



Environment and Natural Resources Trust Fund

2025 Request for Proposal

General Information

Proposal ID: 2025-233

Proposal Title: Pilot Water Budget Framework for Managing Water Withdrawals

Project Manager Information

Name: John Nieber

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

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Project Basic Information

Project Summary: This project will develop a pilot water budget framework to identify sensitive areas in Minnesota where net water withdrawals have a significant impact on surface and ground water.

ENRTF Funds Requested: \$198,000

Proposed Project Completion: June 30, 2026

LCCMR Funding Category: Small Projects (H)

Secondary Category: Water Resources (B)

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?

In the Future

Narrative

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

Managing water availability for human use is becoming increasingly difficult due to the confluence of increased public water demand and the variability of weather induced by climate change. Increased public water demand can result from increased population, increased agricultural water demand from more acreage or a move to increased irrigation, while climate change can cause lower water availability during dry periods from decreased precipitation and increased evaporation due to increased temperatures.

Water availability is shared and needs to be managed accordingly. However, in Minnesota, it is managed by many state agencies with no clear framework and a bias towards water quality. Areas with mild water shortages should get more resources for restoration and areas with severe water shortages might need to be restricted to current users only. Water-use data can be better organized and analysis tools can be developed to prioritize watersheds and groundwater zones, so that those areas most affected by water deficits get the most attention.

We see the need to develop a framework for water withdrawal management to systematically identify critical areas where the streamflow or groundwater has been depleted. Low streamflow or groundwater level is an indicator of excessive surface or groundwater withdrawals.

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 propose developing a pilot water budget framework for managing water withdrawals in Minnesota. The work will identify critical areas where the natural supply of water has been depleted. This approach will be based on the framework outlined in the Massachusetts Sustainable Watershed Initiative and will provide the impetus for a new framework for Minnesota.

A water budget approach is a relatively simple accounting of human-based water withdrawals and discharges relative to the natural hydrology. The yardstick for measuring net withdrawal impact is typically the median monthly natural streamflow or annual natural recharge rate. All human inputs and outputs of water for each area are quantified and the net human impact determined. The net human withdrawal rate is then compared to the estimated natural rate for each area to determine the relative human impact (percent).

We will evaluate a select number of areas to determine the best way to implement the water budgets method in Minnesota. The work will evaluate the availability of water withdrawal data, the size of the area, and the definition of the correct natural recharge rate for determining relative impact (percent). This new water withdrawal framework could unify the efforts of the state agencies managing water.

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?

Water budgets can offer helpful guidance on short and long-term decisions about the use of water. The proposed framework will identify areas with water deficits that warrant further planning and action by communities to ensure the sustainability of their invaluable water resources. Communities will be able to better understand the impact of their withdrawals and discharges on specific watersheds or groundwater zones. As a planning and regulatory tool, communities could consider the impact of wells and wastewater discharges, find better water sources, and seek ways to improve the overall natural balance of their water resources.

Activities and Milestones

Activity 1: Develop a Water Budget Framework for Managing Surface Water

Activity Budget: \$85,000

Activity Description:

Our Team will work define three study watersheds with predominantly urban, agricultural, and forested land use. Because cumulative effects are important for streamflow impacts, we will create a cumulative watershed for the areas upstream of the selected watersheds. These cumulative watersheds will be used to calculate the net withdrawals and median streamflow values.

The data need for this project will include monthly withdrawals, monthly discharges, private well/septic areas, and forested/irrigated areas. Time lag between the withdrawal/discharge location and the river can be accommodated approximately with the USGS Stream Depletion tool.

Natural streamflow will be estimated using a USGS publication (2023) on low flow statistics in Minnesota. We will evaluate various natural low flow statistics for a flow metric or yardstick. The most likely metric will be the monthly median values of daily streamflow. Cumulative net withdrawal divided by cumulative natural streamflow will be the estimate of relative impact (%). Relative impact will be summarized for the three subwatersheds.

The relative impact results will be evaluated for water management utility. We will also evaluate how climate change might influence this approach, using information from a soon-to-be funded LCCMR project on the effect of climate change on streamflow (2024-213).

Activity Milestones:

Description	Approximate Completion Date
Define study watersheds, data needed and metrics	August 31, 2025
Acquire data needed and process for each watershed	September 30, 2025
Calculations for study watersheds	November 30, 2025

Activity 2: Develop a Water Budget Framework for Managing Groundwater

Activity Budget: \$85,000

Activity Description:

Our Team will work define up to three study groundwater areas with predominantly urban, agricultural, and forested land use. Because cumulative effects are not important for groundwater storage, we will used the actual groundwater area for this analysis. These areas will be used to calculate the net withdrawals and average recharge rate.

