Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-259

Proposal Title: Whitewater River Evolution: Sediment Dynamics and Cross-Section Inventory

Project Manager Information

Name: Dylan Blumentritt

Organization: Minnesota State Colleges and Universities - Winona State University

Office Telephone: (507) 457-5234

Email: dblumentritt@winona.edu

Project Basic Information

Project Summary: Evaluate streamflow, sediment, and floodplain changes in the Whitewater River valley. Making 80 years of legacy data available and building upon it to understand changing impacts on critical river corridors.

Funds Requested: $265,000

Proposed Project Completion: 2024-06-30

LCCMR Funding Category: Water Resources (B)

Project Location

What is the best scale for describing where your work will take place?
    Region(s): SE

What is the best scale to describe the area impacted by your work?
    Region(s): SE

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.

Excess sediment impacts the Whitewater River, a prominent trout stream and recreational area in Southeastern Minnesota (Figure 1). Here we seek to understand how this sediment moves through the valley and reshapes the river. In 1939 by Dr. Stafford Happ of the USDA Soil Conservation Service and his team established a network of 72 cross-sections throughout the entire Whitewater River system (Figure 2). He monumented each cross-section with steel pipes set in concrete and measured the topography of the valley bottom. These sites were re-surveyed in 1964 by Dr. Happ and his team, and again in 1994 by NRCS Staff (Figure 3). More recently, significant efforts have been made to locate many of the cross-section monuments. The Happ cross-sections contain a wealth of high-resolution historical sediment data, but are no longer a priority for the federal government. Our project would use the cross-section data along with stream-flow measurements and grain-size analysis to inform the sediment dynamics model being constructed by Dr. Andrew Wickert and his team through an NSF grant. Our work would help better determine the influence of human activities on post-glacial stream adjustment in Whitewater River valleys.

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.

We are seeking funding to help address two primary needs in the Whitewater Watershed:

(1) Update, catalog, and make datasets related to the Happ cross-sections publicly available.
Here we propose work that would compile, catalog and create an online database to make the 80+ year dataset available to state agencies, the Whitewater Joint Powers Board (WW-JPB), and interested citizens. Efforts here would be focused on archiving the 40 GB of data already passed down from former NRCS staff, surveying in monuments using centimeter-precision GPS, and compiling data into a cohesive database. This database will be published in a GIS web mapper so users can access data.

(2) Better understand the difference between natural and human-caused sediment movement.
We propose to set up instrumentation to measure stream velocity at key locations in each of the three main branches of the Whitewater River. In addition, grain-size analysis of bed sediment will be performed throughout these study reaches. This work will help inform ongoing modeling efforts by Wickert to understand how changing rainfall patterns and land use impact surface water quality in the Whitewater Watershed.

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?

1.   Preserving 80 years of irreplaceable data that tell us how watersheds respond to changing agriculture, temperature, and precipitation. This can be a blueprint for how to help farming and watershed management co-exist in the future.

2.   Creation of a unique set of data and expertise for collaboration with WW-JPB and State agencies to focus upland implementation efforts and target stream channel restoration projects.

3.   Development of applied fluvial geomorphology techniques to improve river water quality.

4.   Establishing automated stream-gauging stations on the North, Middle, and South Fork Whitewater Rivers to better understand the source and fate of sediments.

Activities and Milestones

Activity 1: Stream Cross-sections

Activity Budget: $62,000

Activity Description:

Compile research maps and field notes and use them to locate the remaining monuments from the original Happ surveys (approximately 60). Most of the monuments have been located over the past several years by Doug Christianson (retired) and Lawrence Svien, who have graciously shared their findings with us in the hopes that we could continue this work.

Survey all possible monuments with centimeter-precision GPS to precisely record their location, including elevation. This will allow us to re-set any monuments that may be lost in the future due to human activities or natural erosion.

Re-survey up to 30 key cross-sections that will best inform the sediment dynamics model being developed by Wickert et al. (U of M). We will overlay these cross sections onto historical surveys to determine channel and floodplain sediment shifts since the 1994 surveys.

Activity Milestones:

Description	Completion Date
Obtain names and addresses of landowners and notify of our activities	2022-05-31
Survey all monuments with high-accuracy GPS	2022-11-30
Locate missing cross-section monuments	2022-11-30
Survey select topographic cross-sections	2023-11-30

Activity 2: Stream Monitoring: Flow and Sediment

Activity Budget: $147,000

Activity Description:

Set up stream gauges on the North, Middle, and South Fork Whitewater Rivers to track specific flow (and sediment) sources to the mainstem. These stations will incorporate multiple surface-velocity radars to make safe and consistent flow measurements. Flow measurements will be automatically uploaded to servers via cellular network for real-time comparisons with established gauges on the Whitewater, and will also help us to track floods and understand how this critical recreational river is changing through time.

