



Environment and Natural Resources Trust Fund

M.L. 2024 Approved Work Plan

General Information

ID Number: 2024-153

Staff Lead: Noah Fribley

Date this document submitted to LCCMR: June 6, 2024

Project Title: Managing Future Floods and Droughts in Minnesota

Project Budget: \$460,000

Project Manager Information

Name: Amanda Farris

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

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Project Reporting

Date Work Plan Approved by LCCMR: June 20, 2024

Reporting Schedule: June 1 / December 1 of each year.

Project Completion: June 30, 2026

Final Report Due Date: August 14, 2026

Legal Information

Legal Citation: M.L. 2024, Chp. 83, Sec. 2, Subd. 07e

Appropriation Language: \$460,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to leverage new statewide climate data to assess future change in the duration, frequency, and magnitude of heavy precipitation and drought events and engage communities to prepare for these extremes.

Appropriation End Date: June 30, 2027

Narrative

Project Summary: Leveraging new statewide climate data, we will assess future change in the duration, frequency and magnitude of heavy precipitation and drought events and engage communities to prepare for these extremes.

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

Minnesota's climate is getting warmer and wetter with more extreme precipitation events. The top-10 combined warmest and wettest years on record all occurred between 1998 and 2020. Research also suggests that while dry extremes have largely remained unchanged across the Midwest, transitions between wet to dry conditions are happening more quickly and more frequently, posing significant management challenges across sectors from forestry and water resource management to ecosystem conservation and agriculture. 2021 and 2022 are primary examples of this shifting balance between floods and droughts and their impacts on Minnesota's residents, species, and natural and cultural resources.

It is essential that we are able to plan not only for increased intensity and frequency of heavy precipitation events and rapid onset drought, but also for moving more frequently between these wet and dry extremes. Current projections of future climate conditions in Minnesota do not yet provide necessary details about these changing extremes or subsequent impacts on hydrological processes. Additionally, resources are needed to translate this research into meaningful information to support planning and decision-making that will ensure we are able to sustain Minnesota's thriving economy, communities, and natural landscapes.

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.

In partnership with Great River Greening and the National Integrated Drought Information System (NIDIS), the University of Minnesota Climate Adaptation Partnership (MCAP) will develop needed data and information to fill the knowledge gap around Minnesota's changing extremes as well as resources to support integration of this critical climate information decision-making.

MCAP is generating future climate projections to 2100 that directly factor in Minnesota's unique climate setting. This project will leverage these data to conduct essential analysis to enable a clearer characterization of the impacts of climate change on the state, including how extreme precipitation events and droughts will change under future climate conditions. These new data will be incorporated into hydrologic models to provide specific information about how changing extremes will impact surface water resources at a watershed scale.

Throughout the project, data and resource development will be refined to incorporate specific information needs through direct consultation with communities, practitioners, and rights holders through "action planning" workshops. Through this interactive process, results will be integrated into an interactive online tool, Extension programming, and communication resources. These resources will inform effective climate risk management for individuals and practitioners from across different sectors including forestry, water and natural resources management, and agriculture.

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 publicly available information about how extreme precipitation and drought events will change in the future and how these changes may impact soil moisture, lake levels, and streamflows based on analysis in pilot watersheds. The information will be used to inform planning and decision-making by state, local, and Tribal governments, water and natural resource managers, and agricultural producers, among others. Potential applications include adaptive planting of resilient species in conservation areas, evaluating future irrigation needs, and managing water levels for the long-term benefit of wild rice.

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

Activities and Milestones

Activity 1: Climate projections analysis and integration with soil moisture data and hydrologic models

Activity Budget: \$249,361

Activity Description:

First, we will analyze the observed climate record and future projections of wet and dry periods to understand how precipitation extremes are changing and will continue to change into the future. We will use the Standardized Precipitation Index (SPI) to identify wet and dry periods and will assess their duration, intensity, and occurrence on an interannual time scale, comparing the observed record with future projections to detect anticipated changes. These results will allow us to investigate how changing precipitation extremes will subsequently affect soil moisture and lake and stream water levels. Using soil moisture observations we will compare our historical and future precipitation simulations to project any anticipated long-term trends in soil moisture across the state. We will also employ a detailed hydrologic model to quantify how expected future changes in precipitation will impact surface waters including lakes and rivers. Watershed selection will be done in direct consultation with practitioners (Activity 2). As a warmer climate delivers more available energy into the hydrologic system, shifts between extreme wet and dry conditions may happen at a more rapid pace. Thus we will include any indicators of changes to the frequency of floods and flash droughts in our research outcomes.

