

**Environment and Natural Resources Trust Fund
2015 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 048-B

Achieving Minnesotas Groundwater Sustainability Through Irrigation Efficiencies

Category: B. Water Resources

Total Project Budget: \$ 431,100

Proposed Project Time Period for the Funding Requested: 4 years, July 2015 - June 2019

Summary:

This project restores a trout stream and provides the tools and a system to restore and protect existing and emerging environmental issues related to groundwater use statewide.

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Sponsoring Organization: Benton Soil and Water Conservation District

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Location

Region: Central

County Name: Benton, Morrison

City / Township:

Alternate Text for Visual:

Activities shown on the left, which include improving irrigation system efficiencies, improving soil health and implementing a decision support system, will result in the outcomes listed on the right. Outcomes include the restoration of a trout stream, increased groundwater, improved water quality, improved profitability and the transfer of software and procedures for addressing similar concerns statewide. The high density of irrigation wells is shown in the center map. Each dot represents an irrigation well.

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



PROJECT TITLE: Achieving Minnesota’s Groundwater Sustainability Through Irrigation Efficiencies

I. PROJECT STATEMENT

Several areas in Minnesota exist where groundwater use exceeds sustainable levels. The goal of this project is to provide the tools and expertise needed to overcome sustainability issues throughout many parts of Minnesota. The outcome of the project will be a voluntary producer led system of managing limited groundwater resources for Little Rock Creek that will be transferable to other parts of Minnesota.

Why Little Rock Creek? Little Rock Creek is a trout stream in central Minnesota impaired for cold-water fisheries, low dissolved oxygen, and nitrates. Computer modeled response to groundwater use changes make it an ideal system to integrate water users voluntary BMPs with sustainable use. Irrigation is especially important because the soils are sandy and have little natural water holding capacity. Similar to other areas of the state, groundwater demand for crop irrigation has increased dramatically, with irrigated acreage more than doubling since the drought years of the late 1980s. **This project aims to reduce groundwater use to sustainable levels and restore trout to Little Rock Creek.** Additionally, the project will demonstrate that this can be accomplished while obtaining multiple benefits for producers, such as increased yield and reduced fertilizer and irrigation input costs, using proven conservation practices. The outcomes of this project, including the software can be applied in other areas of the Minnesota.

This project’s outcomes will be achieved through implementing three initiatives simultaneously:

- 1) *Restoring trout by increasing dissolved oxygen above 7 ppm and maintaining critical stream flow* using a decision support system that integrates creek flow, soil moisture balance, and forecasting and provides real-time condition appropriate irrigation methods to producers.
- 2) *Increasing irrigation efficiency*, including use of irrigation scheduling has been shown to decrease water use by 30% while improving yields 5% and decreasing energy use up to 35%. To increase adoption of scheduling, an on-line scheduling assistant will be developed and utilized by irrigators.
- 3) *Improving soil health*, such as increasing soil organic matter, on sandy soils. Reduced till methods when combined with cover crop practices can reduce irrigation needs by as much as 5” of water due to better infiltration, increased water holding capacity, and reduced evapotranspiration.

Finally this project will demonstrate that the existing regulation employed by the DNR through the permitting system, when properly self-administered by the irrigators and supplemented with conservation measures, is sufficient to avoid additional regulation that further restricts irrigation on farmland while ensuring sustainability.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: *Increased adoption of irrigation and soil conservation practices to reduce water use, restore flow, and increase dissolved oxygen to 7ppm.* **Budget: \$68,883**

Conservation technicians will target producers with the greatest pumping capacity and potential to impact surface water flows. Soil health practices will be integrated into production systems using the NRCS soil health checklist. Irrigation applications will be optimized through irrigation system calibration and irrigation scheduling. An online irrigation scheduling assistant, customized to each individual producer, will be developed.

Outcome	Completion Date
1. Producers prioritized, technical team consulted, targeting strategy implemented	Annual
2. 5,000 acres of irrigation management and soil health practices installed	Fall 2018

Activity 2: *Conservation Irrigation Decision Support System (CIDSS)* **Budget: \$147,560**

A decision support system will be developed that provides daily information on condition appropriate conservation irrigation methods. Recommended methods will be delivered via web or other appropriate



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2015 Main Proposal

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technology. Local producers will develop the decision point criteria for implementing the specific conservation measures that optimize crop production and stream health at various flow levels. Simple indicators of irrigation categories, such as a stoplight approach (green = standard rate; yellow = conservation rates; red = deficit irrigation rates) will be developed to inform producers on the appropriate irrigation methods to be implemented.