Collect grain-size data at each monitoring site as well as multiple locations upstream and downstream. Trout require gravel to shelter their eggs. Sand moves more quickly down the river, and can rapidly reshape the bed and banks. Mud washes through the channel, but can be deposited in the floodplain, producing wetland habitat and stable river banks. All three are required for a healthy ecosystem, and knowing where they are and where they come from is critical to characterize habitat and predict how it will change into the future.

Activity Milestones:

Description	Completion Date
Install stream-gauging radar stations	2022-04-30
Set up automated data return and make these data publicly available via the internet	2022-05-31
Identify cross-sectional survey sites using the gauging stations and Happ cross sections	2022-10-31

Survey the streams for grain size to inform river health, habitat, and future change	2024-06-30

Activity 3: Cross-section Database

Activity Budget: $56,000

Activity Description:

Organize historical and recently collected data into a single database. We have already obtained 40+ GB of historical data that includes cross-section surveys, GIS data files, survey notes, old reports and correspondences, historical photos, etc. We propose to organize this information, along with the data we collect for this project, into one geospatially referenced database.

This database will be stored on WSU servers and maintained by staff at the Southeastern Minnesota Water Resources Center at WSU. The database will be published as an online interactive map for public access. The map will be similar to the DNR's Minnesota Spring Inventory (MSI) Map, which allows the user to click on an individual point and then obtain all the information for that point through a pop-up window. The MSI interactive web mapping tool can be found at this link:
https://arcgis.dnr.state.mn.us/portal/apps/webappviewer/index.html?id=560f4d3aaf2a41aa928a38237de291bc

Activity Milestones:

Description	Completion Date
Perform further information research to fill any missing gaps in data	2023-06-30
Organize data into one cohesive database	2023-06-30
Design, populate, and publish the online interactive map	2024-06-30

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Sheila Harmes	Whitewater Joint Powers Board	Help coordinate contacting landowners to conduct work in the Whitewater watershed.	Yes
Andrew Wickert	University of Minnesota	Co-investigator. Guide the stream flow monitoring and sediment analysis efforts. Use data from this project to develop sediment dynamics model for Whitewater River (NSF-funded). Advise University of Minnesota graduate student.	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 cross-sectional and grain-size data will be hosted in perpetuity at Winona State University. Data from the stream gauges will be returned via telemetry to the University of Minnesota, from which they will be made publicly available. Students from WSU will visit and service the stream gauges as part of their undergraduate research beyond the life of this project.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Water Quality Monitoring in Southeastern Minnesota Trout Streams	M.L. 2017, Chp. 96, Sec. 2, Subd. 04d	$500,000
Landslide Susceptibility, Mapping, and Management Tools	M.L. 2017, Chp. 96, Sec. 2, Subd. 03i	$500,000

Project Manager and Organization Qualifications

Project Manager Name: Dylan Blumentritt

Job Title: Assistant Professor

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

Dr. Dylan Blumentritt, a native to southeastern Minnesota, earned an MS ('06) and PhD ('13) in Earth Sciences from the University of Minnesota. He has 7 years of experience as an Assistant Professor, and has served as a faculty member at Winona State University since 2016.

His research interests fall within the broad scope of human-induced landscape changes, with a particular interest in water quality. His PhD work focused on developing geochemical techniques for determining suspended sediment sources in the Minnesota-Mississippi River system.

Most recently he has served as a co-PI on two LCCMR projects. (1) The Water Quality Monitoring in Southeastern Minnesota Trout Streams project involved helping to manage a $500,000 budget, his direct activities included setting up a water quality monitoring network, developing and executing sampling protocols, and coordination with water analysis labs at WSU and U of M. (2) The Landslide Susceptibility, Mapping, and Management Tools project where he managed a sub-award of $17,000 to map and inventory landslides throughout five counties in southeastern Minnesota. This project was a coordinated effort with multiple groups from across the state working in different regions.

Dr. Blumentritt has advised or co-advised three masters students at WSU and numerous undergraduate projects during his time as a university faculty member.