Activity Milestones:

Description	Approximate Completion Date
Start statewide analysis of wet and dry periods in the observational record and future climate	July 31, 2024
Start statewide assessment of changing soil moisture conditions by integrating stations observations with precipitation data	August 31, 2024
Complete statewide analysis of wet and dry periods in the observational record and future climate	January 31, 2025
Complete statewide assessment of changing soil moisture conditions by integrating stations observations with precipitation data	March 31, 2025
Start priority watershed hydrologic modeling of lake levels and streamflows using HSPF or similar model	May 31, 2025
Continue priority watershed hydrologic modeling of lake levels and streamflows using HSPF or similar model	October 31, 2025
Complete priority watershed hydrologic modeling of lake levels and streamflows using HSPF or similar model	December 31, 2025
Start priority watershed-scale data analysis for change detection and statistical significance	January 31, 2026
Complete priority watershed-scale data analysis for change detection and statistical significance	April 30, 2026
Summarize findings and support integration of results into final project materials	June 30, 2026

Activity 2: Community and End User Engagement to Inform Data Delivery and Resource Development

Activity Budget: \$104,320

Activity Description:

To ensure our results are useful and usable, we will engage community members and practitioners throughout the project to assess how the information matters and is best presented to effectively inform different types of decision making. In Year 1 we will host an 'Action Planning' workshop, in collaboration with Great River Greening and NIDIS, to discuss potential strategies related to natural resources management decisions and the connection to changing climate and weather extremes. We will determine the data qualities (e.g., spatial scale, time scale, format) needed to inform these decisions. We will also seek guidance from workshop participants on a pilot study area for the hydrologic modeling component of the project. Results of the workshop will be used to incorporate the climate projections into the suite of interactive tools, trainings, convenings, and technical support services that are part of our dedicated climate services

Extension program designed to deliver critical climate-related information to a diversity of communities and practitioners across the state. Additionally, we will develop case studies to highlight proactive and reactive management decisions identified for Tribal lands (see letter), natural resources management, water resources, forest health, and community well-being that demonstrate how the information can be applied.

Activity Milestones:

Description	Approximate Completion Date
Start planning for first Action Planning workshop by convening project partners with Great River Greening	September 30, 2024
Start identifying and developing appropriate case studies with project partners related to proactive and reactive	September 30, 2024
Invite stakeholders for first Action Planning workshop	December 31, 2024
Continue planning for first Action Planning workshop with partners from Great River Greening	February 28, 2025
Conduct and complete Action Planning workshop to assess user information needs and inform resource, training,	March 31, 2025
Complete evaluation of first Action Planning workshop to inform planning for second Action Planning workshop	June 30, 2025
Continue to develop case studies related to proactive and reactive management strategies	June 30, 2025
Start integrating climate data, hydrologic modeling outputs, and workshop participant feedback into draft resources for	July 31, 2025
Complete case studies and post to climate.umn.edu website	February 28, 2026
Complete integration of climate data, hydrologic modeling outputs, and workshop participant feedback into draft resources	March 31, 2026

Activity 3: Connecting Climate Science to Adaptation Implementation

Activity Budget: \$106,319

Activity Description:

The aim of this activity will be to further refine project deliverables through end user testing to ensure usefulness and useability. Using draft resources updated to incorporate initial workshop participant feedback, we will conduct a second Action Planning workshop which will allow end users to test the data and information to determine its usefulness and useability during an example planning scenario. The scenario would incorporate future conditions based on the climate and hydrologic projections developed for the project and would require participants to evaluate the degree to which the data equips them to make informed decisions about the most desirable strategies to direct towards desired outcomes. Feedback from the workshop will be used to inform the final iteration of the interactive tool and supporting resources. Final deliverables will be based on the scientific research and informed by practitioner perspectives to develop a suite of resources and presentations that effectively address community and practitioner needs. The tools and resources will provide not only actionable climate data and information but also recommendations for strategies to address the impacts of future precipitation extremes to advance Minnesota-specific climate adaptation and resilience.

Activity Milestones:

Description	Approximate Completion Date
Start planning for second Action Planning workshop by convening project partners with Great River Greening,	August 31, 2025
Send invitations to stakeholders for second Action Planning workshop	November 30, 2025
Continue planning for second Action Planning workshop with partners from Great River Greening	January 31, 2026
Conduct second Action Planning workshop to test the tools and resources	February 28, 2026
Integrate climate data, hydrologic modeling outputs, and workshop participant feedback into final resources	June 30, 2026

