Environment and Natural Resources Trust Fund
2011-2012 Request for Proposals (RFP)

LCCMR ID: 040-B

Project Title: Nutrient Retention by Vegetation in Southeast Minnesota Streams

Category: B. Water Resources

Total Project Budget: $ $436,000

Proposed Project Time Period for the Funding Requested: 3.5 yrs, July 2011 - Dec 2014

Other Non-State Funds: $ 0

Summary:

Reduce nutrient and sediment contamination through the natural functions of stream aquatic vegetation by: assessing contaminant removal capacity, determining habitat requirements of aquatic vegetation, and identifying management and restoration strategies.

Name: Megan Kranz-McGuire

Sponsoring Organization: Whitewater Joint Powers Board

Address: 400 Wilson St, PO Box 39

Lewiston MN 55987

Telephone Number: 507-523-2171 x110

Email megankm@charterinternet.com

Web Address http://whitewaterwatershed.org/

Location

Region: SE

Ecological Section: Paleozoic Plateau (222L)

County Name: Dodge, Fillmore, Houston, Olmsted, Wabasha, Winona

City / Township:

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ Employment	_____ TOTAL _____%

2011-2012 MAIN PROPOSAL

PROJECT TITLE: NUTRIENT RETENTION BY VEGETATION IN SOUTHEAST MINNESOTA STREAMS

I. PROJECT STATEMENT Streams of SE Minnesota are renowned for their superb trout fishery, but many of these same streams are declining in quality. In karst geology, surface water and groundwater are intimately connected. Removing nitrates and other contaminants from Driftless Area streams protects both drinking water and aquatic communities. Stream restoration efforts that improve trout populations may also enhance the nutrient and sediment self-cleansing capacity of streams by promoting in-stream aquatic vegetation.

Rooted aquatic vegetation likely promotes natural self-cleansing of streams through:

- **Increasing microbial denitrification** (nitrate removal)
- **Trapping of transported sediment**
- **Reduction of phosphorus transported with suspended sediments.**

While these functions are well-documented for wetlands, little is known about the effect of vegetation in streams. Analysis of aquatic vegetation's role in retaining and removing contaminants in streams has never been conducted in the Upper Midwest. Completion of the following activities will promote better understanding of the self-cleansing capacity, restoration potential, and management opportunities of streams in SE Minnesota:

1. **Characterize features of stream vegetation beds that are critical for removal of nitrogen, phosphorus and sediments;**
2. **Assess removal rates of nitrogen, phosphorus, and suspended sediments by aquatic plant beds; identify causes of removal and factors promoting retention;**
3. **Create mapped inventories of stream vegetation; determine geologic settings promoting in-stream vegetation and best sites for restoration of stream vegetation;**
4. **Promote enhanced stream management activity through outreach targeted at land managers, stream restoration professionals, and landowners.**

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: <u>Identify habitat requirements of aquatic vegetation.</u> **Budget: $110,000.**

During the summer months of the 3-year study, we will intensively characterize 15 stream reaches (5 per year) to determine why aquatic vegetation beds are present in certain locations and not in others. In addition, the information will be critical for assessing nutrient/sediment removal capacity and stream restoration potential. Physical, chemical, and biological attributes of the vegetation beds and stream channel will be assessed to determine requirements for vegetation growth and features critical for contaminant retention.

Outcome	**Completion Date**
1. Characterization of aquatic vegetation beds in 15 stream reaches.	*August 2013*

Activity 2: <u>Assess nutrient and sediment retention by aquatic vegetation.</u> **Budget: $242,000**

We will perform a vegetation removal experiment on four stream reaches (two streams each summer in Years 2 and 3) to determine the effect of the vegetation on sediment and nutrient retention. Water sampling, stream hydrology, and solute transport modeling will allow us to generate nutrient and sediment budgets for each reach and quantify vegetation bed removal/retention of nutrients and sediments. These removal/retention metrics can then be extrapolated to other stream networks in the Driftless region of SE Minnesota (Activity 3).

Outcome	**Completion Date**
2. Determine in-stream vegetation effect on nutrients and sediment	*5/20/2014*

Activity 3: Map regional nutrient/sediment retention capacity and restoration sites. **Budget: $57,000.**
USGS GIS specialists will use existing LIDAR coverages and new aerial photography in 6 counties (Dodge, Fillmore, Houston, Olmstead, Wabasha, Winona) to determine total area of stream vegetation beds, local soil and geologic characteristics promoting vegetation growth, and potential sites for restoration to promote stream vegetation. We will combine mapped stream vegetation area with assessed nutrient and sediment removal capacity to estimate the sediment and nutrient removal capacity of in-stream vegetation in SE Minnesota.

