

**Environment and Natural Resources Trust Fund
2010 Request for Proposals (RFP)**

LCCMR ID: 041-A3

Project Title:

When Nitrogen BMPs Falter: Innovative, Low-Cost Solutions

LCCMR 2010 Funding Priority:

A. Water Resources

Total Project Budget: \$ \$340,770

Proposed Project Time Period for the Funding Requested: 3 years, 2010 - 2013

Other Non-State Funds: \$ \$0

Summary:

Four novel approaches for reducing nitrate contamination using perennial crops, wetlands or bacteria for optimum cost efficiency will be evaluated and provide valuable options for water resource staff and policymakers.

Name: Bruce Montgomery

Sponsoring Organization: MN Department of Agriculture

Address: 625 Robert St N
St. Paul MN 55155

Telephone Number: (651) 201-6178

Email: Bruce.Montgomery@state.mn.us

Fax: (651) 201-6117

Web Address: www.mda.state.mn.us

Location:

Region: Statewide

County Name: Lincoln, Nicollet, Otter Tail, Wadena

City / Township:

_____ Knowledge Base	_____ Broad App.	_____ Innovation
_____ Leverage	_____ Outcomes	
_____ Partnerships	_____ Urgency	_____ TOTAL

MAIN PROPOSAL

PROJECT TITLE: When Nitrogen BMPs Falter: Innovative, Low-Cost Solutions

I. PROJECT STATEMENT

After decades of research, there are excellent recommendations on the timing, rate, and placement of nitrogen fertilizer for crop production. However, there are vulnerable geologic settings where groundwater and tile drainage waters are at risk.....even when producers fully implement the best available technology. Are there effective and affordable options to prevent or remediate water quality in these sensitive areas?

We propose to test four innovative solutions for removing excess nitrate. Each technique uses plants or microorganisms to do the dirty work. Each approach also has sufficient small-scale research to justify applying the technique to a larger, real-world problem. During this three year project, we will determine the cost per pound of nitrate removal for each technique. This metric can be used to compare these and other approaches and will provide valuable options to policymakers, public agencies, community water suppliers and land managers.

II. DESCRIPTION OF PROJECT RESULTS

Result 1: Perennial biocurtains are “lights out” on nitrate losses. Budget: \$97,231

Tile drainage allows timely field activities on millions of acres in the Corn Belt. Even with BMPs and no fertilizer inputs, significant amounts of nitrate can escape during the spring season because the annual row crops are still too small to use the nitrogen. Narrow strips of deeply-rooted perennial grasses or legumes planted directly over the tile lines has shown significant N reductions in small plot studies. This will be the first field-scale test using this approach.

Deliverable

	Completion Date
1. Site identification and land-owner agreements, monitoring set-up	12/1/2010
2. Tile drains located and curtains seeded	5/1/2011
3. Harvesting (3 times annually) and continuous water quality monitoring	6/30/2013

Result 2: Scouring groundwater with the “Hoover” of the plant world. Budget: \$106,539

Under intensive, irrigated agriculture on sandy soils, contamination of shallow groundwater is common. This new approach, called “phytofiltration”, uses deeply-rooted crops like alfalfa to selectively remove nutrients from the nitrate-laden irrigation water. This concept, first developed with LCMR funds a decade ago, will be the first field-scale application and cost/benefit analysis.

Deliverable

	Completion Date
1. Site identification and soil sampling	9/1/2010
2. Monitoring wells, equipment installed and seeding establishment	5/1/2011
3. Phytofiltration treatments begin	5/1/2012
4. Water quality monitoring for treatment effects	6/30/2013

Result 3: One lump or two?...Sugar-feeding bacteria to gobble up nitrate. Budget: \$35,500

Specialized bacteria have the ability to remove nitrate from groundwater. These denitrifying bacteria are present in soil and aquifers but are generally not active because of the limited food supply. We propose to implement a new technique of injecting corn syrup as the bacteria's food source into the nitrate-contaminated soil. We will measure how much nitrate is lost and in what forms, and will evaluate effects on other water quality components.

Deliverable	Completion Date
1. Site identification, tile drain and shallow well installation	11/1/2010
2. Carbon source treatments imposed, groundwater monitoring	11/1/2012
3. Data analysis and reports	6/30/2013

Result 4: Tapping the power of wetlands. Budget: \$92,500

Wetlands have been recognized for treating nitrate from tile drainage but can they handle the high N discharge from public drinking water treatment facilities? Rather than discarding the N back into nearby streams, we will use wetlands to treat the effluent and possibly improve the habitat of the Topeka Shiner at the same time.

