Environment and Natural Resources Trust Fund

2026 Request for Proposal

General Information

Proposal ID: 2026-289

Proposal Title: Reducing Microplastics and PFAS from Minnesota Lawn Fertilizers

Project Manager Information

Name: Dominic Petrella

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

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Project Basic Information

Project Summary: This project will provide data to inform Minnesotans if fertilized turfgrasses contribute to microplastic and PFAS pollution, and to identify barriers/tradeoffs/incentives for consumers to use contaminant free fertilizers.

ENRTF Funds Requested: $998,000

Proposed Project Completion: June 30, 2029

LCCMR Funding Category: Land (F)

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

Narrative

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

Fertilization of lawns and other turfgrass areas ensures functional, dense grass that keeps soil in place; reducing runoff, filtering pollutants, and creating enjoyable places for recreation. For years, university Extension programs have recommended fertilization best practices that reduce environmental risks such as nutrient runoff or leaching. Of those practices, the use of slow release fertilizers is often recommended. Polymer coated controlled release fertilizers (PC-CRF) and organic fertilizers offer slow release of nitrogen into soil, meeting plant needs while decreasing nutrient movement. However, PC-CRFs and organic fertilizers have the potential to increase pollution due to both microplastics and per- and polyfluoroalkyl substances (PFAS). Microplastics and PFAS (described here as pollutants) have been shown to be harmful ecologically and to human health, but we are unaware if microplastics and PFAS are a problem in turfgrass ecosystems such as youth sports fields, parks, golf courses, and home lawns. PC-CRFs and organic fertilizers are considered "safer" fertilizers, but we do not know if this value is outweighed by potential microplastic and PFAS contamination. Average Minnesotans interact with and manage turfgrasses more than most other crops, and therefore may encounter high amounts of these pollutants or unknowingly introduce them into our shared environment.

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.

This project will determine if microplastic and PFAS contamination are problems in and near turfgrass ecosystems in Minnesota. We will sample soils, drainage water, and nearby streams/ponds to identify and quantify microplastics and PFAS across home lawns, public parks, sports fields, and golf courses in Minnesota. Using historical fertilizer application data from each location samples are collected, we will determine the extent to which PC-CRFs and organic fertilizers are contributing to pollution. These data will inform us on whether or not microplastics and PFAS are a problem that outweighs the benefits of PC-CRFs and organic fertilizers. We will also establish long-term experiments in which we will examine accumulation of microplastics and PFAS in soil, runoff, and leachate using different fertilizers and fertilizer programs. These data will be used to educate Minnesotans, both the public and turfgrass stakeholders, on microplastic and PFAS pollution from fertilizer application; presenting them with alternative fertilizers to use that don't contain these pollutants. Finally, we will examine social and economic factors associated with the use of reduced impact fertilizer products to better grasp if consumers are willing to use microplastic and PFAS free fertilizers.

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?

Our project will determine whether or not microplastics and PFAS are commonly found pollutants in turfgrass ecosystems, and if they are present in concerning concentrations. We will also better understand how fast microplastics and PFAS accumulate in turfgrass ecosystems using common fertilizer programs, and if these contaminants readily move. Throughout the project, we will communicate and educate Minnesotans and stakeholders on this topic and discoveries that we make including updating best management practices to reduce pollution. Last, we will understand barriers to consumers and managers using alternative fertilizers that still provide slow release nutrients, but lack microplastics and PFAS.

Activities and Milestones

Activity 1: Investigate microplastic and PFAS contamination from fertilizers in turfgrass ecosystems in Minnesota

Activity Budget: $607,098

Activity Description:
In year 1 we will sample home lawns that are part of an ongoing research project (NSF MSP LTER), public parks, athletic fields from local schools, and Minnesota golf courses (40 locations). At each location, we will collect soil, and from locations with nearby waterways, ponds, or accessible drainage outflows we will collect water samples 3 times per year. Samples will be analyzed for total microplastics (UMN) and PFAS (Eurofins) via LC and/or GC-MS/MS. We will request historical data on which fertilizers have been applied at each location. We will also quantify PFAS from organic fertilizers commonly used on turfgrasses such as biosolid products along with fertilizers made from animal manure and plant residues (20 products).

Starting in year 1 and continuing through year 3, we will establish field studies using an established runoff research area at the University of Minnesota to examine accumulation and movement of microplastics and PFAS from fertilizers. We will apply fertilizer using established programs that contain or do not contain PC-CRFs or organic fertilizers using industry best practices. Each year, we will sample soil, runoff, and leachate multiple times per year to examine how different fertilizers lead to pollutant accumulation and movement.

