Environment and Natural Resources Trust Fund
2020 Request for Proposals (RFP)

Project Title: **ENRTF ID: 235-F**

Integrated Conservation to Achieve Water Quality Goals

Category: F. Methods to Protect, Restore, and Enhance Land, Water, and Habitat

Sub-Category:

Total Project Budget: $ 1,963,155

Proposed Project Time Period for the Funding Requested: June 30, 2024 (4 yrs)

Summary:

Implementation of soil and water management and conservation practices to restore and protect soil and water resources while making measurable
changes toward water quality improvements in southwest and northwest Minnesota

Name: Jeffrey Strock

Sponsoring Organization: U of MN

Job Title: Professor

Department: Southwest Research and Outreach Center

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Web Address:

Location:

Region: Northwest, Southwest

County Name: Clearwater, Cottonwood, Lyon, Murray, Pennington, Polk, Red Lake, Redwood

City / Township:

Alternate Text for Visual:

The Cottonwood River and Red Lake River watersheds in southwest and northwest Minnesota, respectively. Showing the Plum Creek and Red Lake River middle subwatersheds

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

PROJECT TITLE:
Integrated Soil and Water Conservation to Achieve Water Quality Goals

I. PROJECT STATEMENT
The Minnesota Nutrient Reduction Strategy identifies the "watershed approach" as the key to increasing water storage on the landscape and improving water quality. Most water quantity/quality improvement studies have been carried out on small plots or at the field scale. Thus, our knowledge is mostly limited to local scale systems and interactions. As a result, these studies show low environmental benefits of management practices at the watershed scale. To bridge this gap, we propose an innovative, nested watershed approach combining traditional investigation methods like edge-of-field water monitoring and watershed-scale computer simulation with new techniques like remote sensing to detect soil health parameters. We are building partnerships and collaborating with the Redwood and West Polk county Soil and Water Conservation Districts (SWCD) and others to implement soil and water conservation measures and monitor water quantity and quality from two MPCA/EPA small watersheds chosen for prioritized federal Clean Water Act (CWA) Section 319 program funding in 2020.

The SWCDs will work with participating land owners/operators and other interested citizens in the Plum Creek watershed in the southwest and the Red Lake River – middle subwatershed in the northwest. The mission is to work collaboratively to implement soil and water conservation practices that will restore and protect soil and water resources and make measureable changes toward water quality improvement (nutrients, sediment and bacteria).

Project Objectives:
1. Engage farmers in participatory assessment of potential adaptation and mitigation scenarios through one-on-one meetings and the I-Farm model.
2. Survey farmers, through FANMAP, to assess the role of perception and socioeconomic factors on decisions regarding adaptive or mitigative soil and water conservation best practices.
3. Monitor water quantity and quality impacts of best practice adoption for livestock and crop producers to determine the watershed scale benefits using a nested, paired-watershed approach.
4. Quantify how sub-watershed scale soil and water management and conservation measures may influence watershed-scale hydrology and predict how these systems may change under various scenarios (e.g. level of best practice implementation, variable weather, changing climate).
5. Discriminate high density (compacted) from low density (non-compacted) soils as an indicator of soil health (e.g. aggregation, bulk density, infiltration, soil water storage capacity) using multispectral imaging.
6. Provide knowledge and information through locally based education/Extension engagement on flexible soil and water management adaptation and mitigation strategies that improve water quality and increase ecosystem system resiliency and sustainability.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1 Engage stakeholders and establish nested, paired watershed focus areas. Budget: $1,963,155
Engage and invest landowners by conducting outreach meetings to exchange current knowledge and economic analyses of soil and water management adaptation and mitigation strategies. Install water quantity and quality monitoring stations at multiple, strategic locations within Plum Creek and the Red Lake River – middle subwatershed. Monitor the stations for performance, water quality, and impact on water flow under different environmental conditions. Measure select soil health metrics for impact on water infiltration and storage in the soil. Model soil and water management and conservation scenarios across watershed scales. Share results and

observations with landowners and other stakeholders.

