



Environment and Natural Resources Trust Fund

2026 Request for Proposal

General Information

Proposal ID: 2026-239

Proposal Title: How Do Microplastics Impact Minnesota's Wild Birds?

Project Manager Information

Name: Sushma Reddy

Organization: U of MN - Bell Museum of Natural History

Office Telephone: (612) 625-4977

Email: sreddy@umn.edu

Project Basic Information

Project Summary: Birds are often indicators of emergent environmental threats. We propose using salvaged wildlife from across the state to investigate the prevalence and impact of microplastics in wildlife and ecosystems.

ENRTF Funds Requested: \$508,000

Proposed Project Completion: June 30, 2029

LCCMR Funding Category: Fish and Wildlife (D)

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

Narrative

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

Birds are excellent indicators of how human activities impact wildlife, such as landmark studies showing how pesticides harm not just birds but also have cascading effects on ecologically connected species. These critical studies have led to environmental policies that benefit wildlife and humans. An emergent contaminant is microplastics, small plastic particles <5mm in diameter, that are now ubiquitous in the environment. Plastic pollution has been increasing in both aquatic and terrestrial ecosystems for decades. Wildlife can be exposed to these contaminants through varied sources - roadsides, waterways, agricultural fields, dust, etc. The impacts of microplastics on health include associations with rising rates of diseases in humans and other species. Birds occur in all habitats, feed on a variety of plants and animals, and interact with their environment and other species in diverse ways, making them valuable proxies for surveying ecosystems. We are well-positioned to conduct a comprehensive analysis of microplastics contamination using specimens collected throughout Minnesota from a previously funded LCCMR project. Microplastics are currently considered an unregulated contaminant of concern by most pollution and environmental agencies as data on their risks and sources are needed to help make decisions regarding strategies and policies to mitigate microplastics accumulation.

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 assess microplastics prevalence in birds across Minnesota using salvaged wildlife from an ongoing community science project funded by LCCMR. We are exceptionally positioned to carry out this effort given our state-wide engagement of individuals and organizations to collect recently deceased birds for scientific research. We already have several hundred specimens that are available for this study. We will use these samples to address two foundational questions: 1- What is the prevalence of microplastics across birds of different species, lifestyles, and habitats? 2- Are microplastics associated with health concerns? The first objective will measure whether the concentration of microplastics differs across species categories – the 4 biomes of Minnesota, 10 feeding guilds (ex: carnivore, granivore, insectivore), 5 habitats (urban, grassland, shorelines, aquatic, and forests), and 2 lifestyles (migratory, resident). This will measure whether some species or areas are more prone to accumulate microplastics. The second objective will test whether microplastics are harming birds. Recent studies have shown that microplastics exposure is associated with diseases. We will collect samples of three different organs – lungs, livers, and gastrointestinal tracts – to trace how birds are being exposed to microplastics and if high levels of their presence are associated with diseased conditions.

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 produce a comprehensive investigation of microplastics across a large distribution of Minnesota's birds representing all four biomes and varied ecosystems. We will produce data for 30-50 species and approximately 300-500 individuals, making this the most wide-ranging survey conducted to date across the globe. For each bird, we will measure the concentration of microplastics in its body and examine the link to detrimental health impacts, such as metal accumulation or changes in gut microbiomes. Our study will provide critical data for developing policies and strategies for reducing the impact of microplastics on birds and other wildlife.

Activities and Milestones

Activity 1: Organize, dissect, prepare specimens for analyses

Activity Budget: \$131,085

Activity Description:

We will identify which specimens are available by sorting through recent, still intact carcasses in the Bell Museum’s freezers. We have started this process but will continue to assess the list of specimens for this study based on which species are available for each category as specimens are constantly being collected. We will aim for the following comparisons – 4 MN biomes (mixed forest, broadleaf forest, prairie, tallgrass), 10 feeding guilds (carnivore, crustacevore, frugivore, granivore, herbivore insectivore, molluscovore, omnivore, piscivore, vermivore), 5 habitats (urban, grassland, shore, aquatic, forest), and 2 lifestyles – migratory and non-migratory. Our goal is to sample at least 30 individuals per category and aim to cover multiple species with a minimum of 10 individuals per species to get adequate data to calculate trends rather than one-offs. We will take standard body measurements and weight, then dissect out three organs for analysis – lungs, liver, gastrointestinal tract – and prepare the remaining carcass for archival storage at the Bell Museum for other studies. These three organs represent potential pathways that microplastics can enter, as airborne particles or via food sources, and ways to measure their impact on physiological functions. We have developed a dissecting procedure to avoid contamination from lab plastics.