Outcome	Completion Date
<i>1. Producer group established and initial decision point criteria developed</i>	<i>Winter 2016</i>
<i>2. Conservation Irrigation Decision Support System program developed, beta tested, and implemented with training and full launch</i>	<i>Spring 2016</i>
<i>3. Annual stakeholder program review, updates of decision point criteria, outreach</i>	<i>Annual, winter</i>

Activity 3: Evaluation of effectiveness and progress towards project goals **Budget: \$111,069**

Data will be collected throughout the growing season during years 2 and 3 to evaluate the effectiveness of activities toward program goals. Creek water quantity and quality monitoring will evaluate the impact of conservation systems, crop yield data will evaluate production improvements, and soil testing will evaluate soil conditions. Reports on program effectiveness will be developed and communicated to various audiences.

Outcome	Completion Date
<i>1. Data collection and analysis on creek water quality, crop yield, and soil testing</i>	<i>Spring-Fall, 2 yrs.</i>
<i>2. Annual reporting on program effectiveness, working with the technical team to adapt program implementation strategies based on effectiveness results</i>	<i>Annually</i>

Activity 4: Outreach, promotion, and sharing results throughout the state **Budget: \$103,588**

Project partners will demonstrate the benefits of conservation practices to producers through multiple channels including irrigators and crop growers associations, farm visits, field days, websites, and traditional mailings. Project results will be shared statewide at conferences, and through project reports, websites, and other channels as appropriate. Conservation Irrigation Decision Support System made available statewide.

Outcome	Completion Date
<i>1. Outreach team established; SWCD staff and project partners (listed in A. below) develop and update materials regularly with new information and messages.</i>	<i>On-going</i>
<i>2. Up to 4 field days, event, conferences/year for target audience and stakeholders</i>	<i>Summer 2018</i>
<i>3. Demonstration of technology and program results, both annually and upon completion</i>	<i>On-going</i>

III. PROJECT STRATEGY

A. Project Team/Partners

Benton SWCD will receive ENRTF dollars.

In kind partners participating on the planning team, providing technical support, promoting conservation programs and outreach include Morrison County SWCD (Helen McLennan), DNR (Dan Lais), MPCA (Maggie Leach), BWSR (Jason Weinerman), NRCS (Mike Walczynski), Central MN Irrigators Association (Alan Peterson).

B. Project Impact and Long-Term Strategy

The Conservation Irrigation Decision Support System and scheduling software will be provided to others at no cost. Any on-going implementation costs associated with the support system will need to be paid for by the user.

C. Timeline Requirements

The first full growing season (2016) will focus on implementing conservation practices and launching the irrigation decision support system. These activities and data collection will continue through summer of 2017 and 2018. In order to report on two full seasons of data it is essential that this project conclude December 2018.

2015 Detailed Project Budget

Project Title: Achieving Minnesota's Groundwater Sustainability Through Irrigation Efficiencies

