



Environment and Natural Resources Trust Fund

2025 Request for Proposal

General Information

Proposal ID: 2025-312

Proposal Title: Trace Metals in Municipal Yard Waste and Compost

Project Manager Information

Name: Lucy Rose

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

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Project Basic Information

Project Summary: The project will assess trace metal contamination of compost feedstocks (residential yard waste) and finished compost at municipal yard waste recycling programs in the Twin Cities metro area.

ENRTF Funds Requested: \$120,000

Proposed Project Completion: June 30, 2027

LCCMR Funding Category: Small Projects (H)

Secondary Category: Foundational Natural Resource Data and Information (A)

Project Location

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

Region(s): Metro

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

Region(s): Metro

When will the work impact occur?

During the Project and In the Future

Narrative

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

Minnesota law prohibits yard waste disposal in residential trash. Many municipalities operate yard waste collection sites where this material becomes the raw material (feedstock) for compost, which is made available to residents. Yard waste is ideal for composting; however, urban waste may be enriched in pollutants (e.g., trace metals), which can persist in finished compost. Trees provide “passive filtration” of atmospheric pollutants (Figure 1) generated by ever-present pollution sources— such as vehicle exhaust and industrial activities— in urban areas. Consequently, the neighborhood-level density of pollutant sources and urban trees may regulate the route of pollutant exposure, either through the air or, potentially, through municipal compost. Moreover, trace metal bioavailability can increase during the composting process and with compost age, rising to levels that exceed drinking water standards. To assess the safety of municipal compost made available to urban gardeners, the proposed work will: 1) quantify trace metal concentrations in compost feedstocks at urban yard waste collection sites and, 2) assess drivers of trace metal variability in compost across urban yard waste collection sites. Information resulting from this work will be communicated to public health officials in order to inform risk vs. benefit decisions about urban compost production and distribution.

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 quantifies trace metal (e.g., aluminum, arsenic, lead, zinc, and copper) concentrations in urban compost feedstocks, finished compost, and leachate (organic matter-rich water that drains from compost). We will also characterize the spatial variability of these trace metals to characterize the effect of pollutant source and urban tree densities on compost materials sourced throughout Ramsey County and portions of Hennepin and Washington Counties. Compost feedstocks (e.g., tree leaves, grass clippings) will be collected weekly from September-November 2025 and September-November 2026 at seven Ramsey County yard waste sites. In the following spring (i.e., March-June in 2026 and 2027), compost will be collected during five visits to yard waste sites. Compost will be collected immediately following delivery of finished compost to yard waste collection sites (i.e., when 100% of the available compost pile is present), and when 75, 50, 25, and 10 percent of the compost pile remains. These stratified collections will ensure that representative cross sections of the compost pile are sampled through time. This sampling program will assess 1) the level of trace metal pollution in urban compost feedstocks and 2) the level of trace metal exposure to urban home gardeners via finished compost available through

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?

Project outcomes address Minnesota’s natural resources by quantitatively tracking the fate of trace metals in yard waste generated by urban residents and the finished compost used in residential home gardens. The air filtering capacity of urban trees represents an important component of the natural resource base in Minnesota communities with high road densities and intensive development. Similarly, municipal composting programs reflect Minnesota’s commitment to conservation and waste reduction. These two facets work together to protect Minnesota’s natural resources through improved air quality and reduced waste; this project adds key information on the potential transfer of associated pollutants to urban soils.

