



Environment and Natural Resources Trust Fund

M.L. 2025 Approved Work Plan

General Information

ID Number: 2025-191

Staff Lead: Tiffany Schaufler

Date this document submitted to LCCMR: June 6, 2025

Project Title: Citizen Scientists Capture Microplastic Pollution Around State

Project Budget: \$419,000

Project Manager Information

Name: Melissa Maurer-Jones

Organization: U of MN - Duluth

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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. 04p

Appropriation Language: \$419,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to develop adaptable microplastic sampling and detection methods, develop a public-access database, and leverage citizen scientists to survey microplastic pollution throughout the state to allow for data-driven risk management decisions and solutions.

Appropriation End Date: June 30, 2028

Narrative

Project Summary: This project would develop adaptable methodologies and leverage citizen scientists to survey microplastic pollution throughout the state to allow for data-driven risk management decisions and solutions.

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

Microplastics are small plastic particles, measuring less than 5 mm in diameter, that are found in nearly all bodies of water. These particles enter our environment through various pathways, including stormwater runoff, wastewater effluent, other municipal activities, and atmospheric deposition. They range from unaltered plastics, such as plastic manufacturing nurdles, to fragments from the degradation of larger plastic items like ship coatings or environmental plastic pollution. The presence of plastic pollution, including microplastics, in our aquatic systems poses significant challenges to ecosystem health. These particles can be ingested by all organisms, leading to detrimental effects. Given the potential impact on both ecosystem and human health, it is imperative to assess the extent of microplastic pollution in our state's waters. Minnesota lakes serve diverse purposes, ranging from recreational to urban and some even serving as sources of drinking water. Our project aims to design straightforward methods and engage citizen scientists in the collection and analysis of water samples to evaluate microplastic pollution. Additionally, we aim to establish a publicly accessible database to facilitate water quality management efforts.

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.

The scope of microplastic pollution in our lakes has not been widely studied and, in general, the microplastic community is still working to understand the threshold values where a water body may be considered impaired. One of the challenges to accessing and assessing the relationships between plastics in Minnesota lakes with various use-levels (i.e., urban vs rural vs remote) is that the process of surveying the wide-ranging locations and seasons is unsustainable for a small team of PIs from the perspectives of both time and money. There is a clear need to expand the network of samplers to allow the collection of more samples from a greater number of lakes, which will substantially strengthen our datasets tracking the distribution and amounts of microplastics in MN waters and improve our predictions about the potential impacts of microplastics in the environment. We will develop a kit for microplastic sampling and detection that will be deployed through collaborations in high school science classrooms and expanded to other stakeholders as the kits are vetted and improved. Further, we propose to develop a public-access database of the field data using an open-source relational database management system MySQL.

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?

This project will provide data on microplastics in Minnesota lakes, and those data could be used by stakeholders to determine management strategies for microplastic pollution. Further, this work will also develop educational tools that can be used by high school science teachers to fulfill the MN science standards. Lastly, the microplastic collection and analysis tools built for this study could be deployed by stakeholders throughout the state, such as county water quality managers and lake association boards, to help build strategies for remediation if necessary. Additionally, the project will also be detailed in peer-reviewed publications.

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: Development of detection device and validation of microplastic samples collected by citizen Scientists

Activity Budget: \$200,471

Activity Description:

The objective of this activity is to develop a detection strategy for microplastics that overcomes the need for expensive detection tools typically afforded microplastic researchers. A major challenge in identifying microplastics in environmental samples is distinguishing between plastic and naturally occurring particles and plant-based fibers like cotton and cellulose. Capitalizing on expertise of the team, we aim to develop a small, portable device that can image the filters on which the microplastics are collected. This tool will generate images that students can use to more easily count the particles and we aim to develop staining strategies to aid in differentiating the nonplastic particles from plastic particles in the image. The success of this tool will require validation and quality assurance / quality control (QA/QC) of results using traditional microplastic detection strategies including the hot needle test and Fourier Transform Infrared microscopy. Upon development of staining strategies and QA/QC, we also aim to use machine learning tools to automated the software for particle counting. The objective of this activity will be assessed and developed into peer-reviewed publications as noted in Activity 2, milestone #4 along with public presentations to stakeholders about the technology.

