



Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-158

Proposal Title: New Small Mammal Monitoring Methods for Minnesota

Project Manager Information

Name: Ron Moen

Organization: U of MN - Duluth - NRRRI

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Project Basic Information

Project Summary: We will develop camera trapping methods for small mammals, a new tool in the toolbox to fill key knowledge gaps in status of Minnesota mammal species.

Funds Requested: \$199,000

Proposed Project Completion: December 31, 2026

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?

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.

Why monitor shrews, mice, voles, and squirrels in Minnesota?

1. Biology. Small mammals support fox, bobcat, coyote, hawk, and owl populations.
2. Economics. Mice eat weed seeds, insect pests, and agricultural crops.
3. Human health. Mice are associated with diseases (Lyme disease, Hantavirus).
4. Legal. Management actions may help recover Threatened or Endangered species populations.
5. Management. Species in Greatest Conservation Need (SGCNs) need to be monitored for species evaluations and the Minnesota State Wildlife Action Plan (SWAP).

Small mammals are usually monitored by trapping. Trail cameras are a time- and cost-effective method to enhance monitoring and evaluate status of small mammals. Why consider trail cameras?

1. Cameras will work better than traps in some situations.
2. Camera sampling can cost much less than trapping for similar data.
3. Cameras also increase efficiency by identifying locations to trap (or not trap).

We have developed this technique with pilot project funding from NRRI. We will evaluate technology and develop protocols for using camera technology to monitor populations of small mammals like mice, voles, and shrews. We will test this protocol at sites distributed throughout Minnesota.

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 new method uses down-pointing trail cameras (aka camera traps). Pictures from a pilot project funded by NRRI (see proposal graphic) show how the technique works. Comparing snap trap captures to camera trap captures under standard conditions will also make it possible to use legacy data on small mammal presence and relative abundance.

In the pilot project animal pictures were often taken within 4 hours of camera deployment. With snap traps or live traps, capture rate is often less than 15% and traps are deployed for 3 to 4 days. Two mouse species comprised almost 8,000 of the 9,000 mice trapped over 20 years in a project coordinated by the 1854 Treaty Authority! 72% of trap transects had only 1 or 2 species in snap trapping we did in 2021 and 2022. Multiple species are detected with camera traps because of the longer duration of deployment.

We can identify many mammal species, estimate species diversity, and estimate relative abundance from pictures. We will deploy camera traps in multiple habitats across Minnesota (see map in graphic) to identify when and how to best include camera traps in management.

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?

Outcome 1: Develop and validate a new and improved protocol for small mammal monitoring. This new technique will not replace trapping, it will be a new tool for collecting foundational data on small mammals in Minnesota.

Outcome 2: Document rare and Species of Special Concern (SSC) mammals in Minnesota non-invasively. We will deploy down-pointing cameras in locations where SSCs have been captured by traditional trapping techniques (see map).

At a higher level, our desired outcome is to demonstrate that the down-pointing camera technique can efficiently and economically collect baseline data for management, legal, or ecological reasons.

Activities and Milestones

Activity 1: Test and implement new small mammal monitoring method in Minnesota

Activity Budget: \$199,000

Activity Description:

In our pilot project we demonstrated that the down-pointing camera technique is a new tool to help monitor small mammal populations. Operationally, we need protocol development testing equipment setups (e.g., distance to bait, camera boxes, alternative baits, box entrances, camera array size) that can be done locally in the Duluth area.

A second part of protocol development is extending testing across Minnesota. The Minnesota Biological Survey has trapped small mammals in every county in Minnesota over the past 35 years. We will obtain general locations where the MBS has captured small mammal species (especially rare and SGCN species) using traditional monitoring methods and deploy down-pointing cameras. We will also use sites where we have captured rare and SGCN species (e.g., smoky shrews, rock voles, see graphic).

At sampling sites, we will deploy an array of cameras to detect small mammal species that are present. We deploy cameras for 2 to 4 weeks, and then identify species (or possible species) that are present from pictures. Capturing and handling animals is not necessary. Logistically, in each year of this project we would test the new camera technique in at least 75 locations throughout Minnesota (see graphic).

Activity Milestones:

Description	Approximate Completion Date
Develop standard protocol and deploy down-pointing cameras in northern Minnesota.	November 30, 2024
Disseminate preliminary results (year 1) to managers and the public via outreach and media	April 30, 2025
Deploy down-pointing cameras at sites in southern Minnesota	November 30, 2025
Disseminate preliminary results (year 2) to managers and the public via outreach and media	April 30, 2026
Operational data collection from deployed cameras in remaining sites	September 30, 2026
Complete all analyses and project technical reports	December 31, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Michael Joyce	UMD-NRRI	Co-investigator. Will provide input and support on all aspects of this project and will work with project manager to oversee all aspects of this project.	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?

This project is unique because it develops a new technique to monitor populations of small mammal species in Minnesota. It is a tool that could be used in future MBS efforts in the appropriate situations. Down-pointing cameras won't replace trapping, but are another tool in the toolbox that would be economically efficient. Specifically, we have designed this project to address key knowledge gaps and provide information that will help inform the status of mouse, vole, and shrew species as the DNR reviews species statuses as part of the next State Wildlife Action Plan update.