As in Task 1, the data need will include monthly withdrawals, monthly discharges, private well/septic areas, and forested/irrigated areas. We will also evaluate various estimates of natural recharge to develop a recharge metric or yardstick. The most likely metric will be the average annual recharge rate. Cumulative net withdrawal divided by cumulative natural recharge rate will be the estimate of relative impact (%). Relative impact will be summarized for the three groundwater areas.

The relative impact results will be evaluated for water management utility. We will also evaluate how climate change might influence this approach. We will utilize recent work at UMN (by Harsh Anurag, now at Geosyntec) to evaluate the effect of climate change on recharge.

Activity Milestones:

Description	Approximate Completion Date
Define study groundwater zones, data needed and metrics	December 31, 2025
Acquire data needed and process for each groundwater zone.	January 31, 2026
Calculations for study groundwater zones	March 31, 2026

Activity 3: Project Management and Reporting**Activity Budget:** \$28,000**Activity Description:**

The team will establish a Technical Advisory Committee (TAC) with experts from Minnesota Department of Health (MDH), Minnesota Pollution Control Agency (MPCA), and Minnesota Department of Natural Resources. The TAC will meet every three months while the full project team will meet monthly. Leveraging our existing relationships, we will establish a stakeholder group from cities, counties, watershed districts/organizations, and non-profits.

A draft and final report will provide documentation of the project to clearly explain the proposed pilot framework. Following the completion of the final report, our Team will develop draft and final training slides, then conduct a one-hour workshop (recorded) on the proposed water management framework.

Our team will provide periodic updates to the LCCMR as contracted. The updates will include documentation of the TAC meetings, status of the tasks, discussion of unexpected issues and resolutions, and any results to date.

Activity Milestones:

Description	Approximate Completion Date
Finalize proposed TAC members	July 31, 2025
Draft and final report	May 31, 2026
Present a one-hour training webinar	June 30, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
John Nieber	University of Minnesota	Project Manager	Yes
Nigel Pickering	Geosyntec Consultants, Inc.	Project Consultant	Yes
State Staff	State Agencies	TAC Members (added in Activity 3)	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?

Water availability is shared but in Minnesota it is managed by many state agencies with no clear framework. This pilot water budget framework will provide a catalyst for future water quantity management and bring together the many state agencies that are currently involved with water management in Minnesota. It will also help define the data needs of the framework, the datasets needed for efficient tracking of water withdrawal impacts, and the best approach for estimating the impacts to surface water and groundwater. With future LCCMR funding, this pilot framework could be extended to the entire state.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Setting Realistic Nitrate Reduction Goals in Southeast Minnesota	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04m	\$350,000

Project Manager and Organization Qualifications

Project Manager Name: John Nieber

Job Title: Professor

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

John Nieber has 43 years conducting research and teaching at major research universities (38 years at the University of Minnesota). He has conducted research in hydrology and water quality problems during that time. He has published over 100 refereed journal manuscripts and is a license professional engineering and certified professional hydrologist.

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

Organization Description:

In the College of Food, Agricultural and Natural Resources Sciences (CFANS) at the University of Minnesota, we look at the bigger picture. When we envision a better tomorrow, it includes disease-resistant crops, products that protect our health, lakes free from invasive species, and so much more. We use science to find answers to Minnesota's and the world's grand challenges and solve tomorrow's problems. Almost 93 percent of students who earn CFANS undergraduate degrees find jobs in their career field or enter graduate school within six months of graduation.

The Department of Bioproducts and Biosystems Engineering, in CFANS, discovers and teaches solutions for the sustainable use of renewable resources and the enhancement of the environment. We discover innovative solutions to

address challenges in the sustainable production and consumption of food, feed, fiber, materials, and chemicals by integrating engineering, science, technology, and management into all degree programs.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Principal Investigator		Will oversee all project activities and manage the project to meet proposed deadlines.			37.1%	0.03		\$6,855
Graduate Student Research Associate		The student, with expertise in hydrology, will work with the project collaborators to process available data and perform water budgets analysis.			46.45%	1		\$56,177
							Sub Total	\$63,032
Contracts and Services								
Geosyntec	Professional or Technical Service Contract	Contractor will assist with all aspects of the project including developing the conceptual framework, data collection, data/GIS analysis, report preparation, and webinar preparation/presentation. Senior Water Resources Engineer/Project Manager, Data Analyst, GIS Analyst, and Administrator.				1.2		\$134,968
							Sub Total	\$134,968
Equipment, Tools, and Supplies								
							Sub Total	-
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
							Sub Total	-

Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$198,000

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	-

Total Project Cost: \$198,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [7f315240-b50.pdf](#)

Alternate Text for Visual Component

Water Budgets Map of Human Impact by Subbasin...

Supplemental Attachments

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

Title	File
Letter of Authorization to Submit	41a4d39c-716.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

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?

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:

Riana Fletcher (she/her)

Principal Grant and Contract Officer

Team 4 Lead

Sponsored Projects Administration

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