



Environment and Natural Resources Trust Fund

M.L. 2026 Final Work Plan

General Information

ID Number: 2026-169

Staff Lead: Lisa Bigaouette

Date this document submitted to LCCMR: May 27, 2026

Project Title: PFAS in Precipitation: Assessing a Critical Statewide Threat

Project Budget: \$910,000

Project Manager Information

Name: Alexander Frie

Organization: U of MN - Duluth - Sea Grant

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Project Reporting

Reporting Schedule: April 1 / October 1 of each year.

Project Completion: June 30, 2030

Final Report Due Date: August 14, 2030

Legal Information

Legal Citation: M.L. 2026, Chp. 104, Sec. 2, Subd. 04h

Appropriation Language: \$910,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota for the Minnesota Sea Grant college program in Duluth to create a multiyear, multisite, foundational dataset of per- and polyfluoroalkyl substances (PFAS) in rain and snow and to investigate the processes and sources that influence PFAS levels in rain and snow to inform management and remediation efforts. This appropriation is available until June 30, 2030, by which time the project must be completed and final products delivered.

Appropriation End Date: June 30, 2030

Narrative

Project Summary: PFAS contaminates Minnesota's natural resources through rainfall and snowfall. This project will support statewide, multi-year, measurements of PFAS in rain and snow and investigate associated sources.

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Per- and Polyfluoroalkyl substances (PFAS), known as forever chemicals, can be toxic to humans and wildlife, persistent in the environment, and present in rain and snow. PFAS in rain and snow contaminate even the planet's most remote regions, including Minnesota's lakes, fields, forests, and prairies. Precipitation can represent the dominant pathway for the introduction of PFAS to these resources. Data from previous studies found common PFAS with concentrations in Minnesota's rain and snow above Minnesota's drinking water guidance levels.

A multi-year, multi-site, high-quality dataset is needed to assess the impact of PFAS in rain and snow on Minnesota's water resources and ecosystems. This dataset will help Minnesotans understand seasonal and yearly changes in PFAS levels and establish a foundation for estimating risks to wildlife and natural resources. It will also serve as a baseline to gauge the impact of PFAS remediation efforts.

The National Atmospheric Deposition Program (NADP) is a nationwide network of sites operated by collaborating agencies that collect weekly integrated rain and snow samples in the National Trends Network (NTN) and measure their chemistry. Originally established to monitor acid rain and nutrients, the NADP recently developed processes for PFAS analysis, providing an opportunity for Minnesota.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

We propose three years of comprehensive monitoring of 30+ PFAS in rain and snow at seven NADP-NTN sites across Minnesota. This sampling effort would leverage the existing physical, analytical, and digital infrastructure and investments of the NADP to provide weekly resolved measurements of PFAS in rain and snow. These measurements would be made publicly available through the NADP's website, creating a foundational dataset for use by all Minnesotans, scientists, and regulators.

In addition to producing this dataset, we will apply atmospheric modeling and investigate changes in PFAS amounts and types to understand how PFAS gets into Minnesota's rain and snow, information critical to solving MN's PFAS challenges. To better understand PFAS not measured in standard analysis techniques, we will also measure total organic fluorine and use non-targeted PFAS analysis to investigate PFAS for which standard techniques have not been established, known as "unknown unknowns."

The value of this dataset and analysis would be immense. Multi-year datasets for other chemicals in precipitation helped solve acid rain, understand harmful algae blooms in lakes, and establish risks to sensitive plant and animal species. This dataset will support similar efforts to understand and remediate the impact of PFAS on Minnesota's resources.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

The core outcome of the project will be a publicly available, 3-year, weekly, 30+ PFAS dataset for seven Minnesota NADP-NTN sites. This dataset will be foundational to understanding the impact of PFAS on Minnesota's natural resources and will be useful for identifying at-risk animal and plant species, targeting remediation activities, and strategically reducing pollution sources. This dataset will support estimates of atmospheric loadings of PFAS to Minnesota's ecosystems. The atmospheric modeling and statistical analysis of these data will provide insight into how PFAS move and what sources and processes are most important in Minnesota.

