on the agricultural emission of ammonia from a dairy installation in south-central Idaho. Research included the gaseous ammonia measurement (transects) to measure the spatial and temporal variability, along with the modeling estimates of dry deposition. Measurements were made within the NADP AMoN network, and used NADP procedures over three years (2018-2020). NH_3 fluxes were estimated using the Surface Tiled Aerosol and Gaseous Exchange (STAGE) model. The authors measured much higher concentrations versus agricultural and non-agricultural sites. Annual dry deposition estimates were as high as 45 kg N ha^{-1} y^{-1}, which were well above comparable natural landscapes (<1 kg N ha^{-1} y^{-1}), and conclude that further research is needed into the role of soil processes in NH_3 dry deposition to arid and sparsely vegetated natural ecosystems in the West. The authors ran a NADP AMoN network sampling station for the study, and used NADP ammonia measurement procedures for all of their transect sites over the 3-year study.

- Nair, A. A., Yu, F., & Luo, G., 2023. The importance of ammonia for springtime atmospheric new particle formation and aerosol number abundance over the United States. Science of the Total Environment 863: 160756.

The Nair et al. study was focused on the formation of small particulate matter primarily from reactions of ammonia gas (< 0.1 um) and the resulting health impacts. Specifically, they examined NH_3 and particulate formation in the spring over the US using the GEOS-Chem transport model and a newer particle formation treatment. The new model combination does a better job estimating particulate formation, and shows that NH_3 is important to match estimates of spring abundance (63% variance explained). This is obviously important, since agricultural sources are a very large source of NH_3 to the atmosphere, particularly in agricultural regions. For this study, the authors used NADP

AMoN measurements from 2007 to the current time, using observations from 116 sites over all the years.

- Singh, H., Carter, E., Sharma, L., Sidhu, S., & Omara, P., 2023. Sulfur Deficiency in Cotton: Causes, Symptoms, and Considerations: SS-AGR-478/AG474, 11/2023. EDIS, 2023(6), Agronomy Department, University of Florida/IFAS Extension.

In a second extension use, Singh et al. (SAES scientists) discuss the relatively new incidence of sulfur deficiency in Southeast U.S. cotton production. The authors show farmers directly the impacts on cotton due to lack of sulfur in soil, compare these outcomes to nitrogen deficiency, and provide suggested types of sulfur additions for use. The authors refer directly to NADP observations over time, and also link to the NADP's animation of sulfate decrease over time (https://nadp.slh.wisc.edu/maps-data/animated-maps/). This is another direct to farmer use of NADP data.

Section: Briefly describe how the broader public benefited from your project's activities.

Given that NADP data is made available to all, and that our data are fundamental observations, it is used for a very wide variety of issues important to the Nation. The research impacts have been noted previously, therefore see our full set of journal articles using our data (https://nadp.slh.wisc.edu/pubs/nadp-bibliography/).

Additionally, our data is used by many government agencies (federal, state, tribal) to make more informed policy decisions. The NADP (in addition to SAES) is heavily funded by federal and state agencies, and is used by these agencies in a variety of ways by improving the science of deposition and pollution flow through ecosystems. We feel that we can make a strong case that the NADP data goes to many areas of scientific research that affects and improves policy decisions for the United States.

For educational purposes, it is clear that NADP provides data that are used in many different dissertations and theses, improving the quality of graduate education in many areas (agriculture, environmental, geographical, engineering based upon the departments listed with these documents). We typically have NADP data used in 15 or so dissertations and theses each year. Occasionally, we also record an undergraduate thesis. Although we

have little documentation, we do know that our data support undergraduate education (understanding environmental problems, real world observations for projects, statistical education, and textbook materials). So primarily, we support education in science and science, technology, engineering and mathematics (STEM) classwork.

With to the leadership of the SAES scientists, and the highly diverse nature of this NRSP, there are many nationally-important issues that NADP data and information can and do contribute toward.

<u>Agricultural Issues</u>
Grand Challenges (from the *Science Roadmap for Food and Agriculture).*

- Grand Challenge 1 "*.. enhance the sustainability… of U.S. food and agricultural systems."*, through the monitoring of pollutants that are emitted from and deposited to agricultural land, feeding operations, and fertilizers (Nitrogen in particular).
- Grand Challenge 2 "*adapt to and mitigate the impacts of climate change...*", by monitoring precipitation at 300 sites, and the changes in pollution in precipitation with fuel changes and restrictions, as climate changes occur, and specifically the changes in air pollutant flow with increased cooling needs.
- Grand Challenge 3 "… *energy security and the development of the bioeconomy*…", by tracking the movement of Sulfur, Nitrogen, and Mercury compounds (all associated with energy production), we are documenting the change in atmospheric chemistry and deposition to lands as the evolution of energy production occurs, and monitor for air quality changes with increased biofuel production and increased electric generation.
- Grand Challenge 4 *"… leadership role to ensure a safe, secure, and abundant food supply...*", where NADP could support this challenge through the tracing of agricultural disease movement through the atmosphere (our samples have been used for this purpose, unofficially, with soybean rust spores), and through the increased need/use of fertilizers (i.e. potential pollutants). An additional issue is our building capacity to monitor for PFAS compounds, which agricultural scientists are beginning to investigate now (see above).
- Grand Challenge 6 "… *heighten environmental stewardship through the development of sustainable management practices*.", where NADP easily supports this challenge by monitoring the emission of and the deposition to agricultural lands, with current and new agricultural practices for a large number of pollutants being investigated (see publication list).