Activity Milestones:

Description	Approximate Completion Date
Sort and Identify specimens for analysis	September 30, 2026
Develop SOP for dissection; Dissect first 50 specimens	December 31, 2026
Dissect 100-150 specimens	June 30, 2027
Dissect next 100-150 specimens	December 31, 2027
Dissect final specimens (50-150)	June 30, 2029

Activity 2: Conduct analyses of microplastics, microbiome, metals

Activity Budget: \$312,020

Activity Description:

The sampled organs will be processed in three different steps. 1- lung and GI tracts will be processed for microplastics screening by digesting organic matter in a strong hydrogen peroxide solution, then density separation of microplastics. Inorganic matter (such as plastics) will be screened, stained, and identified by size, shape, and quantity – the exact plastic polymer of particle classes will be confirmed through FTIR. 2- liver tissue will be used to estimate burdens of heavy metal pollutants using ICP-MS to test correlations between microplastic and metal load. 3- the gastrointestinal tract will be carefully dissected to be able to remove some organic matter (containing digested and microbial cells) from the lower intestines for microbiome analysis while the remaining organ will be used for step 1. We will use an extraction protocol that separates DNA from other materials, allowing us to use the sample for microbiome DNA sequencing and screen the remaining material for microplastics. DNA samples will be sent to a genomics facility for screening microbial genes and sequencing. We will process raw data based on our expertise – microplastics load and metal concentrations (Snell-Rood lab), microbiome and bird metadata (Reddy Lab, Bell Museum).

Activity Milestones:

Description	Approximate Completion Date
Microplastics analyses of lungs	March 31, 2029
Microplastics analyses of GI tract	March 31, 2029

Metals analyses of liver	March 31, 2029
Microbiome analyses of GI tract	March 31, 2029

Activity 3: Analyze, publish, and disseminate study results

Activity Budget: \$64,895

Activity Description:

We will compare levels of microplastics across species, biomes, feeding guilds, and habitats to see if there are significant differences of load across categories. We expect our results to indicate differences in exposure based on how birds interact with their environments as well as how they process resources. Next, we will examine if there is a relationship between microplastics and metal concentrations. Previous studies have found that high levels of microplastics are associated with concentrations of certain metals and metaloids, indicating that microplastics impact absorption of essential nutrients and subsequent malnutrition. We hypothesize that metal and microplastic loads will be correlated, either because of plastics vectoring metals or due to correlated exposure patterns. Finally, we will examine if high concentrations of microplastics in the gut is associated with substantially different microbes and bacteria, a strong indication of the health of a bird. We hypothesize that there will be significantly different microbial communities in birds with high versus low microplastics loads. Our innovative study design of multiple comparisons can be used to analyze how microplastics loads relate to bird survey data and test the role of these pollutants in contributing to recent trends of population declines.

Activity Milestones:

Description	Approximate Completion Date
Analyze microplastic load data and prepare publication	June 30, 2029
Compare metals and microplastics data and prepare publication	June 30, 2029
Compare microbiome and microplastics data and prepare publication	June 30, 2029
Public engagement opportunities	June 30, 2029

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Emilie Snell-Rood	University of Minnesota	Partner	Yes

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 study will be of interest to many researchers, policy makers, and the public who are learning about microplastics. Given the high number of specimens and comparisons in this study, we anticipate publishing our results in high-profile scientific journals, garnering attention for this potentially emergent threat. We will aim to disseminate our results to agencies such as MN DNR and USFWS, if there are trends that can be mitigated through management. We will also use opportunities throughout the project duration for public engagement – these include social media posts, statewide engagement events, and public programs through the Bell Museum.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Salvaged Wildlife to Inform Environmental Health, Ecology, Education	M.L. 2023, , Chp. 60, Art. 2, Sec. 2, Subd. 03i	\$486,000