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Activities and Milestones

Activity 1: PFAS Data Collection at National Atmospheric Deposition Program Sites Across Minnesota

Activity Budget: \$500,500

Activity Description:

Weekly precipitation samples will be collected by NADP site operators for three years at seven NADP-NTN sites within Minnesota in Anoka, Cook, Itasca, Lake (2 sites), Morrison, and Redwood counties. Samples will be collected and shipped to the Wisconsin State Lab of Hygiene (WSLH) following NADP’s validated PFAS collection protocols.

Samples will then be extracted and analyzed for 30+ PFAS using state-of-the-art coupled Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS) following validated methods approved by the National Atmospheric Deposition Program. Additionally, monthly composites will be collected and reserved for non-target analysis at the University of Minnesota’s Natural Resource Research Institute and total organic fluorine analysis at the WSLH. Non-target analysis will allow for the investigation of “unknown unknown” species that will provide additional insight into the provenance of the PFAS. Up to 100 samples of interest will be investigated using non-target analysis.

After data has been produced and the quality verified, all targeted PFAS data will be made publicly available on the NADP website, which already hosts nearly 50 years of rain and snow chemistry data from NTN sites across the country.

Activity Milestones:

Description	Approximate Completion Date
Begin PFAS sampling at National Atmospheric Deposition Program Sites	July 31, 2026
Begin non-target analysis of monthly composites	December 31, 2026
Complete PFAS sampling at National Atmospheric Deposition Program Sites	June 30, 2029
Complete targeted, non-target, and total organic fluorine, analyses	December 31, 2029
Project results and reports available on NADP website	June 30, 2030

Activity 2: Data Analysis, Atmospheric Modeling, and Community Engagement

Activity Budget: \$409,500

Activity Description:

After the collection of the targeted data, data will be analyzed to understand the processes and sources that influence the PFAS levels and “fingerprints” observed in rain and snow. First, targeted PFAS data will be analyzed for significant seasonal, spatial, and meteorological (i.e., temperature, precipitation type, storm type) controls and trends. Next, the data set will be analyzed using a factor analysis approach, such as Positive Matrix Factorization, which uses the variability in composition between samples to identify signatures of different sources and processes. Next, back trajectory analysis will be coupled with the previous analysis to investigate how the history of an airmass, or “where it came from,” contributes to the PFAS observed in rain and snow.

Finally, we will share the results not only with the scientific community and regulators at venues such as the Minnesota Water Resources Conference but also with communities that depend on Minnesota’s resources. We will do this through a series of workshops over years 2 - 4 of the project aimed at bringing this science to local communities and resource managers. These workshops will be held across Minnesota and near NADP sampling sites to emphasize the local impact of this work.

Activity Milestones:

Description	Approximate Completion Date
Begin Analysis of Targeted PFAS Data	December 31, 2026
Begin Back Trajectory Analysis	December 31, 2026
Present Initial Project Results at Minnesota-based Scientific Conference	October 31, 2027
Begin Outreach Workshops	January 31, 2028
Present Mid-Project Results at Minnesota-based Scientific Conference	October 31, 2028
Present Project Results at Minnesota-based Scientific Conference	October 31, 2029
Complete non-targeted and targeted data analysis	March 31, 2030
Publication of Peer Reviewed Article Summarizing Findings	March 31, 2030
Complete the final community workshops	June 30, 2030
Public Project Summary Webinar	June 30, 2030

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Bridget Ulirch	University of Minnesota Duluth - Natural Resource Research Institute	Co-Investigator	Yes
Matin Schafer	University of Wisconsin State Lab of Hygiene - National Atmospheric Deposition Program	Co-Investigator - NADP PFAS Subnetwork Contact	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.

Results of this project will be disseminated through multiple mechanisms. First, during the project, the project team will host events near sampling sites for resource managers and the general public to discuss the project and its results. Second, all targeted PFAS data will be made publicly available via the NADP website once the project is complete. Third, the project team plans to publish findings in peer-reviewed journals and present the results at local and regional scientific conferences. After the project is complete, the project's data will be available via the NADP website, and findings will be available through peer-reviewed publications. The Environment and Natural Resources Trust Fund will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgment Guidelines.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?

