



Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-329

Proposal Title: Minnesota Mammal Atlas

Project Manager Information

Name: Ron Moen

Organization: U of MN - Duluth - NRRI

Office Telephone: (218) 788-2610

Email: rmoen@d.umn.edu

Project Basic Information

Project Summary: The Minnesota Mammal Atlas will be a one-stop source for knowledge and data on all Minnesota mammal species. It will be used by agencies, scientists, students, and citizens of Minnesota.

ENRTF Funds Requested: \$294,000

Proposed Project Completion: June 30, 2029

LCCMR Funding Category: Small Projects (G)

Secondary 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.

The Problem: Mammals are culturally, socially, and economically important to Minnesota, but there is no single clearinghouse for information on mammals in Minnesota.

- The Mammals of Minnesota book was published 44 years ago in 1982.
- The MNDNR website has summaries for only 60 of the 81 species of Minnesota mammals.
- Literature searches on all mammal species found over 8,000 papers referencing research in Minnesota.
- Over 82,000 locations of mammals in Minnesota are available from multiple sources.
- The ENRTF has invested over \$41 million in 74 projects with mammal components.

We will create the Minnesota Mammal Atlas (MMA) to provide efficient and complete access to information on all of the mammal species that live in Minnesota.

We are requesting \$294K to complete the MMA, 7.5% of the \$3.9 million the ENRTF has already invested in 3 Atlas website projects with biological components (birds, bees, and biodiversity).

Websites like the MMA provide exceptional outreach and learning opportunities available to all. In 2025 the Breeding Bird Atlas had almost 60,000 views and a site focused on Minnesota carnivores had over 16,000 views. Both were partially funded by ENRTF.

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.

We will create a one-stop resource summarizing and synthesizing information on all Minnesota mammal species at a cost of roughly \$3,300 per species. Content for each species will be fully documented and will include:

1. Species Description
2. Maps of historical, current, and likely future distribution
3. Population size and trends (when known)
4. Literature on each species with links to pdf files when available
5. Bibliography of Minnesota research on each species
6. Multimedia files (when appropriate)

Information sources include Mammals of Minnesota and similar books, peer-reviewed literature, theses, and DNR reports. We will collate available distribution data (e.g., locations from the Bell Museum Biodiversity Atlas (funded by ENRTF), GBIF, other digital records) into a single township resolution map.

We will recruit experts on each species to write species descriptions and to review species accounts. We have identified potential authors for 15 mammal species and some have already agreed to write species descriptions. Our core team can prepare accounts for 41 mammal species that we have had research projects on, and we will also prepare accounts for species which do not have a resident expert in Minnesota (e.g., jumping mice).

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?

The project outcome is the Minnesota Mammal Atlas (MMA), a comprehensive summary of existing knowledge on every mammal species in Minnesota. The MMA content would be accessible and useful for protection, conservation, preservation, and enhancement of the state's natural resources by managers, scientists, and students. The proposed format also can increase enjoyment and awareness of Minnesota's natural resources by all Minnesota residents.

What we know about Minnesota mammals will be in the MMA, another critically important outcome is that the process of compiling data for the MMA will help identify key knowledge gaps that future research and monitoring could address.

Activities and Milestones

Activity 1: Develop Minnesota Mammal Atlas (MMA) website

Activity Budget: \$294,000

Activity Description:

The Minnesota Mammal Atlas (MMA) will be modeled after the highly successful Minnesota Breeding Bird Atlas (<https://mnbirdatlas.org/>) funded by ENRTF, and the MMA website architecture will be created at NRRI by the primary developer of the Minnesota Breeding Bird Atlas.

Content for each species will be overseen by one team member. Collectively we have over 150 years of research on over half of the mammal species in Minnesota. A species description will be written for each species by a Minnesota expert or by members of the project team. We will create dynamic maps of historical and recent distribution from online sources. Abundance will be obtained from MNDNR data (deer, moose, wolves), or estimated from expected densities and available habitat. The bibliography will be created from over 8,000 papers, theses, technical reports, and DNR reports published on research in Minnesota.

We will encourage public involvement to supplement the pictures, video, and sound files we already have for many Minnesota species from past research projects.

The Activity Milestones result in completion of the MMA website in 1.5 years, with an additional 6 months for updates after feedback from educators, agencies, Minnesota citizens, and other MMA users.