Outcome	**Completion Date**
3. *Assessment of regional nutrient/sediment retention capacity by stream vegetation*	*9/15/2014*
4. *Map of regional stream vegetation and sites for stream restoration*	*9/15/2014*

Activity 4: Outreach to local land managers and landowners. **Budget: $27,000.**
Land managers, stream restoration professionals, and landowners can enhance stream capacity for nutrient and sediment retention by protecting and restoring in-stream vegetation. The project team will communicate the results of this project through: 1) a workshop on in-stream vegetation function and restoration, 2) a traveling poster, and 3) two brochures: one describing Best Management Practices to protect and enhance in-stream vegetation, and one on the ecology and natural history of in-stream vegetation.

Outcome	**Completion Date**
5. *Workshop on stream vegetation function and restoration*	*10/15/2014*
6. *Information products: brochures, poster, BMP guidance*	*10/15/2014*

III. PROJECT STRATEGY

A. Project Team/Partners

Megan Kranz-McGuire, Project Coordinator, Whitewater Watershed Joint Powers Board (WWJPB), will coordinate the project, serve as fiscal agent, and assist with outreach and field work. Eric Strauss, University of Wisconsin - La Crosse, will co-lead sampling design, sample and data analysis, student research and assistance, and report/manuscript production. William Richardson, US Geological Survey, La Crosse, Wisconsin, will co-lead sampling design, sample and data analysis, and report/manuscript production. Paul Wotzka, WWJPB Hydrologist, will coordinate monitoring, ground-truth GIS interpretations and collaborate with data analysis.

Job Additions: The project will: 1) Preserving .5 FTE at the WWJPP, 2) Employee a new graduate student (.25 FTE for two years) and 3) Employee four new undergraduate assistants (.25 FTE for two years.)

B. Timeline Requirements: 42 months due summer field work restrictions. Field surveys and experiments will be conducted each summer for three years (2012, 2013, 2014), and the resulting data will be analyzed in fall 2014. **Year 1** Initiate stream vegetation characterization; Conduct low-level aerial photography; Purchase Equipment. **Year 2** Conduct vegetation experiments; Continue stream vegetation characterization; Conduct GIS analyses and data modeling; **Year 3** Conduct additional vegetation experiments; Complete GIS analyses and modeling; Identify BMPs; Produce and distribute outreach materials. **Completion report:** December 2014

C. Long-Term Strategy and Future Funding Needs

Future efforts for stream restoration, water quality protection, and watershed planning will be able to utilize the results of this project to enhance in-stream nutrient and sediment retention. With collaboration between disciplines, stream habitat restoration projects can be managed for water quality benefits. BMPs for managing vegetation in agricultural ditches for nutrient and sediment removal could provide additional water quality protection. Funding for stream restoration to enhance aquatic vegetation could be linked to trout habitat projects, streambank stabilization projects, and water quality cost share programs.

2011-2012 Detailed Project Budget

Nutrient Retention by Vegetation in Southeast Minnesota Streams

Whitewater Joint Powers Board

IV. TOTAL TRUST FUND REQUEST BUDGET 3.5 years

BUDGET ITEM	AMOUNT
Personnel:	
Megan Kranz-McGuire, Project Manager: coordination, fiscal agent, contract management, field work, outreach; 25% FTE; 87% Salary, 13% Benefits	$ 40,000
Paul Wotzka, Hydrologist: Field work, data analysis, outreach; 22% FTE; 87% Salary; 13% Benefits	$ 32,000
Contracts:	
University of Wisconsin-LaCrosse: Lead stream surveys, vegetation experiments, student assistants, data analysis, report production, and identification of BMPs.	$ 150,000
*US Geological Survey's Upper Midwest Environmental Sciences Center: Co-lead ex*periment design, laboratory water sample processing, data analysis, report production, GIS and aerial photo analysis.	$ 150,000
Outreach Contract: outreach material (brochures, posters, workshop materials, etc.) development and design, printing, and distribution.	$ 13,000
Equipment/Tools/Supplies:	
Flowtracker--Measures stream discharge. Necessary to measure flow in and through stream reaches to characterize stream reaches and measure effect of aquatic vegetation.	$ 9,000
Pressure Transducers: Measures stream stage (depth). Necessary for measuring flow during aquatic vegetation experiments.	$ 4,000
YSI Multiparameter Probes: Instrument for multiple water quality measurements, including temperature, pH, conductivity, and dissolved oxygen. Necessary for stream reach characterization, identifying habitat requirements of aquatic plants, and effects on water quality.	$ 29,000
FMI Pump: Specialized pump required for precise hydrology and nutrient retention measurement. Necessary for determining effect of aquatic plants on hydrology and nutrient/sediment retention.	$ 4,000
Acquisition (Fee Title or Permanent Easements):	NA
Travel: Mileage reimbursement for travel to stream reaches throughout SE MN for stream reach characterization, aquatic plant experiments, GIS field truthing, and outreach.	$ 5,000
Additional Budget Items:	NA
TOTAL ENVIRONMENT & NATURAL RESOURCES TRUST FUND $ REQUEST	**$ 436,000**

