

Environment and Natural Resources Trust Fund 2009 Phase 2 Request for Proposals (RFP)

LCCMR ID: 036-B1

Project Title: Real-time Water-quality Monitoring in the Minnesota River Basin

Total Project Budget: \$ \$300,000

Proposed Project Time Period for the Funding Requested: July 2009-December 2011

Other Non-State Funds: \$ \$200,000.00

Priority: B1. Reduce Soil Erosion

First Name: Eric

Last Name: Mohring

Sponsoring Organization: Board of Water and Soil Resources (BWSR)

Address: 520 Lafayette Rd N

St. Paul MN 55155

Telephone Number: 651-297-7360

Email: eric.mohring@state.mn.us

Fax:

Web Address:

Region:

Central

County Name:

Chippewa, Kandiyohi, Nicollet,
Renville, Sibley

City / Township:

Summary: This study will provide real-time, continuous estimates of sediment and nutrients in the Minnesota River basin. Data will be disseminated so changes in water-quality are immediately available.

Main Proposal: 1008-2-010-proposal-2009_main_proposal_vgc_draft2.doc

Project Budget: 1008-2-010-budget-Copy of RFP_2009_Project Budget_vgc.xls

Qualifications: 1008-2-010-qualifications-EM & VC Project Manager Qualifications.doc

Map: 1008-2-010-maps-Vickis_basemapN.pdf

Letter of Resolution:

MAIN PROPOSAL

PROJECT TITLE: Real-time Water-quality Monitoring in the Minnesota River Basin

I. PROJECT STATEMENT

Significant portions of the Minnesota River basin are impaired by excessive concentrations of nutrients and sediment, which contribute to the sediment loading of Lake Pepin. This study proposes to provide real-time, continuous estimates of sediment and nutrient loads and yields at sites in the Minnesota River basin. As part of an on-going effort, the Minnesota Board of Water and Soil Resources (BWSR) and the U.S. Geological Survey (USGS) have been collecting data in the Chetomba Creek, Beaver Creek, and Rush River basins. The results of that study, funded in part by the Minnesota Environment and Natural Resources Trust Fund, have shown that basins with higher land retirement (CRP, CREP, RIM) percentages in the riparian zone have lower nutrient and sediment concentrations. The existing data set will be used as a calibration data set to generate real-time water-quality models of sediment and nutrients. As part of the TMDL program in Minnesota, real-time water quality models can be used to determine the optimal timing of sample collection and to monitor non-point sources of pollution in the Minnesota River basin. Developing an innovative system for continuously monitoring nutrients and sediment in real-time has numerous advantages over traditional water-quality studies relying on sampling alone. Continuous data is immediately disseminated so that daily, seasonal, and event-driven fluctuations are not missed. This system would make it possible to immediately recognize changes in water-quality conditions, eliminating the waiting time inherent for laboratory results and to provide continuous concentrations and loads. Anglers, boaters, and swimmers also can use the real-time information to decide whether they want to pursue these activities.

II. DESCRIPTION OF PROJECT RESULTS

Result 1: Develop statistical models for nutrients and sediment Budget: \$ 80,000

Regression equations will be developed relating the existing continuous data to the sampled data. Using this method, it is possible to estimate chemicals of concern, such as nitrogen, phosphorus, and sediment, in real time and make the estimates available on the USGS website. Estimates of concentration also will be used to estimate loads and yields from the watershed under various seasonal, temporal, and flow conditions.

Deliverable

- 1. Calculate nutrient and sediment loads**
- 2. Real-time water-quality report**

Completion Date

December 30, 2009
June 30, 2011

Result 2: Maintain a continuous, real-time water-quality network Budget: \$ 150,000

Real-time water-quality information for the proposed monitoring system includes hourly measurements of streamflow, specific conductance, pH, water temperature, dissolved oxygen, and turbidity. Because sensor technology currently is not available to directly measure chemicals of interest in a stream, statistical models (developed for Result 1, above) will be used to link constituents in laboratory-analyzed samples with the in-stream continuous sensor measurements. As the hourly sensor measurements are transmitted from the gaging stations to the USGS computers in Mounds View, MN models can be applied and the computed estimates displayed to the web page. The uncertainty of the estimates also can be documented so decisions made on the basis of the estimates can be put in proper management perspective. The infrastructure for the monitoring currently exists at Chetomba Creek, West Fork Beaver Creek, and South Branch Rush River. Monitor maintenance and periodic sediment and nutrient sample collection will continue.

Deliverable

- 1. Post real-time monitor data on the web**
- 2. Post continuous nutrient and sediment data on the web**

Completion Date

September 30, 2009
June 30, 2010

Result 3: Characterize source of sediment through hysteresis**Budget: \$ 70,000**

Some research has shown that a major source of turbidity or sediment in the Minnesota River basin is from stream-bank or near-channel erosion. However, the State Strategic Plan points to the increasing land in annual row crops that lack early season ground cover and decreases the protection from soil erosion and nutrient loss. With this proposed continuous real-time water-quality system, the data will already exist to characterize sediment source (for example field and stream-bank) through evaluating the hysteresis of the continuous data. Hysteresis can be defined as the lag between a change in streamflow and the resulting change in suspended sediment or turbidity. Erosion of sediment stored in stream banks result in high turbidity concentrations during the beginning of a rainfall/runoff event. The continuous data can be evaluated in a number of ways, for example, when the range of suspended sediment concentrations or turbidity is plotted against streamflow, the slope of the lines are assumed to be indicative of the sediment availability. Steep slopes may indicate a large volume of sediment available for transport; low slopes may indicate limited sediment available for transport. An analysis of the turbidity/streamflow hysteresis will be made to characterize the sediment sources during storm events at the existing real-time water-quality sites in the Minnesota River Basin.