Outcome	Completion Date
1.1. Four farmer informational meetings	Dec. 2020
1.2. Farmer surveys and interviews,	Dec. 2021
1.3. Nested, paired watershed monitoring systems installed	Dec. 2021
1.4. Monitor and analyze water quantity and water quality data	Jun. 2024
1.5. Remote sensing of soil health metrics	Jun. 2024
1.6. Two field events (each) within the two watersheds	Jun. 2024
1.7. Report of modelling, written for general audience, describing adaptive and mitigative scenario impacts on water quantity and quality	Jun. 2024
1.8. Report of monitoring data, written for general audience, describing system performance and water quantity and quality impacts and soil health metrics	Jun. 2024

III. PROJECT PARTNERS AND COLLABORATORS:

Dr. Jeffrey Strock, U of M Southwester Research and Outreach Center – Project manager
Dr. Lindsay Pease, U of M Northwest Research and Outreach Center (ENRTF supported)
Dr. Joe Magner, U of M Dept. Bioproducts and Biosystems Engineering (ENRTF supported)
Brian Pfarr, Redwood County Soil and Water Conservation District
Nicole Bernd, West Polk County Soil and Water Conservation District
Greg Johnson, Minnesota Pollution Control Agency, Hydrologist
Matt Drewitz, Minnesota Board of Water and Soil Resources
Dr. Andry Ranaivoson, U of M Southwester Research and Outreach Center (ENRTF supported)
Mark Coulter, Technician, U of M Southwest Research and Outreach Center (ENRTF supported)
Heidi Reitmeier, Technician, U of M Northwest Research and Outreach Center (ENRTF supported)
Dr. Axel Garcia y Garcia, U of M Southwester Research and Outreach Center (ENRTF supported)
Dr. Brent Dalzell, U of M Dept. of Soil Water and Climate (ENRTF supported)
Dr. Ce Yang, U of M Dept. Bioproducts and Biosystems Engineering (ENRTF supported)
Karen Terry, U of M Extension, Soil Health (ENRTF supported)
Dr. Anna Cates, U of M Extension and UM Dept. of Soil Water and Climate (ENRTF supported)
Jodi DeJong-Hughes, U of M Extension, Soil Health (ENRTF supported)
TBD, Minnesota Department of Agriculture

IV. LONG-TERM IMPLEMENTATION AND FUNDING:

This project is a partnership that includes local SWCDs, U of M, MPCA and BWSR. Base project funding comes from federal CWA Section 319 program funding, administered by US EPA, and passed through MPCA to the local watersheds to implement best practices and adopt strategies to mitigate non-point source pollution. The 319 Small Watersheds Focus Program provides sustainable, longer-term funding. The watersheds are developing focused workplans for these projects and are eligible to receive Section 319 grant funds to implement their workplan over the course of multiple grant cycles, for up to approximately sixteen years. The intent of the program is to make measurable progress for the targeted watersheds ultimately restoring impaired waters and preventing degradation of unimpaired waters. The University, through this proposal, will be able to provide four years of technical expertise and competency required to implement appropriate soil and water-monitoring strategies in both watersheds in order effectively measure best practice performance. These two watersheds are located in close proximity to University Research and Outreach Centers (Lamberton and Crookston) with experienced faculty, staff and resources to assist in developing monitoring plans and analysis and interpretation of results.

Attachment A: Project Budget Spreadsheet
Environment and Natural Resources Trust Fund
M.L. 2020 Budget Spreadsheet
Legal Citation:
Project Manager: Dr. Jeffrey Strock
Project Title: Integrated Soil and Water Conservation to Achieve Water Quality Goals
Organization: Regents of the University of Minnesota
Project Budget: $1,963,155
Project Length and Completion Date: Start: 7/1/20; Completion: 6/30/2024
Today's Date: April 10, 2019

