



Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-244

Proposal Title: Challenges and Opportunities of Minnesota's Changing Winter Weather

Project Manager Information

Name: Peter Snyder

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

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Project Basic Information

Project Summary: In this data-driven project I address the changing character of Minnesota's winter weather. Winter weather impacts tourism, the environment, infrastructure, and the overall functioning of society both beneficially and detrimentally.

Funds Requested: \$149,000

Proposed Project Completion: June 30, 2026

LCCMR Funding Category: Small Projects (H)

Secondary Category: Air Quality, Climate Change, and Renewable Energy (E)

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.

Minnesota's winters are changing. While the exact causes are subject to debate, observational records clearly show that Minnesota is warming most in winter, receiving greater snowfall in most regions, and changing the type of precipitation that falls. This has been shown to impact four key sectors of our state: 1) Tourism; 2) the Environment; 3) Infrastructure; and 4) Citizen Activities. Each of these sectors directly impacts the economic and general well-being of the citizens of the state – both positively and negatively. Understanding how our winters are changing and what sectors of our economy and society stand to benefit or be harmed will be addressed in this project. For example, heavier snowfalls in the winter could both enhance economic opportunities in tourist-rich areas like the Arrowhead, but detrimentally affect the educational opportunities for students in populated areas where getting children and adults into the classroom on snowy days becomes a challenge. In another example, warming periods within the winter can help assist snowmelt in urban areas, but also can accelerate the freeze-thaw cycle that contributes to extensive pothole formation. In this project I seek to address as many of the opportunities and challenges associated with our changing winters.

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.

There is a vast amount of meteorological data available to investigate how our winters are changing in Minnesota. There is an impressive network of observations taken within the state from citizen observers, the Minnesota Department of Natural Resources, the National Weather Service, and the Federal Aviation Administration. But the atmosphere does not recognize state boundaries and there is an extensive network of observing stations throughout the United States and most of the developed world that can be studied to determine how Minnesota's winters are changing and potential impacts. Traditional statistical approaches cannot effectively address the problem with the vast amount of observational data available. More complex data-driven approaches, as proposed here, are required. Specifically, the proposed workplan would include compiling a lengthy list of meteorological data, acquiring said data, using known machine-learning and higher-order statistical techniques to synthesize the vast amount of data (on the order of terabytes), using the Python programming language and graphic suite of tools to visualize the data, and then analyze the results and present them in an effective and coherent way for stakeholders and state agencies.

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 main project outcome is the identification of meteorological changes in Minnesota's winter weather and identification of how those changes may impact tourism, the environment, infrastructure, and the citizenry. The focus will be on trends in these changes and identification of how and when things may become more problematic or beneficial for different geographic areas of the state as well as those vulnerable sectors and citizens.

Activities and Milestones

Activity 1: Data Collection and Processing

Activity Budget: \$149,000

Activity Description:

Collect data, process said data, quality control available data, and prepare for analysis.

Activity Milestones:

Description	Approximate Completion Date
Data Collection and Processing	December 31, 2024
Data analysis and processing	January 31, 2026
Data Dissemination	June 30, 2026

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?

A result of this project would be the production of both a comprehensive report to state agencies (e.g., the DNR State Climate Office) and a separate summary report for end users as well as the University of Minnesota Climate Adaptation Partnership (for which I am a member). Additionally, two research-based manuscripts would be produced that will contribute to the broader meteorological research community. Presentations, to stakeholders and state agencies, educational lectures, and research-based academic lectures would also be outcomes. Outreach to stakeholders, especially in rural communities is a focus.

Project Manager and Organization Qualifications

Project Manager Name: Peter Snyder

Job Title: Associate Professor

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

The Project Manager is qualified to oversee all aspects of the project including management of the graduate student, data acquisition, data analysis (use of numerical data processing, statistical methods, and data visualization), working with stakeholders and Department of Natural Resources staff (primarily State Climate Office staff), and dissemination of project findings in the form of presentations and a report of findings. The Project Manager has a PhD in Atmospheric and Oceanic Sciences from the University of Wisconsin – Madison and has been a professor at the University of Minnesota for the last 15 years. Half of the Project Manager's duties at the University of Minnesota are dedicated to research activities and he is familiar with managing projects such as described here.

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

Organization Description:

The College of Food, Agricultural and Natural Resource Sciences (CFANS) is one of seventeen colleges and professional schools at the University of Minnesota. The College of Food, Agricultural and Natural Resource Sciences includes six divisions, twelve academic units (two are held jointly), 10 research and outreach centers throughout Minnesota, the Bell Museum of Natural History and the Minnesota Landscape Arboretum. The Project Manager's academic home is in the Department of Soil, Water, and Climate on the Saint Paul Campus in the Twin Cities. The mission of the Department of Soil, Water, and Climate is to advance the understanding of Earth system processes and the interaction among land, atmosphere, and water. Through research, teaching, and outreach. The mission of the department is to improve and protect the quality of soil, air, and water resources in natural and managed ecosystems, enhance agricultural and forest productivity and sustainability, predict and mitigate impacts of environmental and climate change on ecosystems and society, and provide science based knowledge for improved decision making and a better informed citizenry.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Faculty		Project Manager. Oversee management of the project, advise graduate student, communicate with stakeholders and state agencies on result dissemination			36.8%	0.16		\$32,292
Graduate Student		Graduate Research Assistant stipend, fringe and tuition benefit. Graduate student will be responsible for data collection, processing, analysis, and visualization activities as well as generation of at least one research manuscript based on the project findings.			24.1%	2		\$108,708
							Sub Total	\$141,000
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
	Tools and Supplies	Computer for Graduate Research Assistant	Given that this is a data-intensive project a iMac desktop computer is being requested in order to conduct the research tasks and presentation of results.	X				\$3,000
							Sub Total	\$3,000
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-

Travel In Minnesota								
							Sub Total	-
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	Publication fee	Two publication fees in Year 2 for publication of project results in peer-reviewed journals.					\$5,000
							Sub Total	\$5,000
Other Expenses								
							Sub Total	-
							Grand Total	\$149,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Equipment, Tools, and Supplies		Computer for Graduate Research Assistant	The university, college, or department do not provide free computers for graduate student research projects. Without a student computer, this project would be unattainable.

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: [49d39677-62e.pdf](#)

Alternate Text for Visual Component

The four sectors affected by changes in Minnesota winters....

Optional Attachments

Support Letter, Photos, Media, Other

Title	File
SPA Letter	ee6dd78b-cc1.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