Activity Milestones:

Description	Approximate Completion Date
Establish fertilizer field plot study to investigate microplastic and PFAS accumulation	October 31, 2026
Collect soil and water samples from turfgrass ecosystem in Minnesota	November 30, 2026
Quantify microplastics from turfgrass ecosystem samples	December 31, 2027
Quantify PFAS amounts in organic fertilizers for lawn and garden and from turfgrass ecosystem samples	July 31, 2028
Complete fertilizer field plot study	April 30, 2029

Activity 2: Educate the public and stakeholders on microplastics and PFAS in fertilizers and lawns

Activity Budget: $67,299

Activity Description:
Based on the findings of activity 1, we will create educational programming to target stakeholder groups using or managing lawns. These stakeholder groups will include homeowners, turfgrass professionals, and fertilizer vendors. Field day events will be used to educate stakeholders at the Turfgrass, Researcher, Outreach, and Education (TROE) center at the University of Minnesota in June 2027, 2028, and 2029. We will use our field plot study as the backbone of these events, and will have education on fertilizers, programming, and microplastic/PFAS pollution to increase awareness. A permanent Extension webpage at extension.umn.edu will be created with results from this research as well as recommendations for best management practices and fertilizer choices. Finally, findings from activity 1 will be communicated with the public via newsletter articles and blog posts as we become more informed from activity 1 results. We will also have signage at the Minnesota State Fair in the turfgrass science booth (Agriculture Horticulture Building), where we can discuss our findings with the public, and provide them with printed materials to help educate them on this topic.

Activity Milestones:

Description	Approximate Completion Date
Start release of newsletter articles and blog posts	September 30, 2026
Extension webpage established	February 28, 2027
Hold initial field day presentations and demonstrations	June 30, 2027
Educate the public at the Minnesota State Fair on initial results	August 31, 2027
Hold second field day	June 30, 2028
Educate the public at the Minnesota State Fair final results	August 31, 2028
Hold final field day	June 30, 2029

Activity 3: Examine the social and economic factors associated with consumer and manager fertilizer choices

Activity Budget: $323,603

Activity Description:
We are aiming to reduce microplastic and PFAS pollution from fertilizers, but this is ultimately a choice by consumers to use lower impact products. We will investigate how consumers (2,000 total) choose slow release fertilizers, including their perceptions on ecological impact, using Qualtrics. Using a choice experiment, we will present participants with different fertilizer options (differ in cost, efficacy, environmental benefits, etc.). Using choice data, we will identify characteristics and barriers that influence fertilizer choice. Additionally, we will investigate incentives such as subsidies that could encourage the adoption of sustainable fertilizers.

Next, for managers (e.g. public land managers, golf course superintendents), key informant interviews (approximately 20) will be conducted to assess similar ideas as in the consumer choice survey, but focused on management practices and their fertilizer choices. Specifically this will include how and why managers make decisions regarding fertilizer product choice; identifying particular barriers, opportunities, and incentives towards shifting away from fertilizers containing microplastics and/or PFAS. Interviews will also focus on the tradeoffs made by managers when selecting different fertilizers. Interviews will aim to include managers from across Minnesota, as well as the type of land they manage (e.g. parks, sports fields, golf courses, etc.).

Activity Milestones:

Description	Approximate Completion Date
Consumer choice surveys will be developed	September 30, 2027
Land manager interviews will begin	April 30, 2028
Results of consumer choice surveys will be analyzed	August 31, 2028
Final results on economic and social aspects regarding fertilizer choice complete	April 30, 2029

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Eric Watkins	University of Minnesota	co-PI	Yes
Chengyan Yue	University of Minnesota	co-PI	Yes
Jon Trappe	University of Minnesota	co-PI	No

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?

Our goal is to reduce pollution from turfgrass ecosystems in Minnesota by gaining new knowledge and sharing educational materials with the public. We will implement our research results through in-person trainings and online resources that will be available long after project completion. Additionally, we will communicate our findings to policy-makers to inform future regulations aimed at protecting Minnesota's natural resources. Future support may be requested from LCCMR or USDA to develop and/or adapt methods that remedy high amounts of microplastics/PFAS in turfgrass ecosystems, and to test alternative slow-release fertilizers that do not contribute to microplastic or PFAS pollution.

