Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-242

Proposal Title: USGS StreamStats Enhances Sediment Monitoring in Minnesota

Project Manager Information

Name: Joel Groten

Organization: US Geological Survey - Upper Midwest Water Science Center

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Project Basic Information

Project Summary: Enhance a publicly accessible web tool (StreamStats) to estimate sediment loads in Minnesota's Rivers lacking sampling data. This tool is needed by resource managers for stream restoration and preservation.

Funds Requested: $300,000

Proposed Project Completion: 2023-06-30

LCCMR Funding 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.

There are more than 6,000 miles of rivers in Minnesota impaired by excess sediment. Understanding fluvial sediment is critical to addressing many environmental problems such as exacerbated flooding, degradation of aquatic habitat, excess nutrients, harmful algae blooms, impairment to aquatic recreation, loss of soil, and the economic challenges of restoring these systems. The U.S. Geological Survey (USGS) uses width and depth integrated sampling to determine accurate bedload and suspended-sediment concentrations (SSCs), but these methods are expensive and time consuming. In contrast, State agencies collect total suspended solids (TSS) data across Minnesota. The TSS method is simpler, faster, and cheaper than USGS methods and meets regulatory standards. However, TSS methods underestimate the sand component of sediment loads, which is the component that causes the most environmental damage and is most expensive to mitigate. Furthermore, the spatial coverage of State TSS data in Minnesota is still not sufficient for informing resource management decisions about rivers lacking any sediment data. Therefore, additional tools need to be developed to provide accurate estimates of sediment loads for river locations lacking measured data.

What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.

Developing a web application to estimate SSC, bedload, and annual sediment loads at streams where data are not available would provide an important tool for natural resource managers that cannot afford to measure SSC and bedload at every stream of interest. This work will use over 6,000 values of SSC, bedload, and streamflow that have already been collected from over 50 sites across Minnesota to enhance the USGS StreamStats web application to estimate sediment information for river locations lacking measured data. The proposed project builds on existing field data collected through collaborative efforts between the MNDNR, MPCA, and USGS and to enhance a web application that is publicly available and already used by water resource managers to inform decisions. Near-channel and watershed characteristics will be extracted from available geospatial datasets, and a model will be created to describe relations between rating curves and watershed characteristics at each site. Relations between sediment rating curves and geospatial characteristics will then be tested for possible application to sites without sediment data. Results from this work will help local and state resource managers along with restoration practitioners to better assess sediment transport at sites lacking sediment data across the state.

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 project outcomes will be an easy to use and publicly available web application that allows users to select a stream point of interest. The results will be sediment estimates for both SSC and bedload. The user will also be provided with annual loads for the streams. These estimates will be useful to resource managers who are tasked with protecting and restoring our streams. It is expensive and difficult to collect sediment at every stream of interest and this project will provide useful estimates based on previously collected samples to help with planning and implementing restoration to prevent project failures.

Activities and Milestones

Activity 1: Data Analysis, Model Archival, and Reporting

Activity Budget: $150,000

Activity Description:
Data analysis will be conducted by USGS staff using the R Statistical Environment and ArcGIS. During data analysis, multiple models will be tested, and the best model will be selected for publication and use in the web application SteamStats. Archival of the model and model estimates will be publicly available on the USGS website ScienceBase. A publicly available report is required by USGS to publish estimates of suspended sediment and bedload in StreamStats. The report will provide the methods of model development and will give users a reference for understanding, replicating, and building upon this work. It will include the methods for developing the model and the results from data analysis. The report will go through a series of USGS reviews in addition to reviews done by a journal. The final report will be published in a journal.

Activity Milestones:

Description	Completion Date
Data analysis	2021-12-31
Model Archival	2022-03-31
Publication of Report	2022-06-30

Activity 2: Making the Results Accessible and Easy to use by the Public and Professionals

Activity Budget: $150,000

Activity Description:
A publicly available website will be developed, tested, and published. The website will integrate the model developed in the prior tasks with the geospatial dataset to estimate SSC and bedload. The website will also integrate with USGS StreamStats that is already used by many water resources professionals in the State. Users will be able to select the stream point of interest and will be provided daily and annual load estimates of SSC and bedload. These estimates are important for different preservation and restoration activities. This innovative tool will help reduce the cost of expensive sampling efforts.