Activities and Milestones

Activity 1: Sample Collection for Yard Waste, Finished Compost, and Compost Leachate

Activity Budget: \$47,005

Activity Description:

The Environmental Health Division of Ramsey County Public Health grants access to Ramsey County yard waste collection sites during the project. Yard waste materials (e.g., tree leaves, grass clippings) will be collected from seven municipal collection sites during peak activity periods, between late September/early October and late November of 2025 and 2026. Samples of finished compost will be collected during the following spring (March-June) in 2026 and 2027. Finished compost sampling will be stratified, with initial samples collected from each site at the time when fresh compost is delivered to yard waste sites (i.e., when 100% of available compost is on site) and additional samples collected over the subsequent weeks to enable collection of compost material from increasingly deeper internal layers of the original compost pile. Compost will be collected at intervals of 75, 50, 25, and 10 percent of the original compost available at sites. This stratified sampling will allow a representative characterization of trace metal variability in finished compost. After collection, one half of each compost sample will be analyzed for trace metal determination on undisturbed material; the other half will undergo water extraction for the determination of trace metal concentrations in compost leachate.

Activity Milestones:

Description	Approximate Completion Date
Representative collections of residential yard waste from municipal yard waste collection sites	November 30, 2026
Representative collections of finished compost from municipal yard waste collection sites	May 31, 2027
Laboratory work for compost leachate preparation	May 31, 2027

Activity 2: Chemical Analysis of Yard Waste, Finished Compost, and Compost Leachate Samples; Ancillary Data Gathering; Data Analysis & Interpretation

Activity Budget: \$72,995

Activity Description:

Yard waste, finished compost, and compost leachate samples will be dried and ground for determination of trace metal concentrations via portable X-ray fractionation at the University of Minnesota. For trace metal concentrations in compost leachate, a subsample of each finished compost sample will undergo water extraction to generate compost leachate. Liquid compost leachate samples will be analyzed for trace metal concentrations via Inductively Coupled Plasma- Optical Emission Spectrometry at the University of Minnesota Research Analytical Laboratory. Trace metal concentrations will be compared across sample types, across the spatial gradient of yard waste collection sites, and across temporal gradients of sampling periods throughout the duration of the project. Supporting data on environmental conditions will be gathered from public data sources (e.g., MPCA, University of Minnesota, NOAA) to aid in the interpretation of temporal and spatial patterns in trace metal concentrations of collected samples. Such ancillary data will include air pollutant concentrations, meteorological conditions (e.g., rainfall patterns, wind speed, wind direction), urban tree canopy cover estimates across areas served by Ramsey County yard waste sites, and estimates of vehicle and point source emissions in areas served by yard waste sites.

Activity Milestones:

Description	Approximate Completion Date
Analysis of residential yard waste materials for determination of trace metal concentrations	December 31, 2026

Analysis of finished compost and compost leachate for determination of trace metal concentrations	May 31, 2027
Analysis and interpretation of spatiotemporal patterns in trace metals and their relationships to environmental conditions	June 30, 2027

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
John Springman	Environmental Health Division of Ramsey County Public Health	This project collaborator is the Supervisor of solid waste operations programs for the Environmental Health Division of Ramsey County Public Health; he will grant access to yard waste collection sites throughout Ramsey County to facilitate sample collections.	No
Diana Karwan	University of Minnesota Twin Cities	This project collaborator will provide access to laboratory facilities at the University of Minnesota to facilitate preparation of liquid compost leachate samples for chemical analysis.	No
Nic Jelinski	University of Minnesota Twin Cities	This project collaborator will provide access to laboratory facilities at the University of Minnesota to facilitate preparation of yard waste and finished compost samples and determination of trace metal concentrations via portable X-ray fractionation analysis.	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?

The results of this project will provide quantitative constraints on trace metal concentrations present in compost feedstocks, finished compost, and compost leachates. The process-based understanding generated by this project will be communicated to county-level policy makers throughout the Twin Cities metro area to inform policies related to environmental and public health in urban municipalities. If project findings reveal that composting programs in areas exposed to chronically elevated air pollution levels unintentionally facilitate the delivery of trace metals to urban soils, additional funding will be sought to investigate opportunities for compost remediation.