Deliver final project results, tools, and resources	June 30, 2026
Journal article submission	June 30, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Heidi Roop	University of Minnesota Climate Adaptation Partnership	Principle Investigator, Oversee scientific analysis and engagement efforts and serve as the primary point of contact for the project	Yes
Stefan Liess	University of Minnesota Climate Adaptation Partnership	Climate Modeler; lead climate data analysis and provide technical support and assistance to project partners	Yes
Amanda Farris	University of Minnesota Climate Adaptation Partnership	Co-PI, Program manager; lead project and partner coordination and end user engagement, including 2 workshops	Yes
Data Visualization Specialist	University of Minnesota - U-Spatial	Communication; integrate climate and hydrologic modeling projections into MCAP's climate visualization tool	Yes
Climate Adaptation Researcher	University of Minnesota Climate Adaptation Partnership	Research and Development; lead translation of climate and hydrologic projections data into useful and usable formats to support decision making, support planning and execution of workshops	Yes
Postdoctoral Associate	University of Minnesota Climate Adaptation Partnership	Hydrologic Modeler; lead hydrologic modeling efforts to integrate climate data into hydrologic model and provide technical support and assistance to project partners	Yes
Extension Educator	University of Minnesota Climate Adaptation Partnership	Community and Practitioner Engagement; assist in developing educational resources and trainings for end user engagement, support planning and execution of workshops	No
Climate Data Visualization Specialist	UNM U-Spatial	Communication; integrate climate and hydrologic model projections into MCAP climate visualization tool	Yes
Todd Rexine	Great River Greening	Community and Practitioner Engagement; project management, implementation, and dissemination lead for Great River Greening	Yes
Sara Nelson	Great River Greening	Community and Practitioner Engagement; assist with implementation, dissemination, and coordination with partners, land managers/owners, and natural resource individuals for workshops	Yes
Jessica Drummond	Great River Greening	Project Coordination; grant fund coordination and status reporting for Great River Greening	Yes
Molly Woloszyn	National Integrated Drought Information System	Community and Practitioner Engagement; support the project team in connecting with drought decision makers and other end users in Minnesota and the broader Midwest region, participate in workshops as a project partner and end user	No
Climate Specialist	1854 Treaty Authority	Outreach and engagement and community science; Tribal liaison, help to identify lake of interest for hydrologic modeling, assist with coordination with Tribal partners for workshops	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.

Project findings will be disseminated through the Minnesota Climate Adaptation Partnership (MCAP), University of Minnesota Extension programs, and our project partners. MCAP works to develop critical climate science knowledge, champion climate adaptation leadership and supports climate resilience actions and collaborations across communities, sectors, and levels of government to ensure Minnesota is making needed progress to prepare for our changing climate. MCAP is a leading multi-sector group dedicated to climate adaptation and resilience in Minnesota and partners directly with state, federal and local governments, the private sector, non-profit, Tribes, community organizations, and individuals. UMN Extension is a major outreach arm of the University of Minnesota with a mission to serve the public through applied research and education. Through MCAP and UMN Extension, we provide a range of programs, products, and tools to help communities and individuals across Minnesota respond to a changing climate.

Our project partners will use the information in their own work as well as sharing it more broadly with partners.

Great River Greening's Vision 2030 plan outlines their strategy to mitigate the effects of climate change in Minnesota and protect our shared natural resources and habitats by restoring and conserving healthy, climate change resilient ecosystems throughout the state. Great River Greening will use the resources developed through the project to meet the goals laid out in this plan and to support climate-informed land restoration and conservation. Through our collaborative coordination of the project workshops, Great River Greening will also help the project team connect to other natural resource managers and stakeholders in Minnesota who will be able to use project resources in their own work as well.

The 1854 Treaty Authority will use the climate projections to better understand how changing precipitation extremes may impact cultural and natural resources in the 1854 Ceded Territory and to inform the update of the 1854 Ceded Territory Climate Change Adaptation Plan in collaboration with the Bois Forte Band of Chippewa and Grand Portage Band of Lake Superior Chippewa.

The National Integrated Drought Information System (NIDIS) will connect their partners throughout the Midwest with the research, methods, and resources developed through the project to support transferability to other areas in the region. These efforts will be in support of elements in the NIDIS strategic plan to 1) increase understanding of the risks of rapid transitions between precipitation extremes, 2) identify innovative solutions and proactive measures to increase resilience to these rapid transitions, and 3) enhance collaboration across the region between national, tribal, state, and local partners.

Environment and Natural Resources Trust Fund will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgment Guidelines.

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?