Activity Milestones:

Description	Completion Date
Website Development	2022-12-31
Beta Testing	2023-03-31
Publication of Website	2023-06-30

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Ian Chisholm/Greg Johnson	Minnesota Department of Natural Resources/Minnesota Pollution Control Agency	The DNR, MPCA, and USGS have invested approximately 7 million dollars in data collection that will be used to build this web application. Due to funding cuts, the State agencies are unable to pay for this web application. The DNR, MPCA, and USGS are looking for financial assistance from LCCMR.	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 be funded?

The results will be implemented on a publicly available website USGS StreamStats. A user will be able to click on the stream point of interest and the estimated SSC and bedload results will be presented to the user. The USGS and DNR will work on funding this website long-term. The website will only cost approximately $7,500 per year for the server space and maintenance to host the website. Also, a small sampling program will be maintained to check the validity of relations used to provide web-based estimates, and several potential long-term funding sources will be explored to

Project Manager and Organization Qualifications

Project Manager Name: Joel Groten

Job Title: Hydrologist

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

Joel Groten is a Hydrologist with the U.S. Geological Survey (USGS) Upper Midwest Water Science Center in Minnesota. He has a M.S. in Water Resources Science from the University of Minnesota. Joel serves as a principal investigator related to USGS sediment and nutrient studies. He has been working with local, state, and federal partners in Minnesota for the past eight years. In this capacity, he provides project oversight, technical assistance, teaching, training, data analysis, and reporting in support of projects for the Minnesota Department of Natural Resources, Minnesota Pollution Control Agency, U.S. Army Corps of Engineers, Lower Minnesota Watershed District, Rice Creek Watershed District, and the Institute for Technological Research in São Paulo, Brazil. These projects vary in scope and relate to stream restoration, geomorphology, nutrient and sediment budgets, continuous data acquisition in real-time, aquatic habitat, TMDL studies, and flood retention and diversion. He has been a primary author of 4 peer-reviewed papers and a co-author on 3 peer-reviewed papers. Joel also is responsible for research and implementation of new technologies to improve understanding of sediment and nitrate sources, fate, and transport mechanisms.

Organization: US Geological Survey - Upper Midwest Water Science Center

Organization Description:

The USGS works as a partner with state agencies towards collecting and analyzing a myriad of water quality data. The USGS is uniquely positioned to carry out the work for this project through its standard techniques and methods for collecting sediment data and experienced hydrologists, hydrologic technicians, and website developers. The USGS Upper Midwest Science Center has state-of-the-science expertise in the office and has access to the most current science and technology related data collection and analyses nationwide.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Hydrologist		Principal Investigator/Project Manager will be responsible for data analysis, model archival, report writing, and overseeing entire project			30%	0.56		$96,400
Hydrologic Technician		Science support for data analysis, model archival, and report writing			30%	0.48		$53,600
Manager		Oversight of USGS Web Informatics and Mapping Team			30%	0.02		$5,700
Website Project Manager		Coordination of development efforts, tracking of project progress through project life-cycle			30%	0.04		$9,400
Front End Specialist		User interface styling and responsiveness			30%	0.1		$20,300
Student Worker		Assist with development and documentation			30%	0.15		$15,200
Developer		Assist with development and documentation			30%	0.18		$35,600
Senior Website Developer		Lead developer on the team, oversight on system architecture, framework selection, and development process			30%	0.18		$53,300
							Sub Total	**$289,500**
Contracts and Services								
							Sub Total	**-**
Equipment, Tools, and Supplies								
	Tools and Supplies	Website and hosting toolset includes cloud costs for production and development environments, development software tools licensing	Necessary					$10,500
							Sub Total	**$10,500**
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	**$300,000**

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				
Cash	USGS Cooperative Matching Funds	Additional funds used for USGS personnel costs	Secured	$100,000
			Non State Sub Total	**$100,000**
			Funds Total	**$100,000**

Attachments

Required Attachments

Visual Component

File: 30285101-e03.pdf

Alternate Text for Visual Component

Example of Sediment in StreamStats main webpage

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have patent, royalties, or revenue potential?

No

Does your project include research?

Yes

Does the organization have a fiscal agent for this project?