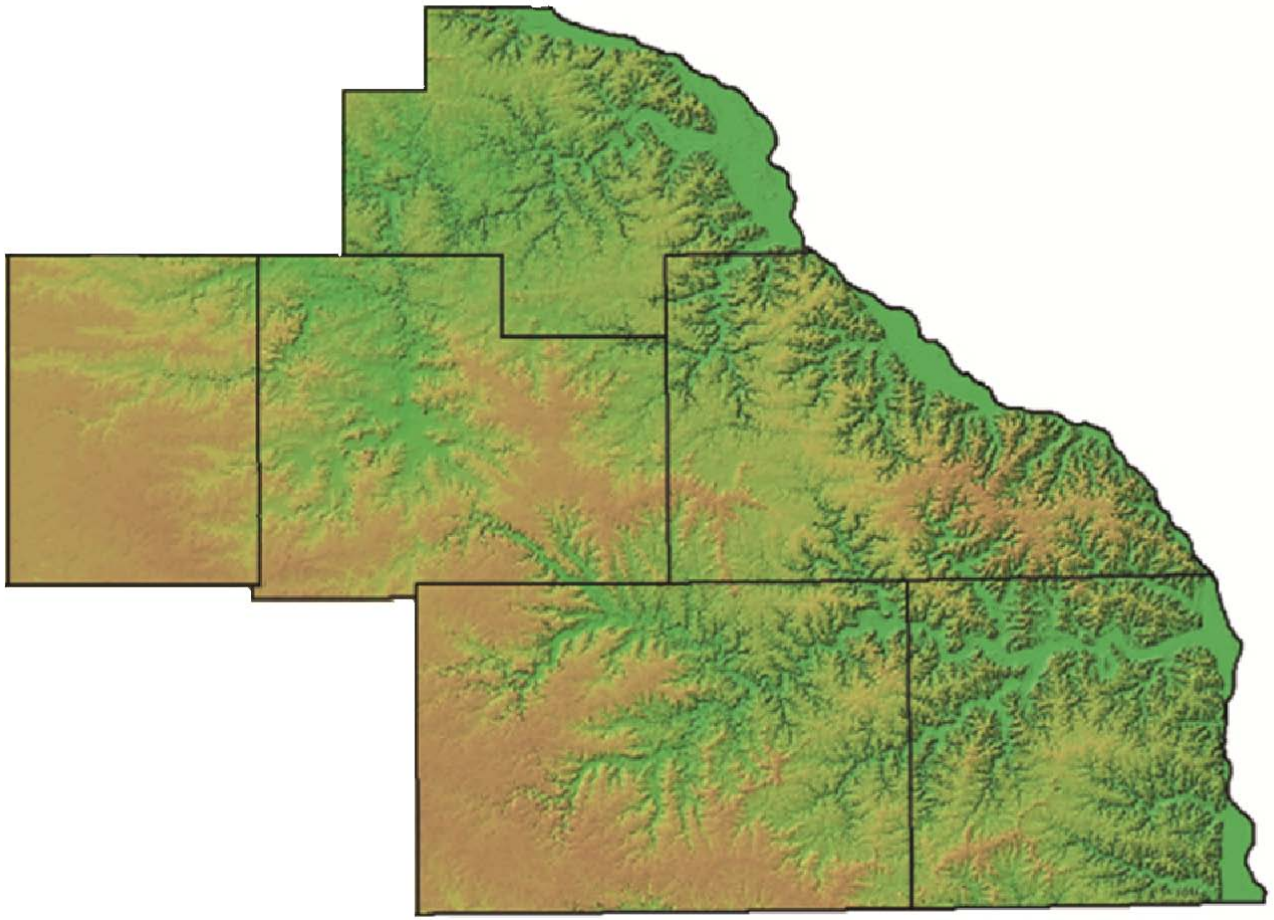
V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ Being Applied to Project During Project Period:	$ -	*Indicate: Secured or*
Other State $ Being Applied to Project During Project Period:	$ -	*Indicate: Secured or Pending*
In-kind Services During Project Period:		
Minnesota DNR, Division of Fisheries: Use of ISCO Samplers (4) for water sample collection during aquatic vegetation experiments.	$ 16,000	
USGS MESC: staff salary (William Richardson $15,000), overhead costs ($33,500)	$ 48,500	
University of Wisconsin--LaCrosse: Overhead Costs	$ 30,000	
Remaining $ from Current ENRTF Appropriation (if applicable):	$ -	
Funding History:	$ -	