Project Manager and Organization Qualifications

Project Manager Name: Dominic Petrella

Job Title: Assistant Professor

Provide description of the project manager's qualifications to manage the proposed project.

Dominic Petrella is an experienced researcher and has experience leading collaborative projects such as what is being proposed here. Dr. Petrella holds a PhD in Turfgrass Science and Physiology from The Ohio State University, where his research is focused on turfgrass responses to environmental stressors and low-input turfgrass management. Dominic has led grants (as lead PI) and funded research projects examining minimum nitrogen fertilizer needs of lawn- and golf-type turfgrasses (USDA specialty crop block grant). He also has been actively working in the area of low-impact lawn fertilizers. As part of a multi-state collaboration (funded by the Indiana Soy and Corn Board), Dominic has been developing alternative plant-based fertilizers, with biodegradable coatings, aimed at reducing pollutants such as microplastics and PFAS. Dr. Petrella also has experience working with collaborative teams to answer big questions. Dominic is a coPI on multidisciplinary USDA grants and has been developing projects with researchers outside of his discipline to broaden his impacts. Last, Dr. Petrella is experienced in supervising other scientists and students, and has the skills to make sure this project stays in track.

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

Organization Description:

Project Manager Dominic Petrella is part of U of MN Department of Horticultural Science. The Department of Horticultural Science is a diversified research-oriented organization that has a strong commitment to teaching and Extension/outreach. The primary mission of the department is to discover, interpret, and transfer new knowledge for the purpose of improving quality of life through a) improving productivity, value, and use of horticulture crops; b) contributing to a quality environment, and c) educating students.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Dominic Petrella (Professor/Faculty)		PI - 2 weeks of summer salary each year. Will direct all project components, lead activity 1 and co-lead activity 2, and supervise the post-docs and undergraduate researchers.			36.6%	0.12		$20,671
Eric Watkins (Professor/Faculty)		coPI - 2 weeks of summer salary each year. Will co-lead activity 1 and 3, and will supervise the researchers.			36.6%	0.12		$29,206
Chengyan Yue (Professor/Faculty)		coPI - 2 weeks of summer salary each year. Will lead activity 3 related to economic analyses, will supervise the graduate student			36.6%	0.12		$32,614
Paige Boyle (Post-doc associate)		Will assist in managing all activities, lead project communications, assist in reporting and assist in Extension and outreach			25.9%	0.6		$50,271
Kim Tiber (Field research manager)		Will manage field plots, assist in fertilizer application, and sample collection for activity 1.			32.3%	0.3		$28,789
Post-doc researcher (TBD)		Will lead research efforts for activity 1 including sample collection, sample analyses and pollutant quantification, and will assist in on-campus field plot research. Will assist in Extension efforts in activity 2 including educating the public.			25.9%	3		$254,198
Researcher 5 (TBD)		Will lead social science research in activity 3 including conducting interviews, analyzing data, and reporting results.			36.6%	0.45		$44,554
Researcher 1 (TBD)		Will assist in social science research in activity 3, specifically helping to conduct interviews			32.3%	0.75		$53,424
Graduate student (TBD)		Will lead economic research in activity 3; develop and conduct surveys, analyze data. Stipend only includes academic months.			23.2%	3		$86,354
Undergraduate researcher (TBD)		Will assist in activity 1 research including helping collect and analyze samples, and assist in fertilizer application for field plot research (240 hrs per year [20 hr/week, 3 months])			0%	0.36		$11,520
							Sub Total	**$611,601**
Contracts and Services								

Qualtrics	Service Contract	Qualtrics will procure a consumer panel (2,000 people) to provide opinions on economic impact of microplastics and PFAS from fertilizers				0		$12,000
Eurofins	Service Contract	Eurofins will identify and quantify PFAS from soil and water samples from activity 1 (450 samples total).				0		$225,000
							Sub Total	**$237,000**
Equipment, Tools, and Supplies								
	Tools and Supplies	Purchase of consumable lab supplies (PPE, sample tubes, sample collection containers) for activity 1	Supplies for safety, collecting, and storing samples for microplastics and PFAS analyses					$3,000
	Tools and Supplies	Purchase of supplies for microplastic analysis and quantification	Supplies including extraction solvents and acids, plastic standards, liquid nitrogen for sample preparation, GC-MS supplies, and sample filters. 40 locations and 3 soil samples per location for off-site ecosystem (120 samples), 10 off-site locations with nearby waterways, collect water 3x in year 1 with 3 replicates (90 samples) - year 1-2. 60 samples per year for field plot research on St. Paul campus (180 samples) - years 1-3					$58,500
	Tools and Supplies	Supplies for field plot research	Purchase of fertilizers for PFAS analysis and use of field plot research, purchase of supplies to maintain field plots including paint, fuel, etc.					$1,500
	Tools and Supplies	Purchase of refreshments, ice, and snacks for those who attend a lawn care focused field day at St. Paul campus in year 1-3 ($250 per year, $750 total)	Each year of the grant we will hold field days for the public and stakeholders to learn about our results. Field days will last long enough to require providing refreshments and snacks for attendees.	X				$750
							Sub Total	**$63,750**
Capital Expenditures								