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	$ -	$ -	$ -
U of M Project Manager responsible for ROC coordination and overall project management. Liaison between SWROC and Plum Creek watershed partners. Collaborate with Co-PIs and collaborator on data analysis and interpretation as well as public engagement/outreach/extension. In kind contribution for all years.	$ -		
Research Professor, Co-PI, collaborate with PI on data analysis and interpretation, public engagement/Outreach/Extension as well as graduate student advising. $63,450 in salary and $22,840 in fringe. 0.15 FTE each year for 4 years.	$ 86,290		
Asst. Professor, Co-PI and liaison between NWROC and Red Lake River middle subwatershed partners. Collaborate with PI on data analysis and interpretation as well as public engagement/Outreach/Extension. $38,205 in salary and $13,755 in fringe. 0.11 FTE each year for four years.	$ 51,960		
Asst. Professor, Researcher and collaborator to Cover cropping, soil health, Crop modeling as well as public engagement/Outreach/Extension. $46,850 in salary and $13,710 in fringe. 0.08 FTE each year for four years.	$ 60,560		
Researcher 5, (SWROC) Responsible for set-up of monitoring stations, data collection and data analysis. $233,945 in salary and $84,215 in fringe. 1.0 FTE effort each year for four years. Responsible for set-up	$ 318,160		
Researcher 2, (SWROC) responsible for site management and maintenance, sample collection and sample analysis.$170,115 in salary and $50,185 in fringe. 0.75 FTE each year for four years.	$ 220,300		
Grad student, assist with data analysis and intrepretation. $147,280 in salary and $103,660 in fringe, 0.15 FTE each year for 4 years.	$ 250,940		
Researcher 6, Researcher and collaborator working with watershed modeling as well as public engagement/outreach/extension. $64,705 in salary and $23,295 in fringe, 0.25 FTE each year for 4 years.	$ 88,000		
Researcher 2, (NWROC) responsible for site management and maintenance, sample collection and sample analysis.$44,382 in salary and $13,093 in fringe, .25 FTE each year for 4 of years.	$ 57,475		
Extension Professor, Researcher and collaborator in soil health metrics as well as public engagement/Outreach/Extension. $10,400 in salary and $3,720 in fringe. 0.03 FTE each year for 4 years.	$ 14,120		
Plot Technician, assist with soil health metrics and public engagement. $21,950 in salary and $6,475 in fringe. 0.10 FTE each year for 4 years.	$ 28,425		
Asst. Professor, collaborator on remote sensing for soil health metrics as well as public engagement/Outreach/Extension.$31,140 in salary and $11,210 in fringe. 0.08 FTE each year for 3 years.	$ 42,350		
Post-Doc Student, assist with remote sensing for soil health metrics as well as public engagement. $77,220 in salary and $18,765 in fringe. 0.50 FTE each year for 3 years.	$ 95,985		
Extension Professor, collaborator in public engagement/outreach/extension and soil health metrics. $4412 in salary and $1588 in fringe. 0.01 FTE each year for 4 years.	$ 6,000		
Under graduate student, assist with data collection. $1500 in salary. 1.0 FTE for year one.	$ 1,500		
Equipment/Tools/Supplies			
Batteries, enclosures, solar panels and wiring materials	$ 78,355		
Teledyne ISCO 6712 Samplers - 6	$ 29,170		
OTT Bubble Level Sensors - 6	$ 28,970		
pH and water temperature sensors - 6	$ 6,570		
Turbidty - 6	$ 6,625		
Cates (soil health) - 6	$ 4,000		
Cellular Modem for wireless communication - 6	$ 3,890		

Capital Expenditures Over $5,000			
HACH Nitratax + SC Nitrate Water Sensors - 6	$ 109,505		
Teledyne ISCO 5800 Refrigerated Samplers - 7	$ 57,045		
CSI Weather Station - 2	$ 32,920		
Printing			
Modeling Report	$ 60,000		
Monitoring Report	$ 60,000		
Travel expenses in Minnesota			
Travel expenses to professional meetings (e.g. MN Water Resources Conference) (six faculty/P&A for one trip per year to a professional meeting. Includes funds for registration, hotel, travel, food and lodging)	$ 60,000		
Travel to field sites from Crookston (1 time per week x 48 months)	$ 14,000		
Travel to field sites from St. Paul (3 times per year by two sites)	$ 1,740		
Travel to field sites from Lamberton (1 time per week x 48 months)	$ 1,500		
Other			
Rural Electric Power for monitoring stations - 6	$ 42,000		
Coliform analysis (300 samples per year x 4 years)	$ 30,000		
Shipping (Coliform)	$ 10,000		
Wireless communication ($100 per month x 48 months)	$ 4,800		
COLUMN TOTAL	$ 1,963,155	$ -	$ -

SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	**Status (secured or pending)**	**Budget**	**Spent**	**Balance**
Non-State:		$ -	$ -	$ -
State:		$ -	$ -	$ -
In kind:		$ -	$ -	$ -

Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	**Amount legally obligated but not yet spent**	**Budget**	**Spent**	**Balance**
		$ -	$ -	$ -