Overall, one of the principal advantages of the NRSP-3, is that it is a science-based observation network that can be restructured with additional techniques to look for a variety of pollutants (herbicides, pesticides, etc.), disease vectors, physical bodies (plastic) and others moving through the atmosphere. This would just require legislative action within NADP committees.

Other Challenges Addressed:

- Mercury contamination is U.S. fish, through monitoring the main addition of mercury to water bodies (precipitation), which also addresses Grand Challenge 4 and 5;
- General Air Pollution: Documenting the presence and removal of inorganic pollutant gases and aerosols in the atmosphere (i.e., US "chemical climate"), all very useful in policy decisions, research modeling, source and sink relationships;
- Assessing the accelerated chemical weathering of material and cultural resources (limestone buildings, monuments);
- Evaluating the effectiveness of current Clean Air Act (CAA) and Clean Water Act (CWA);
- Acidic Precipitation, continued monitoring of reduction of precipitation pH and acidification of soils and waters;
- Nitrogen Fertilization; with increased N deposition, NADP data is used in the research of invasive species in national parks, forests, and lakes.
- Algal Blooms has become a major environmental problem in recent years, and these are associated with both N and P atmospheric deposition (and fertilizer use). NADP supports this issue with both the NTN and AMON measurements, and possible future Total N and P measurements in wet deposition.
- Ammonia increases in the atmosphere; NADP data used to understand the shift from oxidized N compounds to a majority of reduced N compounds (NH_3) which drives a shift in atmospheric chemistry and particulate levels. Note that agricultural sources of ammonia are very important.
- Studies have connected atmospheric N deposition to estuarine eutrophication and related low dissolved oxygen concentrations in lakes and rivers. NADP measures both wet deposition measurements of nitrate and ammonium.

These bullets only briefly describe a number of research areas where NADP has been used to address agricultural and environmental problems. The reader is encouraged to review the list of publications using NADP and the associated research issues addressed (https://nadp.slh.wisc.edu/pubs/nadp-bibliography/).

It is also important to note that NADP cooperates with similar organizations in Canada and Mexico, to evaluate similar issues on a continental scale, and with similar organizations in Europe and Asia to help evaluate similar issues in the Northern Hemisphere and around the Earth.

Section: Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

The NADP is a monitoring cooperative, and strives to make the same measurements year in and year out with the same methods in a consistent way. No substantive changes are planned for operation of the network. Outside of normal issues with inflation and budget, the networks are operating well.

We are continually considering ways to make the network operation more efficient, and increase the throughput of samples and reduce the costs of laboratory services. Several methods we are considering is an improved mercury collection vessel (plastic bags, mentioned previously), automation of several laboratory steps, and improved data review system. More of these efforts will be reported in forthcoming year reports.

As mentioned above, we will continue to make ourselves more relevant to the current research direction, by pursuing these new ideas (as mentioned previously):

- PFAS Subnetwork: the monitoring of Per- and Polyfluoroalkyl Substances (PFAS) in precipitation;
- Total Nitrogen and Total Phosphorus Sampler: a new added sampler to measure total nitrogen and organic nitrogen, along with total phosphorus and organic phosphorus in precipitation; and
- Black Carbon analysis: a measurement of Black Carbon in precipitation.

Training Opportunities:

The NADP is constantly training operators on our equipment and methods, through a variety of means. NADP holds online video meetings, has video presentations, and

provides onsite and training over the phone of our operators. This basic training is for approximately 60-70 operators per year, and is constantly being repeated.

The NADP also, at times, holds special meetings that provide professional development on topics not covered at our two annual meetings. One example was the Spring 2022 Meeting, where the Mercury in the Environment and Links to Deposition (MELD) ad hoc Scientific Committee held an organizational meeting (minutes and attendees online).

Additionally, we have hired a series Association of Public Health Laboratories interns (4 interns during the project year) that were employed to assist and learn the various analytical as well as data management activities of the NADP. We have found them to be quite engaged and good students.

Additional Dissemination of Data

The primary route of data dissemination for the NADP is through its website, its databases, and its series of maps, which are all mentioned in the previous sections. NADP provides data access and availability for all; scientists, policymakers, educators, students, and others are encouraged to access data at no charge from the NADP website (https://nadp.slh.wisc.edu/). Currently, the data is available through June 2024 (quality assurance procedures require this normal delay) and the maps for 2023 were produced on schedule. 2024 maps will be drawn in the Summer, 2025.

Finally, the annual Fall NADP Scientific Symposium, in addition to other conferences, fosters the dissemination of NADP data to key stakeholders and researchers. In 2023 (hybrid), the meetings included a total of 41 oral presentations and approximately 20 posters. Details of the meeting are here (https://nadp.slh.wisc.edu/conferences/).