Environment and Natural Resources Trust Fund

2025 Request for Proposal

General Information

Proposal ID: 2025-144

Proposal Title: Addressing 21st Century Challenges for the St. Croix

Project Manager Information

Name: Jason Ulrich

Organization: Science Museum of Minnesota - St. Croix Watershed Research Station

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Project Basic Information

Project Summary: A St. Croix River watershed model will be developed to identify potential hydrologic and water quality impacts to the Lower St. Croix River over the next 75 years.

ENRTF Funds Requested: $243,000

Proposed Project Completion: June 30, 2027

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?

Region(s): Central, Metro,

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

Region(s): Central, Metro,

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.

Changing climate and watershed conditions in the 21st century present challenges to the St. Croix River Basin (SCRB), one of the most pristine large river systems in the US. Over the last 15 years, changes in precipitation and intense storm events have increased flooding and higher-flow periods throughout the SCRB, while in other years prolonged drought and low-flow periods have occurred. These trends are consistent with regional climate projections for the next 75 years. The SCRB is mostly covered in forests, lakes and wetlands; nevertheless, phosphorus from agriculture and wastewater treatment plants has degraded water quality in the lower river's in-stream lakes, and increased precipitation and population in the future will likely increase these phosphorus exports. The upper SCRB also contains a considerable number of dams; however, their flood, sediment, and phosphorus storage benefits are not known, and efforts to remove aging dams are ongoing. In the face of these potential changes, scientists, managers, and the public do not yet have clear data on how SCRB will respond. Given these uncertainties, this study will provide scenario-driven insights into how flow and water quality in the economically, culturally, and ecologically vital SCRB may be impacted by future climate and watershed changes.

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 comprehensive watershed model of the SCRB that will predict hydrologic and water quality impacts from potential climate and watershed changes over the next 75 years. The model will simulate a range of possible climate scenarios as well as possible changes to landuse/landcover (e.g., changes in agriculture, forest, population/development), increased agricultural BMPs, and decreased dams/reservoirs. While the entire SCRB will be modeled, the focused study area will be the Lower St. Croix reaches (Taylors-St. Croix Falls to Lake St. Croix), where recreational use is highest.

Potential hydrologic impacts will be defined by predicted changes in hydrologic variables such as frequency, magnitude, duration and seasonal timing of flood- and drought flow events, while potential water quality impacts will be expressed by predicted changes to the masses and seasonal timings of sediment/phosphorus loads. As such, these results of future SCRB hydrology and water quality can be directly related to the SCRB's ability to provide economic, social, and ecological benefits in the future.

Results will communicated via agency-focused resource impact assessments (specific to resources such as boating, swimming, species habitats, etc.) and GIS maps, as well as public-focused web newsletters and social media outreach.

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 is designed to inform the public and directly aid local, state and federal agencies in planning and prioritizing future SCRB management actions by helping answer questions such as: (1) Will flood events become more numerous or damaging? - and to what degree will probable decreases in dams and reservoirs affect this? (2) How will potential changes in high- and low flow regimes affect boating, camping, fishing and overall ecology (e.g., mussels, non-game fish, riparian tree species) in the River? (3) Is water quality in Lake St. Croix expected to improve or further degrade?

Activities and Milestones

Activity 1: Develop St. Croix River Watershed Model

Activity Budget: $151,000

Activity Description:
We will build a SWAT hydrologic and water quality model for the St. Croix River Basin (SCRB). We will use high-resolution soils, landuse and elevation data, and incorporate all streams, lakes and dams. We will evaluate landuse changes over the calibration period (2000-2022) and if appropriate use a time-varying landuse dataset. Wastewater treatment plant loads will be incorporated using state agency datasets. The model will be calibrated using existing discharge and water quality datasets from local, state, and federal agencies. To improve the model, we will collect sediment cores from six backwater/riparian lake sites to measure sediment/phosphorus deposition rates. These sites were previously cored in 2005 and re-coring will provide a measure of sediment/phosphorus deposition in these areas over the last 20 years. These data will provide insights into how sediment/phosphorus storage has changed in this reach of the river and will be used to more accurately configure and calibrate simulated sediment/phosphorus flux. Early in the project, a Technical Advisory Committee (TAC) will be formed comprising experts from agencies and universities. The TAC will review project progress every 6 months and provide advice, feedback and additional data sources as needed.

Activity Milestones:

Description	Approximate Completion Date
Acquire and compile data necessary for model creation/calibration	October 31, 2025
Conduct sediment coring field work and analyze results	March 31, 2026
Complete initial SWAT model	June 30, 2026
Calibrate SWAT model	September 30, 2026

Activity 2: Use St. Croix River Watershed Model to Simulate Impacts from Future Climate and Watershed Scenarios

Activity Budget: $92,000

Activity Description:
In this activity, the SCRB SWAT model will simulate hydrologic/water quality variables for the period 2025-2100 using a developed set of future scenarios, each comprising different combinations of projected future climate and watershed conditions. Future climate scenarios will use the latest projected climate data available for the region, and will be adapted from existing National Park Service climate planning work. We will convene a Scenario Development Workshop -- consisting of TAC members, natural resource managers, and other SCRB stakeholders -- to decide the composition of future modeling scenarios. Scenario development discussions will focus on degree of future watershed changes such as increased row-crop agriculture and population/urbanization, decreased forest cover, increased agricultural BMPs, and decreased dams/reservoirs. Results will be summarized in a final report, 1-page fact sheet, as well as resource-specific impact assessments (e.g., for boating, camping, swimming; mussel, fish habitats) and GIS maps intended for management agencies. Specifications of reporting deliverables will be determined from TAC meeting and Scenario Development Workshop feedback.