							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	University of Minnesota fleet vehicle rental. $80 per trip (rental and mileage), 66 total trips across activities 1-3	Funding will be used to travel off-campus sites collect sample soils/water, travel to Extension events, and travel to conduct interviews					$5,280
							Sub Total	**$5,280**
Travel Outside Minnesota								
	Conference Registration Miles/ Meals/ Lodging	Funding includes conference registration, flights, and per diem for one person for activity 1 research ($2,000 per trip, 1 trip per year, $6,000 total)	Travel to scientific meetings to present results of activity 1	X				$6,000
	Conference Registration Miles/ Meals/ Lodging	Funding includes conference registration, flights, and per diem for one person for activity 3 research ($2,000 per trip, 1 trip per year, $6,000 total)	Travel to scientific meetings to present results of activity 3	X				$6,000
							Sub Total	**$12,000**
Printing and Publication								
	Printing	Printing of flyers and Extension bulletins for Extension events ($500 per year, $1,500 total)	Funding to print material to educate the public on turfgrass ecosystems, their benefits, their negative impacts, fertilizers, and results of our findings					$1,500
	Printing	Printing of signage for field days and for the Minnesota State Fair turfgrass booth ($500 per year, $1,500 total)	Funding to print plot signage to sign plots for field day events, funding for banner and signage to be placed at the Minnesota state fair to educate the public about slow release fertilizers, microplastics, PFAS, and pros/cons of some slow release fertilizers.					$1,500

	Publication	Publication of peer-reviewed manuscripts (2 publications)	Publish results from activities 1-3 in an open access manner so everyone can read results from this funded work (4 total publications)					$4,000
							Sub Total	**$7,000**
Other Expenses								
		Funding for interviewee incentives	Funding will be used to provide incentives to interview public land managers on the social aspects of slow release fertilizers and potential pollutants from these products					$2,352
		Graduate student tuition (3 years of tuition)	Fund the tuition of the graduate student leading research on economic factors associated with consumer fertilizer choice					$59,017
							Sub Total	**$61,369**
							Grand Total	**$998,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Equipment, Tools, and Supplies		Purchase of refreshments, ice, and snacks for those who attend a lawn care focused field day at St. Paul campus in year 1-3 ($250 per year, $750 total)	We will hold field days open to the homeowners and turfgrass stakeholders each year of this grant. Events are expected to last 2-3 hours long in which we will provide light refreshments and snacks to attendees.
Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	Funding includes conference registration, flights, and per diem for one person for activity 1 research ($2,000 per trip, 1 trip per year, $6,000 total)	This funding request includes the cost of conference attendance. We will formally present results of our research to the scientific community in order to help bring in outside ideas to our research and expand the impact of our results outside of Minnesota.
Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	Funding includes conference registration, flights, and per diem for one person for activity 3 research ($2,000 per trip, 1 trip per year, $6,000 total)	This funding request includes the cost of conference attendance. We will formally present results of our research to the scientific community in order to help bring in outside ideas to our research and expand the impact of our results outside of Minnesota.

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	**-**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**-**

Total Project Cost: $998,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: 886de407-605.pdf

Alternate Text for Visual Component

This visual description depicts experiments in which we will measure microplastics and PFAS in turfgrass ecosystems in Minnesota, and economic/social science that will be conducted to understand consumer and turfgrass manager fertilizer choices....

Supplemental Attachments

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

Title	File
U of MN approval letter	2e9cb7cc-79d.pdf
AURI - letter of support	9c4a7fc7-1ee.pdf
MGCSA - letter of support	903552ed-75b.pdf
MTGF - letter of support	76c21886-838.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

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 proposal:

Dave LaFave, University of Minnesota

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