Activity Milestones:

Description	Approximate Completion Date
building prototype for microplastic imaging	May 31, 2026
validation of microplastics counts with new tool against standards in the microplastic community	December 31, 2026
build 3-5 additional fluorescence microplastic detectors	January 31, 2027
writing software for automatic detection of microplastic particles	May 31, 2027

Activity 2: Deploying kits to citizen scientist through high school science classrooms and development of public database

Activity Budget: \$218,529

Activity Description:

The objective of this activity is to obtain data from at least ten MN lakes and rivers by partnering with high school teachers and their students. We will recruit teachers through already established connections with teachers in Minnesota public schools, including Janesville Pemberton Waldorf, Proctor, Duluth and Minneapolis. Additionally, we will expand our network of participants through collaborating with the outreach specialist at MN Sea Grant. The new kits will include the device developed in activity one. For our first few sampling trips, we will work with teachers who have gained experience sampling for microplastics using the previously established methods. The teachers and their students will collect parallel samples for processing using the old and new methods, which will enable assessment of the effectiveness of the new kits. Subsequent sampling trips will use only the newly developed kits. Finally, this activity will build the mechanisms of collecting the citizen-science datasets, validating the results, and building the publicly accessible database. The objectives of this activity will be assessed and developed into peer-reviewed publications as noted in Activity 2, milestone #4, building the publicly accessible database and presentations to stakeholders to detail usability of the database.

Activity Milestones:

Description	Approximate Completion Date
build ~15 new microplastic sampling kits	July 31, 2026
recruitment of teachers and deploying sampling kits to high school science classes	June 30, 2027
development of mechanisms to collect data from classrooms	June 30, 2027
validation of data collected by citizen scientists	December 31, 2027
dissemination of results in peer-reviewed publications and with state stakeholders (e.g., DNR or MPCA)	June 30, 2028
development of publicly accessible database that citizen science results can be displayed	June 30, 2028

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Lee Penn	University of Minnesota - Twin Cities	Dr. Lee Penn will be a secondary project manager and is faculty in the Chemistry Department at UMN (also graduate faculty in Water Resource Science and Earth Sciences) and an expert in studying how microplastics change under environmental conditions. Dr. Penn will supervise graduate and undergraduate students.	Yes
Matt Simcik	University of Minnesota - Twin Cities	Dr. Simcik is in the Division of Environmental Health Sciences in the School of Public Health. Dr. Simcik is an expert in the fate and transport of organic contaminants in the environment. Dr. Simcik will co-advise graduate assistants at UMN and UMD.	Yes
Margaret Elmer-Dixon	Milwaukee School of Engineering	Dr. Margaret Elmer-Dixon was a post-doc at UMD and will start as a faculty in MSOE in the department of physics. Dr. Elmer-Dixon is an expert on spectroscopic characterization of the degradation of soft materials and will build the detection tool for microplastic analysis.	Yes
Giniw (Colin Eagle)	Leech Lake Tribal College	Giniw will lend his expertise to coordinate and implement field sampling and testing and supervise and mentor undergraduate students at the Leech Lake Tribal College. Giniw will recruit undergraduate students for summer positions during this project.	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.

The effort on this grant is to expand our network of samplers to increase the sampling sites and data available about microplastic abundance across the state. After performing QA/QC evaluation of high school student data collected, we will build a publicly accessible database of microplastic counts in water bodies across MN. We plan to advertise the database by presenting the work at regional and national conferences and workshops. We will target efforts where state-wide stakeholders are present such as the St. Louis Estuary River Summit (held every year in Superior or Duluth).

Further, our efforts on technology development for easy microplastic counting, the results of the QA/QC of non-expert samplers, and the overall scientific results we observe from pulling data from across the state will be reported in regional and national presentations and peer-reviewed publications in journals such as Environmental Science and Technology, Journal of Chemical Education, and Environmental Science: Processes and Impacts. We will work to make our publication open-access to widen the impact of our work.