Project Manager and Organization Qualifications

Project Manager Name: Ron Moen

Job Title: Wildlife Ecologist

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

Dr. Moen is a Wildlife Ecologist and Research Lab Manager at the Natural Resources Research Institute, University of Minnesota Duluth. He has over 25 years of wildlife research experience, with over \$4 million of research projects on Minnesota mammals. Ron has managed many research projects during his career, focusing on mammals, telemetry, and wildlife ecology. In addition, Ron has taught Mammalogy at the University of Minnesota Duluth since 2003. ENRTF research projects have helped fund research on mammals in Minnesota by 14 of his 28 graduate students. Over the years Dr. Moen has also trained over 150 UMD students in wildlife research skills as Undergraduate Research Assistants. A critical aspect of Dr. Moen's research approach is a desire to complete research projects that can be used to inform and improve management of Minnesota's natural resources.

EDUCATION:

Ph.D., 1995. University of Minnesota, Wildlife Conservation.

M.S., 1988. University of Minnesota, Wildlife. Plant Physiology Minor.

B.S., 1984. Cornell University, Division of Biological Sciences.

RECENT PUBLICATIONS. 24 peer-reviewed papers and 36 Technical Reports have used ENRTF-funded data, including these recent publications:

Alston, J.M., M.J. Joyce, J.A. Merkle, and R. Moen. 2020. Temperature shapes movement and habitat selection by a heat-sensitive ungulate. *Landscape Ecology* 35:1961-1973.

McGraw, A.M., R. A. Moen, L. Cornicelli, M. Carstensen, and V. St-Louis. 2021. Evaluating the threshold density hypothesis for moose, deer, and *Parelaphostrongylus tenuis*. *Journal of Wildlife Diseases* 57:569-578.

Velander, T.B., M.J. Joyce, A.M. Kujawa, R.L. Sanders, P.W. Keenlance, and R. Moen. 2023. A dynamic thermal model for predicting internal temperature of tree cavities and nest boxes. *Ecological Modelling* 478:110302.

Organization: U of MN - Duluth - NRRRI

Organization Description:

The Natural Resources Research Institute (NRRRI) is an applied research and economic development engine for the University of Minnesota research enterprise. NRRRI employs over 130 scientists, engineers and technicians to deliver on its mission to deliver integrated research solutions that value our resources, environment and economy for a sustainable and resilient future. NRRRI collaborates broadly across the University system, the state and the region to address the challenges of a natural resource based economy.

NRRRI researchers have extensive experience in managing large, interdisciplinary projects. NRRRI's role is as an impartial, science-based resource that develops and translates knowledge. Projects include characterizing and defining resource opportunities, minimizing waste and environmental impact, maximizing value from natural resources and maintaining/restoring ecosystem function. NRRRI's role is as an impartial, science-based resource that develops and translates knowledge by characterizing and defining value-resource opportunities, minimizing waste and environmental impact, maximizing value from natural resource utilization and maintaining/restoring ecosystem function.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Ron Moen, Research Scientist/Professor		Project Manager			26.9%	0.2		\$33,735
Michael Joyce, Research Scientist		Co-Investigator			26.9%	0.22		\$25,012
Wildlife Technician		Field and office work			24.24%	0.63		\$31,057
M.S. Graduate Student		Conducting field work, data management, data analysis, and writing. The student will contribute to all aspects of this project.			19.4%	0.2		\$12,023
Seasonal Wildlife Technician		Conducts field and office work			7.64%	0.72		\$35,881
Undergraduate research assistant		Conducts field and office work			0%	0.72		\$22,292
							Sub Total	\$160,000
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
	Tools and Supplies	Camera traps and platform setup supplies	To conduct camera trap surveys for small mammals					\$12,000
	Tools and Supplies	Supplies for doing camera surveys (batteries, bait, locks/straps, etc.)	To conduct camera trap surveys for small mammals					\$7,000
							Sub Total	\$19,000
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-

Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel for fieldwork, including mileage (75%) and lodging for technician, researcher, and undergraduate research assistant. Mileage will be reimbursed at the approved U of M travel rate. Lodging is estimated between \$90 and \$110 per night, less if camping is possible. Some trips will involve longer-distance travel and require overnight expenses (camping or motel) and food expenses.	Collect field data for project					\$18,000
							Sub Total	\$18,000
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
		Page charges	Cost to publish papers					\$2,000
							Sub Total	\$2,000
							Grand Total	\$199,000

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				
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	\$109,450
			Non State Sub Total	\$109,450
			Funds Total	\$109,450

Attachments

Required Attachments

Visual Component

File: [aaf734da-aaa.pdf](#)

Alternate Text for Visual Component

The visual component shows example pictures of many small mammal species, including the jumping mouse (rarely captured in traps). We also show a map of counties in Minnesota sampled by MBS by date - 2/3 of sampling is over 10 years old. Technique testing would be throughout Minnesota....

Optional Attachments

Support Letter, Photos, Media, Other

Title	File
UMN Transmittal Letter	462dc6a2-52b.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have potential for royalties, copyrights, patents, or sale of products and assets?

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 design, construction, or renovation of a building, trail, campground, or other capital asset costing \$10,000 or more?

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?

No