IV. TOTAL ENRTF REQUEST BUDGET 4.0 years

BUDGET ITEM	AMOUNT
Benton SWCD Personnel:	
Manager; 0.4 FTE; 77% salary, 23% benefits; July 2015 -December 2018	\$ 34,760
Technician; 1.4 FTE; 77% salary, 23% benefits; July 2015 -December 2018	\$ 89,820
Administrative Assistant; 0.05 FTE; 77% salary, 23% benefits; July 2015 -December 2018	\$ 2,280
All positions are partially covered by soft funding.	\$ -
Contracts:	
Development of Conservation Irrigation Decision Support System, integrated with stream flow and water quality monitoring, data analysis, and report writing (Engineering Firm; To Be Determined through RFP process). Involves setting up the stream monitoring stations, developing the software that integrates the modules, developing the website and applications, as well as maintenance and updates over the life of the grant.	\$ 205,510
Outreach, technology transfer. Involves developing audience appropriate materials for multiple technologies for increasing producer involvement. (Consultant; To Be Determined through RFP process)	\$ 51,480
Equipment/Tools/Supplies:	
Two sets of stream discharge and temperature monitoring equipment (\$11,444); rain gauges for farm operations (20 gauges at \$300/gauge); soil moisture sensors and data loggers for farm operations (20 sets at \$357/set); equipment maintenance and repair (\$3,000); cell data plan (up to \$75/month). Equipment will be used by Benton SWCD for other fields after the grant expires.	\$ 26,967
Lab testing: water quality testing (\$2,064/yr for 2 years); soil quality testing	\$ 6,128
Materials for outreach and education (workshops, meeting space), field days (field supplies)	\$ 4,000
Travel (vehicle mileage): Biweekly visits to monitoring sites for 6 months/yr for 3 yrs; farm operation visits for irrigation scheduling, uniformity checks, and soil health practices; field visits for outreach and technology transfer	\$ 10,155
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 431,100

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ Being Applied to Project During Project Period: USDA program funds, \$75K; It is expected that this project will leverage additional USDA NRCS funds through the EQIP and CSP programs.	\$ 75,000	Pending (USDA programs)
Other State \$ Being Applied to Project During Project Period: Benton SWCD Clean Water Legacy Funds, passed through BWSR \$25K (Secured). The project team will seek opportunities to leverage and enhance this project's effectiveness throughout the life of the LCCMR grant.	\$ 25,000	Secured
In-kind Services During Project Period: Several agencies, organizations and individuals will provide support for this project by participating in the Conservation Irrigation Decision Support System planning team, technical expertise throughout the project, promotion of the program and activities and several education and outreach activities. NRCS Staff Time, \$44K; DNR Staff Time, \$14K; MPCA Staff Time, \$14K; BWSR Staff Time, \$14K. Landowners estimated in-kind practice contribution, \$20K; in-kind volunteer stakeholder involvement, \$6K; in-kind volunteer time for data collection, \$9K; Benton SWCD in-kind, \$2K	\$ 123,000	Pending
Funding History: BWSR Clean Water Fund Irrigation Grant, \$84,211; BWSR Clean Water Fund Accelerated Implementation Grant, \$55,410;	\$ 139,621	Secured

INITIATIVES

1 IMPROVE IRRIGATION EFFICIENCIES



- CUSTOM FIELD IRRIGATION SCHEDULING VIA WEB
- CALIBRATING IRRIGATION EQUIPMENT
- OUTREACH ON IRRIGATION BMPs

2 IMPROVE SOIL HEALTH



- COVER CROPS, REDUCED TILL PRACTICES
- INCREASE SOIL ORGANIC MATTER
- IMPROVE SOIL WATER HOLDING CAPACITY
- REDUCE RUNOFF AND IRRIGATION DEMANDS