Organization: Minnesota State Colleges and Universities - Winona State University

Organization Description:
Winona State University (WSU) is a mid-size regional public comprehensive university. Founded in 1858 as the first teacher training institution west of the Mississippi River, WSU today offers high quality undergraduate and graduate programs in Winona, Rochester, and other locations in the State of Minnesota. WSU is categorized as a "Master's M3" institution (Carnegie) and is accredited by the Higher Learning Commission of the North Central Association. Winona State is a member of Minnesota State System of colleges and universities and has a significant impact on local, regional and state economies. A 2018 study revealed WSU generates $447.9 million in economic impact each year, accounting for operational and capital spending, student and visitor spending, supporting and sustaining jobs, community contributions, state and local revenue, and almost 2,000 graduates per year.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineli gible	% Bene fits	# FTE	Class ified Staff?	$ Amount
Personnel								
Faculty		Project manager, field work, data analysis, reporting			16.5%	0.6		$46,400
Graduate Student		GIS work, field data collection, equipment installation and maintanence, data analysis			50%	1		$70,000
Undergraduate Student		GIS work, field data collection, equipment installation and maintanence, data analysis			7.65%	0.36		$12,130
							Sub Total	**$128,530**
Contracts and Services								
University of Minnesota - Twin Cities	Sub award	Funding for one graduate student to support Activity 2: Stream Monitoring: Flow and Sediment.				0.5		$52,000
Whitewater Joint Powers Board	Sub award	Compile a list and help contact landowners where work will be conducted.				0.05		$4,000
							Sub Total	**$56,000**
Equipment, Tools, and Supplies								
	Equipment	Radar Velocity meters	Monitor stream flow at select locations in the watershed					$58,500
	Tools and Supplies	Miscellaneous tools and supplies	Miscellaneous tools and supplies to conduct field work for Activies 1 and 2. These would include things like hand tools, hardware, batteries, etc.					$4,000
							Sub Total	**$62,500**
Capital Expenditures								
							Sub Total	-

							Sub Total	
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel for field work for Activities 1 and 2.	Travel and per diem to conduct field work in the Whitewater River watershed. This includes local travel from WSU and regional travel from UMN.					$5,870
							Sub Total	$5,870
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Printing	Landowner mailings	Printing materials to be sent to landowners where work will be conducted.					$600
	Printing	Research poster printing	Poster printing for students to present work at local conferences					$400
							Sub Total	$1,000
Other Expenses								
		Web hosting	Web hosting services at UMN for retrieval and storage of digital data stream from monitoring stations.					$10,000
		Data hosting	Data storage of cross-section data to be published online with a interactive web mapper					$500
		Postage	Postage for landowner mailings					$600
							Sub Total	$11,100
							Grand Total	$265,000

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				
-			Non State Sub Total	-
-			Funds Total	-

Attachments

Required Attachments
Visual Component
File: 210fa7f6-d3c.pdf

Alternate Text for Visual Component
Visual component consists of three figures. Figure 1 is a watershed map of the three forks of the Whitewater River in southeastern Minnesota. The watershed consists of 206,000 acres, two state Parks (Whitewater and Carley) and has eight designated trout streams with over 100 stream miles. Figure 2 shows a close-up of the Elba, MN area showing detail of the Happ cross-sections near the confluence of the three forks of the Whitewater River. Figure 3 shows two cross-section plots from the years they were surveyed (1939, 1964, and 1994). Note the change in topography and channel location through time, important indicators of the amount and timing of sediment movement.

Optional Attachments
Support Letter or Other

Title	File
University of Minnesota Support Letter	000dd32a-666.docx

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?
> No

Does the organization have a fiscal agent for this project?
> No

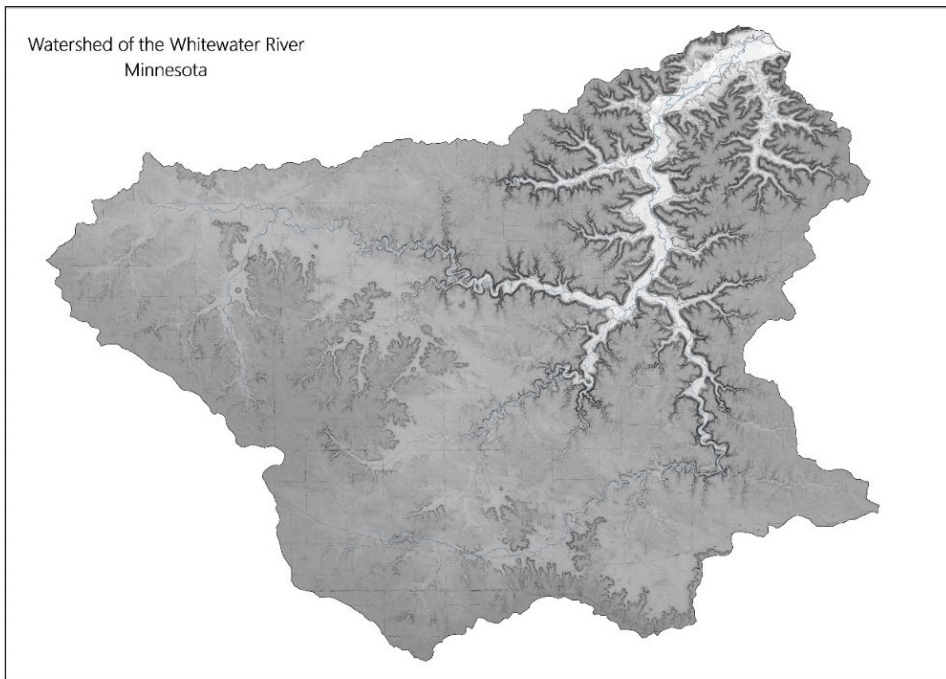Proposal Title: **Whitewater River Evolution: Sediment Dynamics and Cross-section Inventory**