Deliverable**Completion Date****1. Sediment source characterization report****December 30, 2011****III. PROJECT STRATEGY AND TIMELINE****A. Project Partners**

BWSR will provide project oversight and some in-kind analysis. USGS will provide data collection, statistical analysis, and report writing. University of Minnesota or Vermillion Community College students will be hired to help with field work. The USGS will continue to work with the Watershed Projects (Hawk Creek Watershed Project) and Soil Conservation Districts with data sharing and planning. The USGS also will provide matching funds of **\$ 200,000**.

B. Project Impact

This study will provide a framework for estimating concentrations of important water-quality constituents, with statistically defined uncertainty, as they are occurring in the river. These benefits are shared between water-management officials, WWTP managers, boaters, anglers, and swimmers. Improved methods for communicating the uncertainty and probability of concentrations exceeding water-quality standards are in progress. Population served is the Minnesota River basin. With the installation of continuous monitors at other sites, real-time estimates could be developed using the network of more than 100 streamflow gages in Minnesota to provide real-time continuous information on the water quality of streams that can be used to improve the treatment of drinking water and to monitor the environment. Future estimates could be developed for a variety of constituents including bacteria and atrazine.

C. Time

Data collection will begin July 1, 2009; USGS Matching funds will be used prior to this date in order to collect spring runoff data in 2009. Data collection and analysis will continue through September 2010. A report on the real-time water-quality network will be provided to the LCCMR by June 30, 2010, with publication by December 2010. A draft report on sediment source will be provided to the LCCMR by July 2011, with publication by December 2011.

D. Long-Term Strategy

This project builds on an existing data collection effort of the BWSR, USGS, and the Watershed Projects in the Minnesota River basin. Previous data was collected with funding from the Minnesota Environment and Natural Resources Trust Fund (ML 2005, First Special Session, [Chap.1], Art. 2, Sec.[10], Subd. 7(c). and ML 2007, [Chap. HF 293], Sec.[2], Subd. 5(c).). The basins are located in areas with varying degrees of land retirement and the data will continue to be used to show the effects of CRP and other retired lands on water quality. The methods developed during this study will establish the basis for future real-time water-quality work and for disseminating immediate water-quality information throughout Minnesota.

Project Budget

IV. TOTAL PROJECT REQUEST BUDGET

<u>BUDGET ITEM</u>	<u>AMOUNT</u>	<u>% FTE</u>
Personnel: hydrologist 50%FTE over 3 years	\$ 150,000	50%
Personnel: hydrologic technician 50% FTE over 2.5 years	\$ 75,000	50%
Personnel: students 25%FTE over 2.5 years	\$ 10,000	25%
Contracts:		
USGS streamgaging	\$ 35,000	
Equipment/Tools: Water-quality monitor rental and supplies	\$ 10,000	
Acquisition (Including Easements): N/A	\$ -	
Restoration: N/A	\$ -	
Other: Travel for maintenance of monitors and transfer of samples	\$ 8,000	
Laboratory analysis	\$ 12,000	
TOTAL PROJECT BUDGET REQUEST TO LCCMR	\$ 300,000	

V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
Remaining \$ From Previous Trust Fund Appropriation (if applicable): ML 2007, [Chap. HF 293], Sec.[2], Subd. 5(c).	\$ 71,112	<i>scheduled to be spent prior to June 30, 2009</i>
Other Non-State \$ Being Leveraged During Project Period: USGS Matching Funds	\$ 200,000	<i>Pending</i>
Other State \$ Being Spent During Project Period: N/A		<i>N/A</i>
In-kind Services During Project Period: Project oversight provided by BWSR, project presentations, field trips.	\$ 50,000	
Past Spending:	\$ 420,000	

Project Manager Qualifications and Organization Description

Eric Mohring, Hydrologist, Minnesota Board of Water and Soil Resources

Education: BS, geology, Princeton University
MS, hydrogeology, University of Minnesota

Experience:

Eric Mohring has 21 years experience with state government including the Minnesota Board of Water and Soil Resources (BWSR) and the Department of Natural Resources (DNR). Duties have included: assisting local governments with hydrology and water management, data base management, conducting hydrology training, evaluating pollution reduction benefits, administering a well sealing cost-share grant program, hydrogeologic investigations and regional studies, technical assistance to state agencies, local units of government, and the public. He has 2 years experience in private consulting.

Responsibilities for the Land Retirement Project include project over-sight, technical assistance, and report review.

Other: Licensed Professional Geologist in Minnesota

Organization Description:

The Minnesota Board of Water and Soil Resources (BWSR) is a state government agency.

Victoria Christensen, Hydrologist, United States Geological Survey

Education: BA, management, Hamline University
BS, geology, University of Kansas
MS, water resources, University of Kansas

Experience:

Victoria Christensen is currently a project chief for the U.S. Geological Survey, Minnesota Water Science Center. She has 16 years of work experience in the fields of ground water and water quality. Her experience includes managing several research projects in the area of real-time water-quality monitoring of agricultural basins. She has served as project chief on studies of nutrient and pesticide occurrence and distribution, statistical modeling, and ammonia assimilative capacity. Her research history includes studies of water quality, sediment quality and ground-water recharge.

Responsibilities for the Land Retirement project include sampling design, supervision of field activities, data review and compilation, and report preparation.

Organization Description:

The United States Geological Survey is a federal government agency in the Department of Interior.

