Environment and Natural Resources Trust Fund

M.L. 2025 Approved Work Plan

General Information

ID Number: 2025-080

Staff Lead: Michael Varien

Date this document submitted to LCCMR: June 11, 2025

Project Title: Pine Needles Reveal Past and Present Airborne PFAS

Project Budget: $550,000

Project Manager Information

Name: Summer Streets

Organization: Minnesota Pollution Control Agency

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Email: summer.streets@state.mn.us

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Project Reporting

Date Work Plan Approved by LCCMR: June 24, 2025

Reporting Schedule: March 1 / September 1 of each year.

Project Completion: June 30, 2028

Final Report Due Date: August 14, 2028

Legal Information

Legal Citation: M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 07c

Appropriation Language: $550,000 the first year is from the trust fund to the commissioner of the Pollution Control Agency to use current and historic pine needles as a low-cost method to assess statewide per- and polyfluoroalkyl substances (PFAS) levels in ambient air.

Appropriation End Date: June 30, 2028

Narrative

Project Summary: Pine needles are great passive air samplers because their waxy outer layer attracts airborne pollutants. Pine needles will be used to assess airborne PFAS in current and historic pine needles.

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

PFAS has become one of the most pressing environmental issues in Minnesota. MPCA and sister agencies are expending considerable resources to monitor, assess, and control PFAS in the state. Widespread, ongoing monitoring of surface water, groundwater, and fish are now part of our regular work at the agency. Ambient air remains our least-studied environmental media leaving us with a huge PFAS data gap. Understanding PFAS in ambient air is critical to our understanding of PFAS fate, transport, and exposure.

Ambient air monitoring for organic contaminants like PFAS is difficult, expensive, and subject to several limitations. For example, a high-volume air monitor is standard equipment for collecting ambient air samples. High-volume air monitors require a fenced area with electricity, trained staff to manage sample media and run the monitor, and expensive media preparation and analyses that are available at very few laboratories. These limitations mean that a large portion of our state (especially places where we don't have existing air monitoring stations) cannot be monitored for PFAS in air using traditional sampling techniques.

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.

Pine needles provide an opportunity to test atmospheric PFAS that is cost-effective and limited only by the presence or absence of pine trees. Pine needles are ideal passive samplers because:

- They have waxy, lipid-rich cuticles that facilitate sorption of airborne organic pollutants like PFAS,
- It is easy to identify the current year's growth of needles, making it possible to assess current atmospheric conditions,
- Collecting and analyzing is inexpensive, especially when compared with the cost and limitations of using the high-volume air samplers required for PFAS sampling,
- Pine needles capture both long-range and local PFAS, giving a total picture of PFAS in ambient air,
- And pines grow in the most remote areas of the state, making air testing possible in areas where it is not possible to place a monitor.

In addition, using pine needles to assess a wide variety of organic contaminants in air, including PFAS has proven effective and efficient in several studies.

Minnesota's unique resources are advantageous for this type of study. Minnesota has pine throughout the state. We also have a volunteer network at the ready, a contracted laboratory with excellent analytical capabilities, and an herbarium with a vast collection of pine needles dating back to 1875.

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?

Pine needle analysis for PFAS will provide the state with a large amount of ambient airborne PFAS data. Data will be used to:

- Assess current PFAS ambient air conditions, statewide.
- Estimate ambient anthropogenic "background" PFAS conditions in air.
- Identify "hot spots" potentially associated with local sources, which may spur further investigations and source identification.
- Increase our understanding of PFAS presence, fate, transport, and exposure, especially in the most remote parts

of the state where data are currently lacking.

- Estimate PFAS deposition to surface waters as a means of understanding fish contamination when no other source can be identified.

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: Selection and Analysis of Historic Pine Needle Samples

Activity Budget: $78,750

Activity Description:
Up to 30 archived pine needle samples will be selected from UMN Bell Museum Herbarium. Sample selection will focus on samples collected in Washington, Ramsey, and Dakota counties. Samples dating back to the late 1800s/early 1900s prior to the advent of PFAS production will be selected to serve as reference samples. Beginning with samples collected in the 1940s onwards (PFAS production era), 1 – 2 samples will be selected for analysis per decade, up to the year 2020. A subset of samples from greater Minnesota will also be analyzed and will serve as additional reference samples.

Upon selection, all samples will be shipped to Eurofins for non-targeted PFAS analysis. Non-targeted analysis (NTA) provides semi-quantitative data for over 1,000 PFAS, which can be used to assess changes in PFAS production and regional differences in PFAS congener patterns.

Activity Milestones:

Description	Approximate Completion Date
Historic Sample Selection	July 31, 2025
Non-targeted PFAS analysis of historic samples by Eurofins	July 31, 2026

Activity 2: Statewide Collection and Targeted Analysis of Current and Historic Pine Needle Samples

Activity Budget: $466,250

Activity Description:
Current-year pine needles will be collected by these volunteers at no cost to the state of Minnesota. Our goal is to collect 3 samples in each of Minnesota's 87 counties, including the most remote parts of the state. A total of 313 targeted analyses will be performed as follows: 261 current-year needles, 26 duplicate needle samples, and 26 aqueous QA/QC samples.

Up to 10 historic needles samples will also be analyzed using targeted methods.

The project manager will work with the Volunteer Monitoring Coordinators to develop training for PFAS sample collection with our volunteer network. Training will include video and written materials, including a frequently asked question (FAQ) guide. The collection procedure is relatively simple, and our volunteers are already skilled sample collectors.