Activity Milestones:

Description	Approximate Completion Date
Organize and convene St. Croix River Scenario Development Workshop	October 31, 2026
Simulate future scenarios with SWAT model and compile modeling results	February 28, 2027
Create reporting deliverables (fact sheet, full report, impact assessments, GIS maps)	June 30, 2027

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Thomas Parr	National Park Service	Assisting with research advice, review, writing, analysis.	No
Richard Damstra	National Park Service	Facilitate access to water quality datasets; assistance with review and analysis	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?

Project objectives, intermediate, and final results will be communicated to public and professional audiences via Science Museum social media, and presentation at two local scientific conferences during the project. In addition, we will partner with a local media organization, St. Croix 360, which has a large readership interested in the St. Croix, to publish articles about the project from beginning to end. The project's final results, analyses, and implications will be implemented by management agencies after the project is completed, and all project deliverables will be available on Science Museum websites for public access in the future.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Mapping Unprofitable Cropland for Water and Wildlife	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04n	$100,000
Increased Intense Rain and Flooding in Minnesota's Watersheds	M.L. 2022, , Chp. 94, Art. , Sec. 2, Subd. 04h	$192,000

Project Manager and Organization Qualifications

Project Manager Name: Jason Ulrich

Job Title: Assistant Scientist

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

As a watershed modeler and hydrologist, my scientific studies focus on understanding and quantifying the effects of factors such as landuse, climate and agricultural practices on hydrology and water quality. My two principal areas of expertise are: a) modeling the behavior of agricultural watersheds using the state of the art models such as SWAT and HSPF, and b) geographic information systems (GIS) analysis for better understanding of small-scale hydrologic, nutrient and sediment processes using LiDAR elevation data. My experience combines modeling, GIS, and statistical analyses with economics to better predict the cost-effectiveness of proposed agricultural best-management-practices (BMP) strategies, and to understand the effects of climate change and agricultural drainage on trends in river hydrology, flooding and water quality.

Organization: Science Museum of Minnesota - St. Croix Watershed Research Station

Organization Description:

The Science Museum of Minnesota (SMM) is a private, non-profit 501(c)3 institution dedicated to encouraging public understanding of science through research and education. The St. Croix Watershed Research Station is the environmental research center of the SMM with the mission to foster, through research and outreach, "a better understanding of the ecological systems of the St. Croix River basin and watersheds worldwide." The SCWRS supports an

active year-round program in environmental research and graduate-student training, guided by a dedicated in-house research staff with direct ties to area universities and colleges. It collaborates closely with federal, state, and local agencies with responsibility for managing the St. Croix and upper Mississippi rivers and is a full partner with the National Park Service for resource management in parks of the western Great Lakes region. Its research has played a central role in setting management policy for the St. Croix and Mississippi rivers, for establishing water-quality standards for Minnesota lakes and for developing long-term monitoring plans for the National Park Service.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Assistant Scientist		Project manager, primary modeler, analyst; developer of outreach/communication deliverables			26%	1.2		$126,000
Senior Scientist		Lead sediment coring activities; assist and advise with modeling, analysis, development of outreach/communication deliverables			26%	0.14		$22,300
							Sub Total	**$148,300**
Contracts and Services								
Greg Seitz, St. Croix 360	Professional or Technical Service Contract	Writing and publishing of project articles and other outreach content				0.2		$15,000
St. Croix Watershed Research Station	Internal services or fees (uncommon)	Sediment core collection and laboratory dating (6 cores: $2550/core)				0		$15,300
St. Croix Watershed Research Station	Internal services or fees (uncommon)	Lab analysis of sediment core TP fractions (12 samples from 6 cores: $1875/sample)				-		$22,500
St. Croix Watershed Research Station	Internal services or fees (uncommon)	Diatom analysis (8 samples from 6 cores: $4800/sample)				-		$38,400
							Sub Total	**$91,200**
Equipment, Tools, and Supplies								
							Sub Total	**-**
Capital Expenditures								
							Sub Total	**-**

Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Conference Registration Miles/ Meals/ Lodging	Two (1-person) conference registrations at two Minnesota environmental science conferences	Formal presentation of project results					$500
							Sub Total	**$500**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	One peer-reviewed scientific paper published in open-access journals	To communicate our findings with researchers					$3,000
							Sub Total	**$3,000**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$243,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	**-**
Non-State				
In-Kind	Science Museum of Museum	Support services from Science Museum of Minnesota 40.83% of direct costs	Secured	$91,820
			Non State Sub Total	**$91,820**
			Funds Total	**$91,820**

Total Project Cost: $334,820

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: d9869abe-977.pdf

Alternate Text for Visual Component

Graphic showing photos of potential threats to the St. Croix River such as flooding, dam failures and toxic algae threats, and photos of valued St. Croix River resources such as camping, canoeing and endangered mussels....

Supplemental Attachments

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

Title	File
Science of Minnesota Institutional Resolution Letter	162cdd92-c59.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?

Yes

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:

Science Museum of Minnesota - St. Croix Watershed Research Station; National Park Service