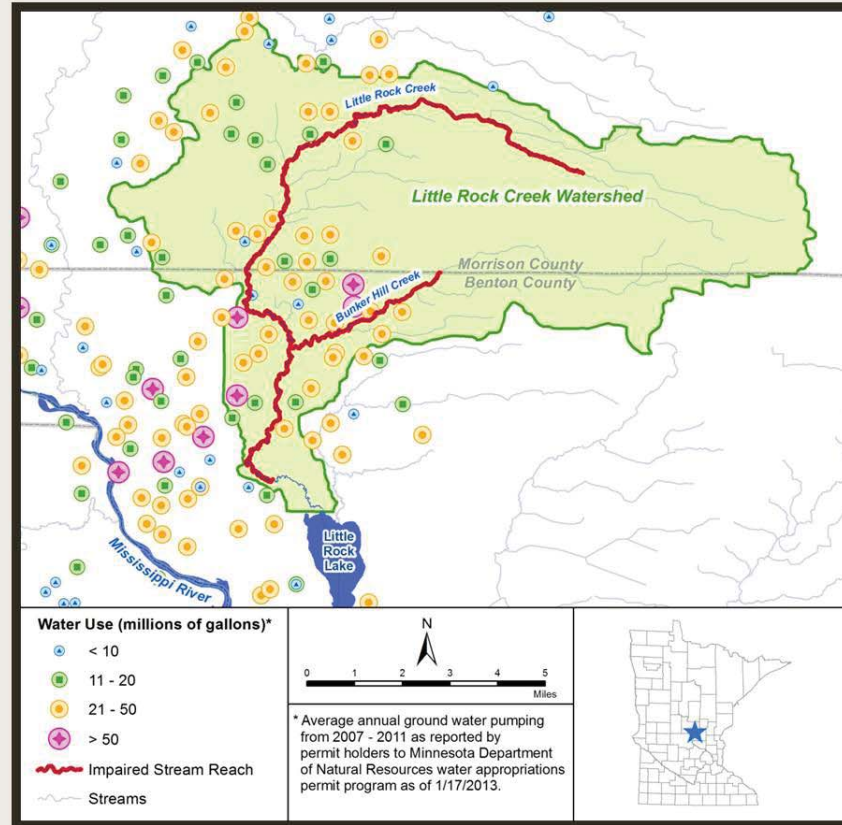
3 IMPLEMENT DECISION SUPPORT SYSTEM



- INTEGRATED FLOW, SOIL MOISTURE, FORECASTING
- REAL-TIME CONDITION APPROPRIATE IRRIGATION METHODS
- METHODS DETERMINED BY PRODUCERS

ACHIEVING MINNESOTA'S GROUNDWATER SUSTAINABILITY THROUGH IRRIGATION EFFICIENCIES

THROUGH VOLUNTARY ADOPTION OF IRRIGATION
AND SOIL CONSERVATION PRACTICES



OUTCOMES

INCREASED GROUNDWATER

- REDUCED IRRIGATION DEMANDS
- PRODUCER-DRIVEN VOLUNTARY PROGRAM

IMPROVED TROUT STREAM CONDITIONS

- REDUCED GROUNDWATER INTERFERENCE
- INCREASED STREAM FLOW
- DECREASED STREAM TEMPERATURE

IMPROVED WATER QUALITY

- LESS IRRIGATION REDUCES RUNOFF
- IMPROVED SOIL HEALTH REDUCES NUTRIENT APPLICATION AND SOIL EROSION

IMPROVED PRODUCER PROFITABILITY

- LESS IRRIGATION REDUCES ENERGY COSTS
- IMPROVED SOILS REDUCE NUTRIENT APPLICATION
- INCREASED YIELDS FROM IMPROVED SOIL HEALTH



The Benton SWCD is a local unit of government that manages and directs natural resource management programs at the local level. We work in both urban and rural settings, with landowners and with other units of government, to carry out a program for the conservation, use, and development of soil, water, and related resources. Benton SWCD is political subdivisions of the State, authorized under Minnesota Statutes Chapter 103C. Our five supervisors serve four year staggered terms, elected during the general election in November. It is the mission of the Benton SWCD to protect and enhance Benton County's soil, water, and other natural resources; to nurture a conservation ethic by educating county residents on conservation and environmental issues.

The project manager will be Gerry Maciej. He holds an Associate in Applied Sciences degree in Natural Resources Technology from Brainerd Community College, Brainerd MN and Bachelor of Science degree in Watershed Management from the University of Wisconsin, Stevens Point, WI.

Gerry has been employed with Benton SWCD since 1996 and has held the positions of District Technician and Water Plan Technician. He has been the District Manager since 2006.

Gerry's responsibilities include the financial management of the SWCD, with an annual budget of approximately \$500,000. The SWCD has received several grants related to the adoption of related best management practices and he has been assigned the duties of principle project manager for all of them. One example is the 2011 BWSR Clean Water Legacy grant titled "Little Rock Impaired Waters Kickoff". This grant included a new watershed wide irrigation water management program. A second "Little Rock Creek Irrigation Management Continuation" will be administered starting in 2014.

Gerry served as the Benton SWCD manager for both the Little Rock Lake TMDL and Little Rock Creek TMDL. The studies included management of multiple contracts with the MPCA and sub-contracts with consultants William Walker, Wisconsin Department of Natural Resources, U.S. Army Engineer Research and Development Center, Natural Resources Research Institute, Minnesota Valley Testing Laboratories and Barr Engineering.