Activity Milestones:

Description	Approximate Completion Date
Finish species accounts for 40 Minnesota Mammal species	February 28, 2028
Initial release of Minnesota Mammal Atlas website with 40 species	March 31, 2028
Finish species accounts for remaining Minnesota Mammal species	November 30, 2028
Complete website with all Minnesota Mammal species released	December 31, 2028
Website updates and documentation of use	June 30, 2029

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Michael Joyce	University of Minnesota, NRRRI	Co-PI. Research on marten, fisher, bobcats, weasels, snowshoe hares, and bears. Content expert on all carnivore species, snowshoe hare, and other species as needed.	Yes
Dr. Trevor Vannatta	Minnesota State University, Mankato	Co-PI. Research on parasites and diseases of mammals. Content backfill for mammal species which do not have other experts in Minnesota. Supervise undergraduate students doing literature searches, downloading pdf files, creating annotated bibliography, and downloading locations for selected species.	Yes
Dr. Joseph Whitaker	Concordia College, Moorhead	Mammalogist. Professor at Concordia College for 25 years. Research on shrews, voles, deer mice, gray squirrels, flying squirrels and ground squirrels. Content expert for small rodents (e.g., voles, deer mice, other mice, and squirrels).	No
Dr. Steve Windels	Voyageurs National Park (Retired)	Mammalogist. Biologist at Voyageurs National Park for almost 25 years. Research on beaver, deer, moose, wolves, and muskrats. Content expert on predators (gray wolves, coyote, gray fox, red fox), ungulates (deer, moose, elk), and aquatic rodents (beaver, muskrat).	No
Dr. George Feldhamer	Southern Illinois University Carbondale (Retired)	Mammalogist. Professor at Southern Illinois University for 45 years. Research on eastern mole, deer mice, several bat species, gray fox, red fox, and shrews. Author of Mammalogy textbook, Wild mammals of North America, and Mammals of the National Parks. Content expert on all Minnesota mammal species	No

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 broadest dissemination will be by Internet search engines when people search for Minnesota mammal species. For example, in 2025 we had over 16,000 site visits to a mammal website we currently have. This is almost 50 visits / day without any promotion to a site with much less content than we will have in the Minnesota Mammal Atlas (MMA).

We will also present information on the MMA at appropriate professional conferences (e.g., Minnesota Chapter of The Wildlife Society), to resource management agencies, and to the public. We also plan to produce 2 peer-reviewed papers focused on the process and the use of the MMA.

As the MMA develops, we will explore the possibility of developing targeted lesson plans for K-12 students. Many team members already give presentations to school classrooms, for example, and this is one of the important mechanisms to keep the next generation of Minnesota citizens engaged with the natural world.

The ENRTF acknowledgement guidelines will be followed in all papers and presentations. The ENRTF logo will be prominently featured on the MMA home page, and we will have the full acknowledgement text on the "About Us" page.

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?

We will build the Minnesota Mammal Atlas (MMA) in three phases.

Phase 1, pre-2027: Initial Conception and Design completed

Phase 2, 2027 - 2029: This proposal

Phase 3: 2030 – 2040: Maintenance

The MMA will be managed from NRRI for the foreseeable future. Website hosting is \$1,200 per year, and biennial updates would require \$5K to \$10K through 2040. If the MMA is as successful as we believe it will be, ~\$5K / year for maintenance should be relatively easy to secure. Possible sources for future funding include internal funding at NRRI, resource management agencies using the MMA, and MMA users.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
New Small Mammal Monitoring Methods for Minnesota	M.L. 2024, , Chp. 83, Art. , Sec. 2, Subd. 03n	\$199,000
Status of Bats and Roost Trees after White-Nose Syndrome	M.L. 2024, , Chp. 83, Art. , Sec. 2, Subd. 03o	\$195,000

Project Manager and Organization Qualifications

Project Manager Name: Ron Moen

Job Title: Associate Professor / Senior Research Associate

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

Ron is a Wildlife Ecologist with over 30 years of mammal research experience and \$4 million of research projects on Minnesota mammals. In addition, he has taught Mammalogy at UMD since 2003, guided over 20 graduate students studying mammals in Minnesota to M.S. and Ph.D. degrees, and employed over 120 undergraduate students in mammal research projects.

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.

SELECTED MAMMAL PUBLICATIONS (> 70 peer-reviewed, > 65 Technical Reports):

Moen, R.A., C.L. Burdett, and G.J. Niemi. 2008. Movement and Habitat use of Canada Lynx during denning in Minnesota. J. Wildlife Management 72:1507-1513.

Moen, R., G.J. Niemi, and C. Burdett. 2008. Canada lynx in the Great Lakes. NRRI Technical Report NRRI/TR-2008/14.

McCann, N. and R.A. Moen. 2011. Mapping potential core areas for lynx using snowshoe hare pellet counts and satellite imagery. Canadian Journal of Zoology 89:509-516.