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?

One of the aims of this work is to develop a publicly accessible database, with continued access even after the completion of this funding. The database will be hosted on a UMN-system server, and the public will have access to existing data and can submit new data. We aim to build partnerships with organizations such as MN Sea Grant, UMN

Extension, or MPCA to help maintain the effort after completion of funding. Further, the results will be published in peer-reviewed journals and presented at regional and national conferences.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Sinking and Suspended Microplastic Particles in Lake Superior	M.L. 2023, , Chp. 60, Art. 2, Sec. 2, Subd. 04e	\$412,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Melissa Maurer-Jones		PI			26.8%	0.18		\$31,462
Matt Simcik		Co-I			26.8%	0.18		\$67,905
R. Lee Penn		Co-I			26.8%	0.18		\$53,936
Undergrad researcher		Undergraduate researchers, mentored by Giniw, Maurer-Jones, and Penn, will work over summer 2026 and 2027 to process samples, expand our lake sampling sites, and beta-test the database. Budget allows for ~900 h of work (\$15-18/h), most of which will be over the summer.			0%	0.15		\$16,267
GRA		2 graduate research assistants (mentored by Maurer-Jones, Penn, and Simcik) will be supported over the course of this grant to validate new detection strategies to standard methods in addition to developing the database and analyzing student survey data.			47%	1		\$103,890
							Sub Total	\$273,460
Contracts and Services								
Giniw Colin Eagle, Leech Lake Band of Ojibwe	Service Contract	Giniw, a member of Leech Lake Tribal College, will aid in expanding our network of citizen science participants, especially in regions outside metro and Duluth areas, in addition to recruiting and mentoring undergraduate researchers.				0.24		\$43,272
Margaret Elmer-Dixon via MSOE	Subaward	Dr. Elmer-Dixon is an expert on the fluorescent analysis tool we plan to employ for detection of microplastics. She is actively working on developing a easy-to-transport device and writing software for the analysis. Her responsibility will be to support that portion of Activity 1.				0.24		\$30,111
							Sub Total	\$73,383

Equipment, Tools, and Supplies								
	Tools and Supplies	Prototype detector supplies	\$13,000 will be used in year 1 to develop a new device to detect microplastics which includes purchasing 3D printer resin, detectors, optics, light sources, and electronic connectors. Upon development, \$12,000 will be used to create more devices that can be lent to classrooms for their analysis of the samples.					\$25,000
	Tools and Supplies	Other supplies	\$8000 is requested in year 1 to assemble the necessary components on the sampling kits (including sieves, USB microscopes, wash bottles, tweezers, and filters). Other supplies include fluorescence dyes, solvents, and lab consumables (e.g., gloves, kimwipes, etc) with will be covered by \$2000 in the Year 1. \$5578.50 is requested for both year 2 and year 3 to cover supplies in the PIs labs included replacement pieces for kits and additional lab consumables.					\$21,157
							Sub Total	\$46,157
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel to classrooms and sampling locations ~\$1400 (1-2 people per trip, estimated number of trips total for 3 years = 15, estimated mileage per trip = 150 miles, estimated mileage reimbursement = \$0.655)	Travel is provided to support PI and student travel in the course of this grant to and from sampling locations					\$1,400

			and classrooms to support the development of the kit.					
	Conference Registration Miles/ Meals/ Lodging	Travel to in-state conferences for the PI and/or GRA over the course of grant - ~\$4800 (including travel (mileage), lodging, meals, and conference registration).	To present finding from the project					\$4,800
							Sub Total	\$6,200
Travel Outside Minnesota								
	Conference Registration Miles/ Meals/ Lodging	Travel to an out of state conference for 1 person over the course of grant - ~\$4800 (including travel (mileage), lodging, meals, and conference registration).	Fund grad student or PI travel to a conference to present findings from this work.	X				\$4,800
							Sub Total	\$4,800
Printing and Publication								
							Sub Total	-
Other Expenses								
		Shipping	When PI or student travel to classrooms is not possible, we will ship the kits and samples. Expenditures expected per shipment of kit = ~\$50 per shipment, which would be shipping kits to 15 classrooms and having them sent back.					\$1,500
		K-12 activity participants	In asking high school science teachers to participate in the development of this kit, we will provide an honorarium to support the time they use to develop curriculum materials. Additionally, we will offset the cost of transportation that may be required to get classrooms to sampling sites. We will provide \$500 per teacher honorarium for 15 teachers over the course of the 3 year grant. That allows us to have \$6000 to assist teachers to					\$13,500