Deliverable	Completion Date
1. Planning phases with DNR, FWS, and cooperators	9/1/2010
2. Earth-moving and installation of control structures, seeding	5/1/2011
3. Water quality monitoring for two full seasons	6/30/2013

Result 5: Educational components and website development. Budget: \$9,000

Deliverable	Completion Date
1. Field day events and winter meetings	On-going
2. Web access of reports, updates	On-going

III. PROJECT STRATEGY

A. Project Team/Partners

Minnesota Department of Agriculture will provide general overall project management, assist the various cooperators at all sites, supervise any student workers, and coordinate educational activities. USDA-Agricultural Research Service will lead a majority of the research elements found in Results 1, 2 and 4. Minnesota Department of Health will lead the research elements in Result 3. Central Lakes Ag Center (Staples) will assist with Result 2. Lincoln-Pipestone Rural Water staff will be partners with Result 4 and DNR staff will be consulted regarding any potential impacts on the Topeka Shiner.

B. Timeline Requirements

Many of the research elements will be achieved within the proposed timeframe. However the environmental benefits of the perennial cropping systems will be maximized after year 3. We intend to find alternative funding to reap the full environmental potential of each technique.

C. Long-Term Strategy

One of the goals will be to build local support on each project so critical elements can be maintained after this grant is expired.

Project Budget

IV. TOTAL PROJECT REQUEST BUDGET (3 years)

BUDGET ITEM <i>(See list of Eligible & Non-Eligible Costs, p. 13)</i>	AMOUNT
Personnel:	\$ -
One USDA-ARS Graduate Student (57% salary, 43% benefits) for duration of the project	\$ 108,370
Two seasonal Student Workers or Interns (100% salary) for cropping seasons	\$ 52,000
Contracts:	\$ -
Wetland construction/earth moving for the Holland site (Contractor TBD)	\$ 10,000
Prairie/wetland planting for the Holland site (Contractor TBD)	\$ 10,000
Planting and alfalfa harvesting at Red Top Farm (Contractor TBD)	\$ 11,250
Water sample analysis (Contractor TBD)	\$ 7,500
Equipment/Tools/Supplies:	\$ -
Water Level control structures (Holland site)	\$ 25,000
Multi-level wells	\$ 3,000
Peizometers for flux measurements	\$ 7,000
Denitrification equipment installation	\$ 14,000
Pump-Holland site	\$ 5,000
Travel: Travel costs for ARS	\$ 9,000
Travel: MDA/MDH	\$ 6,000
Additional Budget Items:	\$ -
Land use fees, additional irrigation costs	\$ 31,650
Denitrification sampling and analysis	\$ 18,000
Supplies, sample bottles, educational materials, carbon sources	\$ 23,000
TOTAL PROJECT BUDGET REQUEST TO LCCMR	\$ 340,770

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ USDA ARS Match	\$ 15,000	Secured
In-kind Services During Project Period:	\$ 25,000	Pending

Biography-Bruce Montgomery

Contact Information:

Bruce Montgomery
OLF A-212, 625 Robert St. N
651-201-6178

MN Dept. of Agriculture
St. Paul, MN 55155-2538
Bruce.Montgomery@state.mn.us

Employment History and Current Job Responsibilities

Minnesota Department of Agriculture, 1990 to present.
North Dakota State University, Dept. of Soil Science, 1977-1990.

Bruce is the supervisor of the "Fertilizer Management Unit" at the Minnesota Department of Agriculture and is responsible for managing a team of Soil Scientists, Agronomists and Water Quality Staff. This team deals with numerous agricultural non-point water quality issues with emphasis on nitrogen, pesticides, and manure management and is responsible for responding in areas of Minnesota where water resources have been adversely affected by these inputs.

Grant Experience as a Project Manager

Served as Project Manager for the following LCMR Projects:

- *"Improved Agricultural Systems Overlying Sensitive Aquifers in Southwestern Minnesota"* (1999-2001)
- *"Nitrate Education and Testing"* (1997-1999)
- *"Developing Soil Specific Nitrogen Management as a BMP"* (1993-1995)

Served as Project Manager for the following Federal Projects:

- EPA 319: "Nitrate Testing and Educational Outreach for Private Well Owners" (1999-2003) Continuation (2004-2006)
- EPA: "A National Laboratory Proficiency Testing Program for Manure Analysis", (2002-2006)
- USDA-RMA: "Accelerated Adoption of University Fertilizer Recommendations through Nutrient Insurance Policies" (2002-2003).

Contributor/Partner on the following LCMR Projects

- *"Improving Water Quality on the Central Sands"* (2005-08)
- *"Effective Manure Management in Conservation Tillage Systems for Karst Areas of MN"*
- *"Nutrient Availability from Land-Applied Manure"*
- *"Managing Agricultural Environments Of North-Central MN Sandy Soils"*
- *"Nutrient Recycling Through Plants"*