The data and information developed through this project will be incorporated into an interactive online tool and associated resources and will be accessible via the MCAP website (climate.umn.edu). Information will also be integrated into Extension programming led by MCAP to provide ongoing training and educational opportunities. Great River

Greening will use the information to inform ongoing and future conservation and landscape restoration efforts. The National Integrated Drought Information System (NIDIS) will share project results to facilitate use of the information by a broader range of users and transferability of the methodology across Minnesota and across the Midwest region.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Water and Climate Information to Enhance Community Resilience	M.L. 2022, , Chp. 94, Art. , Sec. 2, Subd. 04f	\$564,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Principal Investigator		To oversee scientific analysis and engagement efforts; serve as primary point of contact for project			37.1%	0.08		\$13,792
Co-PI, Senior Program Manager		lead project and partner coordination and end user engagement, including 2 workshops			37.1%	0.5		\$43,099
Climate Modeler		Lead climate data analysis and provide technical support and assistance to project partners			37.1%	1		\$95,000
Postdoctoral Associate		Hydrologic Modeler; lead hydrologic modeling efforts to integrate climate data into hydrologic model and provide technical support and assistance to project partners			27.1%	2		\$148,910
Climate Adaptation Researcher		Research and Development; lead translation of climate and hydrologic projections data into useful and usable formats to support decision making, support planning and execution of workshops			37.1%	0.34		\$29,825
Climate Data Visualization Specialist		Communication; integrate climate and hydrologic model projections into MCAP climate visualization tool			37.1%	0.3		\$32,135
							Sub Total	\$362,761
Contracts and Services								
Great River Greening	Sub award	Assist with community and practitioner engagement coordination, dissemination of project results, and implementation of project findings into land restoration and conservation efforts led by Great River Greening and its partners				0.68		\$79,400
TBD	Professional or Technical Service Contract	Funds are requested to cover room rentals and associated fees to host 2 in-person workshops (\$1,250/year)				-		\$2,500
Minnesota Supercomputing Institute	Internal services or fees (uncommon)	Funds are requested to pay for data storage on the Minnesota Supercomputing Institute's (MSI) data drives, necessary to process and store model data.				0		\$2,552

		10TB above the in-kind Tier 1 storage are requested at a rate of \$127.58/TB/year.						
Workshop Participants	Professional or Technical Service Contract	Honoraria will be provided to workshop participants to compensate them for their time during the workshops and offset travel expenses. Honoraria are calculated at a rate of \$40/hour (\$200 per person for each 5-hour workshop) for 10 people totaling \$4,000 for the two workshops.				0		\$4,000
							Sub Total	\$88,452
Equipment, Tools, and Supplies								
	Tools and Supplies	General operating supplies, such as workshop materials (flip charts and travel case, markers, tubs and totes to move materials, binders, name tags, markers, etc. (\$243/yr)), and printing and project promotion materials (\$243/yr).	To facilitate workshops with community members and practitioners					\$486
							Sub Total	\$486
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	We estimate total costs based on expenses for 6 project team members. Trip costs are expected to be approximately \$525.08/person, with variability based on the distance traveled. We anticipate 2 trips of the following approximate distances and durations: average mileage will be 220 miles/round trip at 0.655/mile for a total of \$144.10 per trip. Average per diem, based on 2023 GSA rates, is expected to be \$148 per night for accommodation and approximately \$79 for food and incidentals. \$6,301 is requested to meet these approximate	For the MCAP project team to travel to two community member and practitioner engagement workshops, locations and dates to be determined through the project process and interaction with partners, community members, and practitioners.					\$6,301

		costs for six project team members for Minnesota-based travel.						
							Sub Total	\$6,301
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	Peer-reviewed journal article publication fees	Funds are requested for publication costs in a peer-reviewed journal article in Year 2. Publication journal to be determined.					\$2,000
							Sub Total	\$2,000
Other Expenses								
							Sub Total	-
							Grand Total	\$460,000

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: [e526ccc7-94a.pdf](#)

Alternate Text for Visual Component

The visual demonstrates the iterative, co-production process by which the project team and our partners will create needed data and information to better equip practitioners and communities to address the impacts of future drought and heavy precipitation events in Minnesota....

Supplemental Attachments

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

Title	File
National Integrated Drought Information System (NIDIS) Letter of Support	1b09ac5b-889.pdf
1854 Treaty Authority Letter of Support	ea833ce2-f5c.pdf
University of Minnesota Letter	3cffa50c-4d0.pdf
Updated University of Minnesota Letter	1fd4789f-2b6.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

All fringe rates have been updated to reflect FY24 rates. All salaries have been updated to reflect FY24 increases. We have made modifications for personnel effort and other project expenses to offset these increases and to reduce total projects costs to \$460,000, per the recommended funding amount. Effort for the Climate Modeler was reduced from 8 months in year 1 and 6 months in year 2 to 6 months each year. This will result in a narrowing of the scope of hydrological modeling efforts for the project, likely limiting the number or size of the watershed(s) we are able to model. Subsequently, effort for the Data Visualization Specialist was reduced by 1/2 month in year 2 to reflect the reduction in the amount of customization and updates to the online interactive data tool to integrate the hydrological modeling data. Tools and Supplies were reduced to \$243/year and Workshop Location Rental Fees were reduced to \$1,250/year to reduce total project costs for the lower budget amount.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you agree travel expenses must 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 agree to the UMN Policy.

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