Figure 1. Watershed map of the three forks of the Whitewater River in southeastern Minnesota. The watershed consists of 206,000 acres, two state Parks (Whitewater and Carley) and has eight designated trout streams with over 100 stream miles.

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Figure 2. Close-up of the Elba, MN area showing detail of the Happ cross-sections near the confluence of the three forks of the Whitewater River.
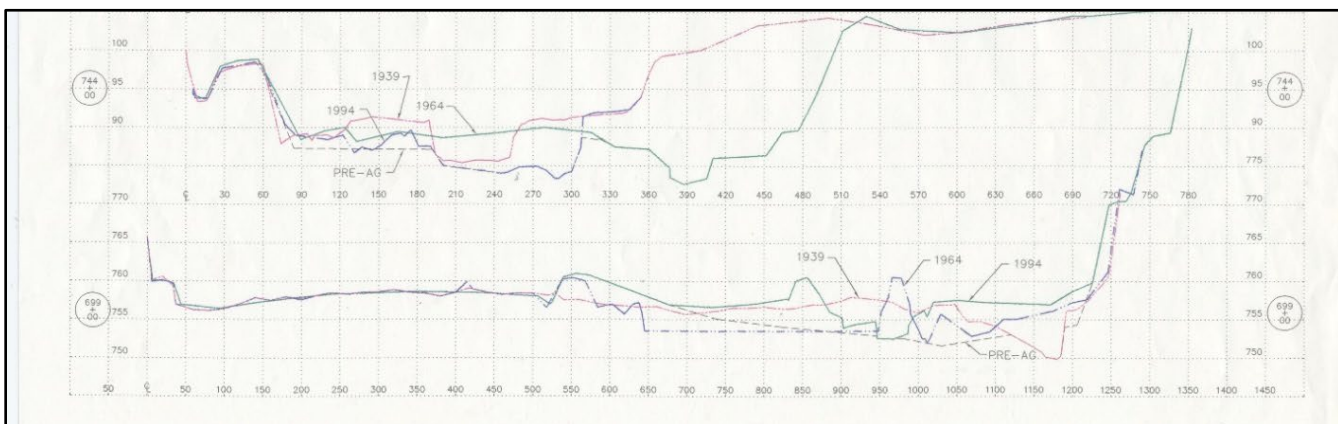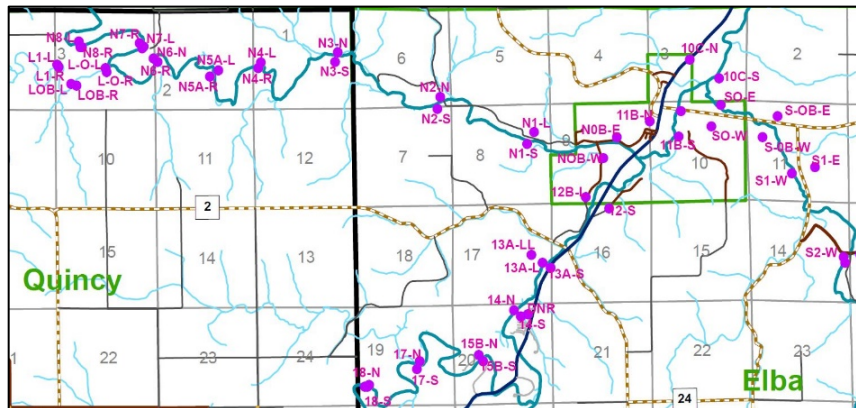

Figure 3. Scan of two cross-section plots from the years they were surveyed. Note the change in topography and channel location through time, important indicators of the amount and timing of sediment movement.