No

USGS **Sediment StreamStats**

SELECT A STATE / REGION >

Step 1: Use the map or the search tool to identify an area of interest. At zoom level 8 or greater State/Region selection will be enabled.

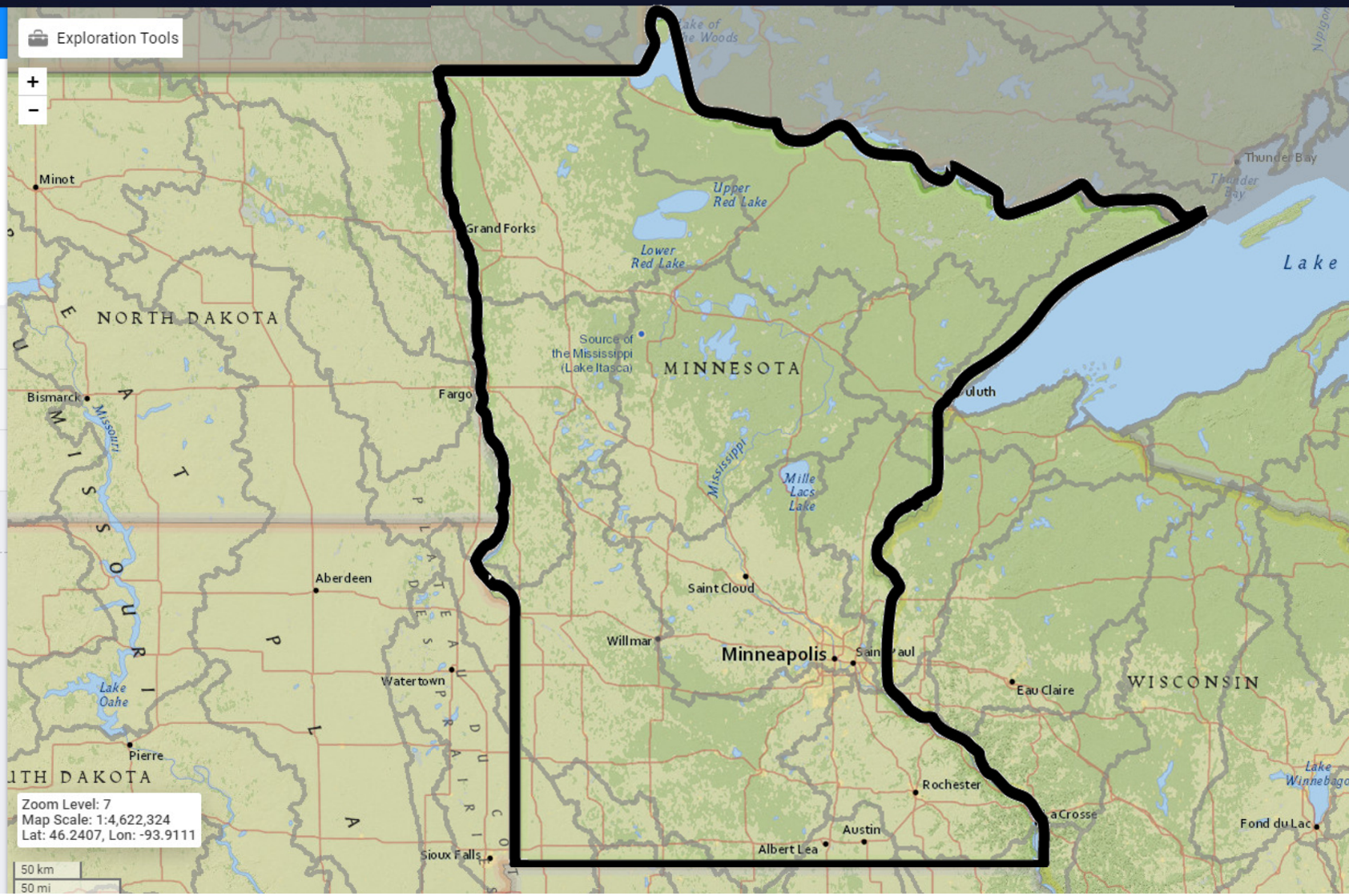
Search for a place

Help

IDENTIFY A STUDY AREA

SELECT SCENARIOS

BUILD A REPORT

POWERED BY WIM

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