All data, analysis, reports, and publications produced through this project will be publicly accessible through the NADP website. The project timeline has been structured to not only allow for data collection, but for analysis and finalization of data projects before project completion.

We anticipate that the three years of data, coupled with previous, more sporadic, federally funded, and non-Minnesota collections, will provide a comprehensive, self-contained, and interpretable dataset. If the dataset reveals a continued need for monitoring to, for example, understand the impact of PFAS solutions, a more appropriate state or federal resource will be pursued.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
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Catch and Reveal: Discovering Unknown Fish Contamination Threats	M.L. 2022, , Chp. 94, Art. , Sec. 2, Subd. 04g	\$246,000
Water Science and Policy Fellowships for Minnesota	M.L. 2024, , Chp. 83, Art. , Sec. 2, Subd. 05f	\$407,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Alexander Frie		Project PI			27%	0.6		\$79,122
Graduate Student		50% GRA. 2 academic years @ 50% time. 3 summers 100% time. Data Analysis and Interpretation			42%	1.5		\$159,054
Bridget Ulrich		Co-PI - Lead for non-target PFAS analysis			27%	0.32		\$43,307
Devin Edge		Laboratory Technician			24%	0.12		\$9,379
Analytical Chemist		Analytical Chemist - Non-target analysis and interpretation			27%	7.29		\$66,567
Post Doctoral Associate		Support Non-target Analysis and interpretation			21%	0.03		\$2,171
							Sub Total	\$359,600
Contracts and Services								
Wisconsin State Lab of Hygiene - National Atmospheric Deposition Program	Service Contract	NADP annual PFAS analysis, and processing costs (\$22,500 per site for 3 years) for 7 sites across Minnesota.		X		0		\$472,500
Wisconsin State Lab of Hygiene - National Atmospheric Deposition Program	Service Contract	University of Wisconsin Lab of Hygiene Analysis of 100 samples x \$145 per sample for total organic fluorine. (\$14,500 total)		X		0		\$14,500
University of Minnesota: Natural Resources Research Institute	Internal services or fees (uncommon)	Non-target PFAS Analysis Instrumentation Costs Analytical costs assume 40 samples per year at \$100/sample. Note that while this total works out to 160 total samples, this includes 100 samples received as well as an additional 60 samples for blanks, quality control, and re-runs.				0		\$16,000
Site Operator Time associated with PFAS Sample Collection and	Service Contract	Site Operator Costs to Collect Samples and Quality Controls - Estimated as 7 operators at 63.50 an hour for 9 hours a year.				0.09		\$12,000

Quality Control/Assurance									
								Sub Total	\$515,000
Equipment, Tools, and Supplies									
	Tools and Supplies	Supplies and consumables for PFAS analysis	Supplies to support non-target PFAS analysis. Supply costs assume 40 samples per year at \$125/sample. Note that while this total works out to 160 total samples, this includes 100 samples for non-target analysis and 60 samples for blanks, quality control, and re-runs						\$20,000
								Sub Total	\$20,000
Capital Equipment									
								Sub Total	-
Acquisitions and Stewardship									
								Sub Total	-
Travel In Minnesota									
	Conference Registration Miles/ Meals/ Lodging	Once a year in year 2-4: Travel for two project members to present results at Minnesota based conference or meeting such as the Water Resources Conference. Calculated as one person traveling 314 miles (0.7*\$314), 2 nights lodging in Minneapolis (2x\$222), 1 day full per diem for meals (1x\$79), 2 days travel per diem for meals (0.75x2x\$79) and registration (\$168.7)).	Travel to present and share results with minnesota scientists and resource managers,						\$6,178
	Miles/ Meals/ Lodging	2 events a year in project years 2,3, and 4. Calculated as two people traveling 289.64 miles (0.7*\$289.64), 1 nights lodging in Minnesota (1x\$144), 2 day travel per diem for meals (0.75x2x\$59). No inflation.	Travel to share results with Minnesota communities.						\$5,222
								Sub Total	\$11,400

Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	Manuscript Publication Costs	Costs associated with publishing at least one peer reviewed manuscript in an open access journal.					\$4,000
							Sub Total	\$4,000
Other Expenses								
							Sub Total	-
							Grand Total	\$910,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Contracts and Services - Wisconsin State Lab of Hygiene - National Atmospheric Deposition Program	Service Contract	NADP annual PFAS analysis, and processing costs (\$22,500 per site for 3 years) for 7 sites across Minnesota.	These funds are directed to an out-of-state entity, the Wisconsin State Lab of Hygiene (WSTLH). NADP-NTN network works with a core analytical facility (WSLH) that coordinates sampling, analysis, and procedures for the network. Access to this sampling network and validated data is only available through WSLH. These services would normally require a bidding process, but WSLH is the only provider of these specific services and an active partner in the project.
Contracts and Services - Wisconsin State Lab of Hygiene - National Atmospheric Deposition Program	Service Contract	University of Wisconsin Lab of Hygiene Analysis of 100 samples x \$145 per sample for total organic fluorine. (\$14,500 total)	These funds are directed to an out-of-state entity, the Wisconsin State Lab of Hygiene (WSTLH). NADP-NTN network works with a core analytical facility (WSLH) that coordinates sampling, analysis, and procedures for the network. This expense corresponds to an added analysis (total organic fluorine measurements) above the standard suite of PFAS. It would be logistically complex and possibly compromise the partially processed samples to send them to a third-party lab for this analysis. These services would normally require a bidding process, but as WSLH is an active partner in the project and shipping the partially processed samples would pose a potential risk, we request to not open this service to competitive bids.

Non ENRTF Funds

Category	Specific Source	Use	Status	\$ Amount
State				
			State Sub Total	-
Non-State				
In-Kind	UMN unrecovered indirect costs are calculated at the UMN federally negotiated rate for research of 54% modified total direct costs	Indirect costs are those costs incurred for common or joint objectives that cannot be readily identified with a specific sponsored program or institutional activity. Examples include utilities, building maintenance, clerical salaries, and general supplies. (https://research.umn.edu/units/oca/fa-costs/direct-indirect-costs)	Secured	\$555,383
			Non State Sub Total	\$555,383
			Funds Total	\$555,383

Total Project Cost: \$1,465,383

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [04eac503-4e7.pdf](#)

Alternate Text for Visual Component

An outline of Minnesota with the text "PFAS" in the center. Above the text, icons of clouds with snowflakes and raindrops indicate precipitation. Below, a downward arrow points to icons representing people, fish, crops, and deer, illustrating potential environmental and human exposure. The color scheme is primarily blue....

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
UMD Authorization Letter	2e6545a1-61d.pdf
2026-169 Research Addendum_ PFAS in Precip_Final	0a0dbc98-e56.docx

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

10/24/2025 requested revisions - Added funding acknowledgment to dissemination plan. Corrected an error in a milestone date. Added additional milestones to activity 2. Declassified in-state conference travel as ineligible. Added details to WSLH service contracts and marked them as typically ineligible. (Original Budget Reduction Revisions) Reduced the number of sites for PFAS sample collection from 8 to 7. Reduced the University of Minnesota Staff time requested. Reduced travel requests and the number of outreach events.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I understand the UMN Policy on travel applies.

Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

No

Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing \$10,000 or more or large-scale stream or wetland restoration?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?

No

Provide the name(s) and organization(s) of additional individuals assisting in the completion of this project:

Brady Rivers, Bridget Ulrich, Martin Schafer

Do you understand that a named service contract does not constitute a funder-designated subrecipient or approval of a sole-source contract? In other words, a service contract entity is only approved if it has been selected according to the contracting rules identified in state law and policy for organizations that receive ENRTF funds through direct appropriations, or in the DNR's reimbursement manual for non-state organizations. These rules may include competitive bidding and prevailing wage requirements

Yes, I understand