



Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-265

Proposal Title: Water and Ecosystems at Risk in Northeastern Minnesota

Project Manager Information

Name: Joe Magner

Organization: U of MN - College of Science and Engineering

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Project Basic Information

Project Summary: Northeastern Minnesota contains rich yet fragile unique public land and water. Changes in precipitation and recreation vehicle use may threaten pristine water quality, and the ecological character of the region.

Funds Requested: \$406,000

Proposed Project Completion: June 30, 2027

LCCMR Funding Category: Water Resources (B)

Project Location

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

Region(s): NE

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

Region(s): NE

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.

Action is urgently needed to preserve the quality of life and liberty caused by changes in climate and land use. Much of northeastern Minnesota is managed by the US Forest Service, such as the BWCA, and the MNDNR. For decades this part of North America has seen very limited land use development and is widely understood as a wilderness area. Yet today, changes in climate could drive extremes in precipitation that could exceed state water quality nondegradation standards, adversely affecting the movement and storage of water and ecotones that have evolved within this landscape since the retreat of glaciers. Superimposed upon the geology and landscape are proposals to increase off-highway vehicle (OHV) trail use via the proposed Border-to-Border route (B2B). These land use changes could adversely impact water quality by changing soil stability, nutrient cycling, and the ecological integrity of plant and animal communities if current trends of increased precipitation continue.

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.

Define and document specific areas in northeastern Minnesota that are most at risk of degradation beyond what is allowed under MN rule, Chapter 7050 – Tiered Aquatic Life Use. Specific areas will be examined in detail including roads that cross over compromised culverts that alter landscape connectivity, and road/disturbance zones that pass near a wetland or lake or over a stream. B2B OHV trail will cross 27 pristine trout streams 61 times in one county. These locations represent land use action that may or may not impact an adjacent water body. We will use physical, chemical and biological metrics to examine water quality and whether any degradation of water quality has already occurred over time due to the proximity of unpaved roads to water bodies. Magner in 2022, published in the American Water Resources Association journal IMPACT a paper entitled Protecting Northeastern Minnesota Wilderness: Thresholds of Land Use Change. This article identifies observed impacts from climate change, historic land use, and current/proposed land use change. Funds are being sought to measure in-field and lab attributes that can be translated into ecosystem resilience from external stress and the relative fragility of a landscape based on soil thickness, slope and erosivity.

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 primary outcome will be a statistically driven resiliency-fragility index (RFI) for specific areas of northeastern Minnesota that contain high quality water resources. This index will be presented to MNDNR and MPCA to encourage enhanced protection measures through state statute and rule development. There appears to be concern from both OHV users and environmental citizen groups about the epistemic uncertainty associated with OHV activity, precipitation, and long-term ecological health and water quality.

Activities and Milestones

Activity 1: Locate research study sites, define the geologic and ecological character and install monitoring equipment.

Activity Budget: \$290,000

Activity Description:

We cannot look at every OHV waterbody crossing, therefore using GIS tools we will identify and select sentinel study sites. The RFI will require a statistical set of data across a range of northeastern MN landscapes and waterbodies. Graduate and undergraduate students will visit 50 or more adjacent waterbody locations. We will install instrumentation at two representative locations using sensors that can track precipitation, water runoff and sediment transport. Dr. Wilson will use GIS and other tools to select sites for study. The graduate student and Drs Magner and Wilson will travel to northeastern MN and recon individual sites and select final representative sites for instrumentation. We will hire a contractor to build tailor made weirs to measure runoff from roads and securely house ISCO samplers with solar panels and YSI probes to measure sediment and solute transport.

Activity Milestones:

Description	Approximate Completion Date
Locate study sites.	December 31, 2025
Install instrumentation.	December 31, 2025
Define geology and ecology.	June 30, 2026

Activity 2: Data collection, analysis, and final report

Activity Budget: \$116,000

Activity Description:

Gather data from instruments, build a RFI tailored model for northeastern Minnesota landscapes, then apply RFI model and analyze data to produce index values for each research study site. Interpret the results under different precipitation scenarios to gauge ecological and water quality impact across temporal and spatial scales. Students will be involved in field data collection through April of 2027. The graduate student will prepare the final report for the project as part of their master's thesis. A portion of this work will be transformed into fact sheets for dissemination to the public.

Activity Milestones:

Description	Approximate Completion Date
Field visits to gather data.	April 30, 2027
Modeling with data to create an RFI score.	June 30, 2027
Final report preparation.	June 30, 2027

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Grace Wilson	UMN	CoPI	Yes
Susan Perrin Schubert	Preserve Our Trails	Concerned Citizen	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?

Follow up work will be required by MNDNR, MPCA and local units of government.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Quantifying New Urban Precipitation and Water Reality	M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 04e	\$500,000

Project Manager and Organization Qualifications

Project Manager Name: Joe Magner

Job Title: Research Professor

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

Dr. Magner has successfully managed between \$8-million and \$10-million in research projects for over four decades as a state of MN employee overseeing project tasks and as UMN employee doing the work. His work has been expressed and communicated by his 100+ publications and public presentations.

Organization: U of MN - College of Science and Engineering

Organization Description:

UMN is a world class top ranked research organization

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Co-Lead Investigator		Direct research and analysis, supervise students and technician			36.8%	0.75		\$83,735
Lead Investigator		Oversee all research and administrative aspects of project			36.8%	0.03		\$16,749
Graduate Student Researcher		Conduct research and analysis, education			42.7%	3		\$152,000
Undergraduate students		Conduct experiments			0%	6.9		\$16,800
Technician		Conduct advanced experiments, lead field work			32%	0.39		\$30,629
							Sub Total	\$299,913
Contracts and Services								
Weir Construction	Professional or Technical Service Contract	Create water collection site secure boxes				-		\$10,000
TBD	Professional or Technical Service Contract	External lab analysis of samples for gasoline, etc				-		\$9,000
Isotope Lab	Internal services or fees (uncommon)	Specialized analysis by Isotope Lab				0		\$17,100
							Sub Total	\$36,100
Equipment, Tools, and Supplies								
	Equipment	YSI multi-parameter probe	research					\$34,000
	Tools and Supplies	Data loggers, pumps, sensors, gloves, etc	To collect samples and conduct analysis					\$24,987
							Sub Total	\$58,987

Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	mileage at .655 gas and mid-day meals: approx. 2800 miles per year	Collecting samples and checking site includes education for students					\$6,000
							Sub Total	\$6,000
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	2-3 professional journal publications	To share results and educate interested audiences					\$5,000
							Sub Total	\$5,000
Other Expenses								
							Sub Total	-
							Grand Total	\$406,000

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	-

Attachments

Required Attachments

Visual Component

File: [24e07cee-73a.docx](#)

Alternate Text for Visual Component

Six photos or dirt roads and crossings...

Optional Attachments

Support Letter, Photos, Media, Other

Title	File
UM 2022 audit	0656746a-70a.pdf
Authorization	44eff947-e99.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?

Yes, Sponsored Projects Administration

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