PROJECT TITLE: NUTRIENT RETENTION BY VEGETATION IN SOUTHEAST MINNESOTA STREAMS

Southeast Minnesota Counties with High Potential for Aquatic Vegetation Nutrient and Sediment Removal:

Dodge, Fillmore, Houston, Olmsted, Wabasha, Winona Counties



NUTRIENT RETENTION BY VEGETATION IN SOUTHEAST MINNESOTA STREAMS

Experience and Qualifications

The Whitewater River Watershed Project is governed by a six-member **Whitewater Joint Powers Board** whose mission is to improve water quality, reduce sedimentation and flooding, and improve habitat in the watershed. The board consists of one County Commissioner and one Soil and Water Conservation District Supervisor from each of the three counties in the watershed. The organization has completed numerous projects since its formation in 1989. The Project is currently executing a 2008 LCCMR grant to 1) inventory riparian land use and 2) survey riparian landowners to enhance riparian buffers implementation in the ten-county region of Southeast Minnesota. The Watershed Project frequently partners with private landowners; local, state and federal agencies; academic institutions; and non-profits to enhance soil and water conservation in the region. Current projects include an Agricultural Watershed Restoration Project in Logan Creek (funded through BWSR), collaboration with the MPCA on the Whitewater Watershed Turbidity TMDL, and a Civic Engagement Project.

Project Team:

Dr. Eric A. Strauss is an assistant professor in the Department of Biology at the University of Wisconsin - La Crosse (UW-L). In this position, he leads an undergraduate and graduate research program examining nutrient cycling and other ecosystem processes in stream and river systems. He also teaches several courses in the fields of limnology, water quality, ecology, and general biology. Prior to UW-L, he spent two years as an assistant professor at Fort Hays State University and several years as a biologist with the U.S. Geological Survey at the Upper Midwest Environmental Sciences Center in La Crosse, WI. With the U.S. Geological Survey, he collaborated with other scientists to determine spatial and temporal patterns of nitrogen cycling in the Upper Mississippi River and to estimate the effects of these processes on nitrate and total nitrogen load and export in the Mississippi River. His education includes a B.S. in Fisheries Biology and a M.S. in Biology (Dr. Walter Dodds, advisor) from Kansas State University. He also holds a Ph.D. in Biology (Dr. Gary Lamberti, advisor) from the University of Notre Dame where he studied the interactive effects of chemical/physical/biological factors on nitrogen cycling in stream ecosystems.

Dr. William Richardson is a research aquatic ecologist with the US Geological Survey's Upper Midwest Environmental Sciences Center in La Crosse, Wisconsin; working there since 1991. For the last ten years Richardson has focused his research on understanding the temporal and spatial variability of nitrogen cycling and food web interactions in the Upper Mississippi River and regional streams. Most recently he has worked to determine the linkage of nutrients to patterns of riverine productivity—focusing on lipids as biomarkers of organism health and food source. He received his Ph.D. in 1989 from the University of Oklahoma and completed Post-doctoral research at the Savannah River Ecology Lab, determining the effects of fish predation on invertebrate secondary production.

Megan Kranz-McGuire coordinates the Whitewater Watershed Projects' programs, grants, finances, board activities, and other administrative tasks. She received her Bachelor of Science degree in Natural Resources and Sustainable Development with a minor in Forest Resources from the University of Minnesota. She has worked for the National Park Service, the Minnesota Department of Natural Resources, and the Forest Ecology Laboratory at the University of Minnesota. During her tenure with the Whitewater Watershed, she has administered and fulfilled grant requirements, coordinated meetings, supervised contracts with consulting firms, coordinated the citizen monitoring effort, and conducted education and outreach activities.