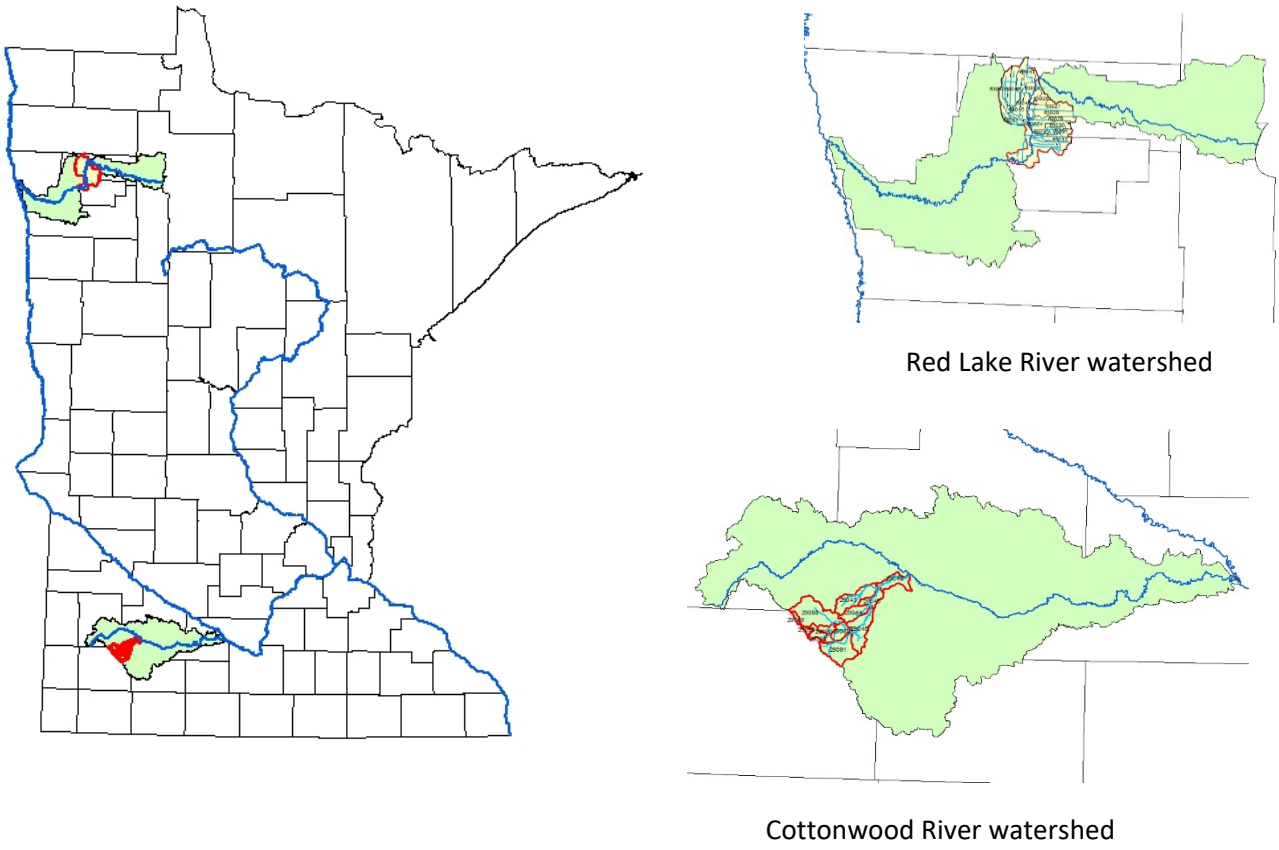

Figure 1. Map showing sub-watershed level details of two MPCA/EPA watersheds, Cottonwood River watershed and the Red Lake River watershed, chosen for prioritized federal Clean Water Act Section 319 program funding in 2020.

Project Manager Qualifications & Organization Description

Dr. Strock is a Professor and Soil Scientist with the University of Minnesota located at the Southwest Research and Outreach Center, near Lamberton, MN. He has over 25 years of experience conducting field research in the areas of watershed management and soil science. He strongly believes in applied, on-farm research and has collaborated with numerous landowner/operators. Since 1999, he has authored or co-authored more than 55 research projects. He has provided administration for planning, organizing projects and successfully managing data collection, analysis and interpretation of data as well as reporting, publishing and financially managing these projects. Dr. Strock has given over 265 extension talks to stakeholders throughout Minnesota and both nationally and internationally pertaining to the results of his work. He has excellent interpersonal communication skills and is a team builder. He believes in organizing multi-disciplinary functional teams to carryout research to answer complex questions. Finally, he believes in building relationships as a foundation for collaboration, for example with stakeholders including landowners, local, state and federal agencies, NGO's, conservation groups, policy makers, and industry professionals.