Project Manager and Organization Qualifications

Project Manager Name: Lucy Rose

Job Title: Researcher 6

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

Dr. Lucy Rose has over 20 years of management and research experience focusing on hydrology, biogeochemistry, and ecosystem ecology. In addition to her current focus on natural resources-related research in the Department of Forest Resources at the University of Minnesota, she has also conducted academic research in the Department of Geology and Planetary Science at the University of Pittsburgh, and Department of Natural Resources and Environmental Sciences at the University of Illinois and collaborated with the U.S. Forest Service and The Nature Conservancy on research projects related to fire ecology. Dr. Rose's work spans spatial scales ranging from individual trees to large watersheds and temporal scales ranging from a single hour to decades. She has authored or co-authored peer-reviewed publications on the topics of hydrology, nutrient cycling, fire ecology and management, and anthropogenic nitrogen pollution in the atmosphere and forest ecosystems. Dr. Rose is currently involved in projects examining the function of tree canopies in urban hydrologic and nutrient cycles in St. Paul, Minnesota, and the influence of dissolved organic carbon characteristics on environmental contaminants in Minnesota streams.

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

Organization Description:

The University of Minnesota is a land-grant institution and research university with a long history of education and service to the state of Minnesota and beyond. The University's College of Food, Agricultural, and Natural Resource

Sciences (CFANS) supports research and innovation across 13 academic departments and 10 research and outreach centers, focusing on food safety and security, agricultural innovation and advancement, and the responsible and sustainable management of natural resources. The University of Minnesota, and CFANS in particular, strives to establish Minnesota as a leader and innovator in the fields of food, agriculture, and natural resources through the development and implementation of science-based solutions to state, national, and global issues of resource availability and protection.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Principal Investigator		Primary project leader; conducts sample collections at study sites and preparation of compost leachate samples; conducts data analysis, interpretation, and report writing; project administration			37.1%	0.25		\$36,013
Principal Investigator		Primary project leader; conducts sample collections at study sites and preparation of compost leachate samples; conducts data analysis, interpretation, and report writing; project administration			37.1%	0.33		\$48,335
1 laboratory staff		Prepares yard waste and finished compost samples for analysis; conducts trace metal analysis on yard waste and finished compost samples			33.3%	0.16		\$21,247
							Sub Total	\$105,595
Contracts and Services								
Research Analytical Laboratory, University of Minnesota	Internal services or fees (uncommon)	This entity will conduct chemical analyses of liquid compost leachate samples for trace metal concentrations.				-		\$10,200
							Sub Total	\$10,200
Equipment, Tools, and Supplies								
	Tools and Supplies	consumable laboratory supplies (nitrile gloves, sample collection bags, bottles)	These items are necessary for the collection, preservation, analysis, and storage of solid and liquid samples collected during the project.					\$805
							Sub Total	\$805
Capital Expenditures								
							Sub Total	-

Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	University vehicle rental, mileage, and fuel costs for travel to project sites	Travel to sampling sites in Ramsey county during Y1 and Y2 of the project					\$3,000
	Conference Registration Miles/ Meals/ Lodging	Conference fee for conference in Minnesota (e.g., Minnesota Water Resources Conference in St. Paul, MN)	To present project findings public health and environmental scientists in project Y2.					\$400
							Sub Total	\$3,400
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$120,000

Classified Staff or Generally Ineligible Expenses

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

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

Total Project Cost: \$120,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [9979ef67-16c.pdf](#)

Alternate Text for Visual Component

Figure shows how urban trees filter particulate matter and associated pollutants (e.g., trace metals) from the atmosphere. Urban tree canopies temporarily sequester atmospheric pollutants on leaf and branch surfaces. When deciduous trees drop their leaves in the fall, residents bring these leaves to yard waste collection sites for composting....

Supplemental Attachments

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

Title	File
Springman_LetterOfSupport	17240fcd-861.pdf
Karwan_LetterOfSupport	4fb38485-a8d.pdf
SPA_Document	5435d3ac-c15.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

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?

Yes, Sponsored Projects Administration

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:

Amber Kevelin, University of Minnesota Twin Cities; Kelsey Grachek, University of Minnesota Twin Cities