Ditmer, M.A., J.R. Fieberg, R.A. Moen, et al. 2018. Moose movement rates are altered by wolf presence in two ecosystems. Ecology and Evolution 8:9017-9033.

Moen, R., and M. Swingen. 2018. Historical northern long-eared bat occurrence in Minnesota based on acoustic surveys. NRRI Technical Report NRRI/TR-2018-40.

McGraw, A.M., R. A. Moen, et al. 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, et al.. 2023. A dynamic thermal model for predicting internal temperature of tree cavities and nest boxes. *Ecological Modelling* 478.

Chenau-Ibrahim, Y., S.A. Moore, S.K. Windels, W.J. Severud, and R.A. Moen. 2024. Moose in wolf diets across northeastern Minnesota. *J. Wildlife. Manage.* 88:10.1002.

Organization: U of MN - Duluth - NRRI

Organization Description:

The Natural Resources Research Institute (NRRI) is a state-chartered applied research institute of the University of Minnesota's Research and Innovation Office. NRRI maintains three sites in Northern Minnesota, focused on informing sound, long-term decisions on the use and stewardship of natural resources.

Our mission: Deliver integrated research solutions that value our resources, environment and economy for a sustainable and resilient future.

NRRI collaborates broadly across the University system, the state and the region to address the challenges of a natural resource-based economy. Research is developed via extensive partnerships with industry, state and federal agencies and governmental units.

As an impartial, science-based resource, NRRI develops and translates knowledge through large-scale, interdisciplinary research. Our expertise focuses on defining resource opportunities, minimizing waste and environmental impact, maximizing natural resource value, and maintaining or restoring ecosystem function.

Major outcomes from NRRI projects include informing environmental management and policy and assisting industry and communities in defining and maintaining the social license to operate in natural systems. NRRI has established mechanisms for sharing outcomes through press releases, peer-reviewed journals, technical reports, annual reports, periodicals, and social media.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Project Manager		Manage project, develop information content			26.8%	0.1		\$23,020
Content developer		Develop content and design, quality control editing			26.8%	0.1		\$14,305
Website developer		Website design. Design and create website architecture.			26.8%	0.16		\$19,094
IT Professional		Website programming			26.8%	0.08		\$4,426
Graduate Assistant		Assist with literature searches, content development			19.5%	0.14		\$9,149
Undergraduate Research Assistant		Assist with literature searches, content development			0%	3.68		\$66,918
Technician #1		Assist with literature searches, content development			7.4%	0.64		\$48,894
Technician #2		Assist with literature searches, content development			7.4%	1.28		\$48,894
							Sub Total	\$234,700
Contracts and Services								
University of Minnesota Duluth	Internal services or fees (uncommon)	NRRI GIS Lab fee. Access to GIS lab for website hosting				0.04		\$2,500
Minnesota State University Mankato	Subaward	Prepare species descriptions, search online databases for published literature to create a literature citation database.				0.24		\$40,000
							Sub Total	\$42,500
Equipment, Tools, and Supplies								
	Tools and Supplies	Hard drives	Data storage, transfer, and backups					\$2,800

							Sub Total	\$2,800
Capital Equipment								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Meetings to demonstrate Minnesota Mammal Resource website.	Costs include mileage, hotel, per diem using the current GSA approved rate.					\$8,000
	Conference Registration Miles/ Meals/ Lodging	Conference attendance (e.g., The Wildlife Society meetings, DNR Roundtable). Costs include conference registration fee and GSA approved rates for mileage, hotel, per diem.	Presentations/Discussion on Minnesota Mammal Resource website					\$2,000
							Sub Total	\$10,000
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	Page charges for manuscripts describing the MMR process/website	Demonstrate utility and increase use					\$4,000
							Sub Total	\$4,000
Other Expenses								
							Sub Total	-
							Grand Total	\$294,000

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 54% 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	\$150,660
			Non State Sub Total	\$150,660
			Funds Total	\$150,660

Total Project Cost: \$444,660

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [d1c2bfbd-3b5.pdf](#)

Alternate Text for Visual Component

Figure showing mock up of species account for Minnesota Mammal Atlas, source data, and potential users....

Supplemental Attachments

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

Title	File
Moen_LCCMR Transmittal letter	bfda7528-f03.pdf
Minnesota State University, Mankato - Budget	c6bd936c-67f.pdf
Minnesota State University, Mankato Commitment Letter	41e1e351-824.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?

Yes

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

Yes

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

No

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")?

No

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

Megan Gorder and Julie Christopherson (UMD-NRRI)

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

N/A