Project Manager and Organization Qualifications

Project Manager Name: Sushma Reddy

Job Title: Associate Professor and Curator of Birds

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

Sushma Reddy is the Breckenridge Chair of Birds, Curator of Birds at the Bell Museum, and Associate Professor at the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. Her training includes a BA from Barnard College, MA and PhD from Columbia University. Reddy has extensive experience at museums, working at the American Museum of Natural History in New York and the Field Museum of Natural History in Chicago, and conducting research in over 20 museums across the globe. Reddy has over two decades of experience working with birds, natural history collections, specimen research, public outreach, and education. She has published dozens of peer-reviewed research articles, conducted numerous biodiversity surveys, and trained more than 100 high-school, undergraduate, and graduate students in research methods. In addition to being the curator in charge of the bird collection, Reddy is currently actively involved in several different aspects of the Bell Museum such as research, exhibits, education, and public engagement. She has several years of experience coordinating large, multi-institutional collaborations. She trains students and coordinates educational and public programs for people of all ages. Reddy has built ties to many statewide organizations related to conservation and wildlife to establish connections to natural history museum collections. Most recently, Reddy is the project manager of the LCCMR funded project called Salvage Wildlife that has created a community-science initiative to collect freshly dead birds and mammals for scientific use and archival at the Bell Museum. This project has brought together many wildlife organizations in this collaboration and hundreds of wild specimens per year available for research, a tremendous resource for studying MN wildlife.

Organization: U of MN - Bell Museum of Natural History

Organization Description:

We are Minnesota's official natural history museum, established by the legislature in 1872 and held in trust by the University of Minnesota. For over a century, the museum has preserved and interpreted our state's rich natural history and served learners of all ages. Additionally, our scientific collections contain over one million specimens, representing every county in Minnesota and various locales around the globe. Collections are a source for Minnesota's biodiversity record, scientific research, and teaching materials for all levels of education. As Minnesota's state natural history museum, our mission is to ignite curiosity and wonder, explore our connections to nature and the universe, and create a better future for our evolving world. Our vision is to energize a community that embraces the transformative nature of science.

We believe education is a journey and we delight in the process of hands-on discovery. We believe in authenticity to engage curiosity. We reflect and respect diversity. We seek to preserve knowledge and biodiversity for the future. We value our visitors and partners and seek collaboration to enrich learning. We strive for excellence in all that we do and we are principled in the way we take care of our people and the planet.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Lab Technician 1		Technician to process the microplastics screening and metals analysis; full-time for 2 years with 3% COLA			32.3%	2		\$147,750
Lab Technician 2		Technician to process dissections and microbiome extractions; full-time for 2 years with 3% COLA			32.3%	2		\$147,750
Sushma Reddy, faculty		project coordination and training; Budget includes 1 month of summer salary per year; Dr. Reddy is on a 9-month salary with UMN; 3% COLA per year			36.6%	0.24		\$51,420
Emilie Snell-Rood		project organization; Budget includes 0.75 months of summer salary per year; Dr. Snell-Rood is on a 9-month salary with UMN; 3% COLA per year			36.6%	0.18		\$42,230
Angela Hornsby, Collections Manager		data management; Budget includes 1 month of salary per year with 3% COLA			32.3%	0.3		\$28,110
Graduate Student, Research Assistant		Research Assistant support for data analysis; 3 semesters of RA with 3% COLA; Graduate student fringe is 23.2% + adv status tuition for 3 semesters, totaling \$4,583			23.2%	1.5		\$53,280
Undergraduate researchers		research support for data collection and analysis; 1 undergraduate per semester [15 weeks] for two semesters at 15.25/hr, 10 hrs per week			0%	0.1		\$9,150
							Sub Total	\$479,690
Contracts and Services								
University of Minnesota Genomics Center	Service Contract	Library prep [\$14/sample for 500] and sequencing of microbiomes [2 runs at \$2000]				0.2		\$11,000
TBD-Metals Analysis Lab	Service Contract	metals analysis lab - \$15/sample for screens of multiple elements; estimate for 500 samples				0.2		\$7,500
							Sub Total	\$18,500

Equipment, Tools, and Supplies								
	Tools and Supplies	supplies for dissection, reagents for processing microplastics, extracting DNA, containers for storing samples	scalpels, glassware, containers, foil, reagents					\$9,810
							Sub Total	\$9,810
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
							Sub Total	-
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$508,000

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: \$508,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [1278a98b-9b2.pdf](#)

Alternate Text for Visual Component

Graphic of varied landscape with caption: Microplastics are everywhere! Wildlife is exposed to microplastics through multiple sources and across different environments. Second graphic of bird dissection with caption: Dead birds tell tales! Salvaged birds from across the state contain information about the prevalence of microplastics and associated health impacts....

Supplemental Attachments

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

Title	File
Reddy_UMN_endorsement letter	9834efa5-c75.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?

N/A

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:

N/A

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