Upon completion of training, volunteers will receive a sample collection kit including everything needed to collect pine needle samples, including nitrile gloves, Ziploc bags, and other supplies. Volunteers will collect the sample according to protocol and promptly submit the samples to Eurofins for analysis.

All pine needles will be shipped to Eurofins for PFAS analysis. Current pine needles will be analyzed by Eurofins using targeted methods (EPA 537 modified + 5 FTOHs) to measure 75 total PFAS.

Activity Milestones:

Description	Approximate Completion Date

Purchase sampling supplies	July 31, 2025
Volunteer recruitment	August 31, 2025
Develop and share sample collection training	September 30, 2025
Send collection kits to volunteers who have completed training	September 30, 2025
Volunteers collect current-year samples	December 31, 2025
Targeted PFAS analysis by Eurofins	May 31, 2026

Activity 3: In-state Travel

Activity Budget: $2,000

Activity Description:
Travel to UMN Herbarium for sample selection and present results at in-state conferences

Activity Milestones:

Description	Approximate Completion Date
One trip to UMN Herbarium to select samples	July 31, 2025
In-state conference attendance and presentation	June 30, 2027

Activity 4: Dissemination

Activity Budget: $3,000

Activity Description:
Current year data collected by our volunteers will be exported to a publicly-accessible, interactive Tableau map. This will allow volunteers to see "their" data and compare their results to the entire statewide dataset. Volunteers will be offered a webinar via WebEx where they can learn more about the meaning and importance of the data they helped collect. Instructions will be provided for accessing and interpreting the map. The map will be made available to the public on MPCA's website, along with a description of the project and guidance for interpreting the data, which may include video as well as written guidance.

The complete results of the study, including non-targeted analysis and modeling results, will be submitted for peer-reviewed publication to a journal such as Environmental Science and Technology. Results will be presented at relevant scientific conferences.

Data will also be shared with the National Atmospheric Deposition Program (NADP). NADP established a PFAS deposition monitoring network in 2024 after several years of development and testing.

All presentations, publications, and communications (electronic or printed) will acknowledge ENTRF by using the logo or language provided in ENTRF acknowledgement guidance.

Activity Milestones:

Description	Approximate Completion Date
Volunteer webinar	May 31, 2027
Publication in open-access journal	June 30, 2027
Tableau map	June 30, 2027
NADP data sharing	June 30, 2027

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Eurofins	Eurofins Environment Testing LLC	PFAS analysis in pine needles	Yes
Timothy Whitfled	University of Minnesota Bell Museum Herbarium	Provide access to archived pine needle samples for PFAS analysis	No

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.
Study findings will be submitted to an open-access peer-reviewed journal for publication. Results will also be shared at scientific conferences and made available on MPCA's website. All articles, presentations, webinars, and communications (electronic and print) on this project will acknowledge ENTRF using either the ENTRF logo or appropriate acknowledgement language according to ENTRF Acknowledgement Guidelines.

An interactive data map will be publicly available on MPCA's website.

A webinar will be offered to volunteers at the completion of the study. A presentation of the data, conclusions, and how to access the interactive map will be provided.

If any "hot spots" should be identified, an effort will be made to identify possible sources and MPCA's Compliance and Enforcement team will be promptly notified.

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?
Results will support Minnesota's PFAS Monitoring Plan. The goals of the monitoring plan are to:
1. Gather Minnesota-specific information in order to craft effective policies around PFAS and their incorporation into MPCA programs;
2. Identify areas of particular concern (due to PFAS concentrations or routes of exposure) that need quick action; and
3. Gather data that galvanizes support for PFAS source reduction and pollution prevention.
The data collected in this study will be supportive of all 3 goals.

This is a one-time study. No ongoing efforts are expected at this time.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Developing Strategies To Manage PFAS In Land-Applied Biosolids	M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 04d	$1,404,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
							Sub Total	**-**
Contracts and Services								
Eurofins Environment Testing	Service Contract	Targeted analysis of PFAS				0		$461,250
Eurofins Environment Testing	Service Contract	Non-targeted analysis of PFAS				0		$78,750
							Sub Total	**$540,000**
Equipment, Tools, and Supplies								
	Tools and Supplies	Nitrile gloves, Ziploc bags, coolers, other sampling supplies including shipping	Sample collection materials					$5,000
							Sub Total	**$5,000**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	One trip to UMN Herbarium from outstate Minnesota	Acquisition of historic pine needle samples					$300
	Conference Registration Miles/ Meals/ Lodging	Conference registration (virtual)	Presentation of results					$1,700

							Sub Total	**$2,000**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	Open Access Journal Fee	Required fee for publication in open access journal					$3,000
							Sub Total	**$3,000**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$550,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount
State				
In-Kind	MPCA staff time equivalent to 0.5 FTE per study year	MPCA staff time	Secured	$135,000
			State Sub Total	**$135,000**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**$135,000**

Total Project Cost: $685,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: cb8be545-011.pdf

Alternate Text for Visual Component

PFAS emitted to the atmosphere adheres to pine needles, where it can be measured to assess past and present PFAS contamination....

Supplemental Attachments

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

Title	File
2025-080 Research Addendum revised_final	49103eb9-e43.docx

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Adjustments were made to the number of samples to be collected and analyzed because the appropriations was a bit less than the amount requested.

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 Commissioner's Plan 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:

Alexis Donath, MPCA

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