			get bussing for students to the sampling sites should they need it.					
							Sub Total	\$15,000
							Grand Total	\$419,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	Travel to an out of state conference for 1 person over the course of grant - ~\$4800 (including travel (mileage), lodging, meals, and conference registration).	Connect with researchers doing similar work in other states about using citizen scientists for sampling microplastics

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 negotiated rate for research of 55% 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	\$226,228
			Non State Sub Total	\$226,228
			Funds Total	\$226,228

Total Project Cost: \$645,228

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [c5acf638-e42.pdf](#)

Alternate Text for Visual Component

Leveraging citizen scientists increases our ability to study a wide variety of geographically and use-level water bodies across Minnesota....

Supplemental Attachments

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

Title	File
LCCMR Transmittal letter - Mauer-Jones	8571db43-9d9.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

1. We have edited introductory information as requested in the comments that mark this work as having an impact on children and that people working on this project will have appropriate background checks.
2. We have included a statement of Dissemination (Tab 9), which was not previously requested.
3. Added an additional statement in the Long-term implementation text box in the "Narrative" tab (Tab 4).
4. The budget was reduced to match what was allocated upon selection, which required us to reduce the budget by \$31,000. To do so, we reduced the summer salaries of PIs Maurer-Jones, Simcik and Penn to 0.75 months for each summer. PI Elmer-Dixon was reduced to 0.75 months summer in year 2 and 3. In part, these reductions were to accommodate making sure we had 2 full years of funding for a graduate student, which was previously 1.5 years. This redistribution reflects the efforts on the activities and the timeline of completion more accurately. We also added additional funds to the supplies budget to cover miscellaneous expenditures such as lost kits, prototyping materials, reagents, and kit consumables such as filters. This will also cover the expenses labs will need to complete the analysis

1/30/25 Update:

I addressed the comments given which included:

1. selecting that "No" that this project does not have original hypothesis driven research
2. re-budgeted travel so only one participant can travel to an out-of-state conference and included an additional budget line for participant(s) to present at an instate workshop or conference.
3. added language to the narrative and milestones about what the specific products of this work would be to demonstrate success of these milestones.
4. moved the K12 activity participant budget item to the "other" tab in added language about the amount of the honorarium + number teachers involved
5. I acknowledged Giniw Colin Eagle's participation as a service contract.

2/14/25 Update:

I addressed the comments given which included:

1. adding language to the dissemination section to state that the ENRTF will be acknowledged through the use of the trust fund logo or attribution language on the project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgement Guidelines

2. To respond to the comment about the order of milestones on Activity 1 - The third milestone is about using machine learning or AI to develop automation of detection. This is not necessary to have been complete to build the physical prototypes and use the data to more "manually" pick microplastics from the images. The machine learning components will take longer to code, which is why the software for automation will happen later. I've reworded the language to that activity description to hopefully clarify this.
3. I've added a milestone in Activity 2 to generate the publicly accessible database.

6/6/25 Update:

I addressed the most recent comment regarding including the building of additional detection tools and assembling additional sampling kits. To address this comment, I've added a milestone to BOTH activity 1 (building the detection tool) and activity 2 (building the sampling kits). These are budgeted in these different activities so had to add these milestones in separate activities.

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?

No

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")?

Yes

Do you certify that background checks are performed for background check crimes, as defined in Minnesota Statutes, section 299C.61, Subd. 2, on all employees, contractors, and volunteers who have or may have access to a child to whom children's services are provided by your organization?

Yes

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

UMN Sponsored Project Administration

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