

**Environment and Natural Resources Trust Fund
2019 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 084-B

Protecting Water Quality with Comprehensive, Integrated Nutrient Planning

Category: B. Water Resources

Sub-Category:

Total Project Budget: \$ 1,721,159

Proposed Project Time Period for the Funding Requested: June 30, 2023 (4 yrs)

Summary:

The University of Minnesota will join the 21st century by creating user-friendly, web-based tools for fertilizer and manure management planning to help farmers save money and protect water quality.

Name: Melissa Wilson

Sponsoring Organization: U of MN

Title: Assistant Professor

Department: Department of Soil, Water, and Climate

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St. Paul MN 55108

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Web Address

Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

An infographic describing agricultural water quality issues in Minnesota. The University of Minnesota will help improve issues by creating web-based tools for farmers to easily plan fertilizer and manure applications.

<input type="checkbox"/>	Funding Priorities	<input type="checkbox"/>	Multiple Benefits	<input type="checkbox"/>	Outcomes	<input type="checkbox"/>	Knowledge Base
<input type="checkbox"/>	Extent of Impact	<input type="checkbox"/>	Innovation	<input type="checkbox"/>	Scientific/Tech Basis	<input type="checkbox"/>	Urgency
<input type="checkbox"/>	Capacity Readiness	<input type="checkbox"/>	Leverage	<input type="checkbox"/>		TOTAL	<input type="checkbox"/> %
<input type="checkbox"/> If under \$200,000, waive presentation?							



PROJECT TITLE: Protecting water quality with comprehensive, integrated nutrient planning

I. PROJECT STATEMENT – To reduce agricultural nutrient losses to ground and surface water, we will create user-friendly, web-based tools for commercial fertilizer and manure management planning on Minnesota farms. The tools include:

- Minnesota Nutrient Application Planner (MinnNAP): Nutrient management software with mapping capabilities
- An updated Minnesota Phosphorus Risk Tool to analyze farm fields for potential phosphorus losses
- Mobile apps for “on-the-go” nutrient planning like calculating manure or commercial fertilizer application rates

This one-stop-shop of online software will be designed specifically for farmers and agricultural professionals and will include research-based University of Minnesota guidelines along with best management practices that are recommended by various Minnesota state agencies.

By using optimum fertilizer and manure application rates, the Minnesota Pollution Control Agency reports that we can reduce nitrate to surface waters by 9.8% and farmers will save money at the same time. By making nutrient and manure management planning easier for farmers, we hope to increase adoption of this practice which will in turn lead to improved water quality across Minnesota.

II. PROJECT ACTIVITIES AND OUTCOMES

ACTIVITY 1: *Create MinnNAP, web-based software for commercial fertilizer and manure nutrient planning*

- **Description:** We will develop a browser-based software program, the Minnesota Nutrient Application Planner (MinnNAP), to help farmers develop a nutrient management plan for their farms. The team will include:
 - Two software developers to design the software for the web
 - A Program Lead with knowledge of crop nutrient management to oversee the software developers
 - Subject matter experts from the University of Minnesota
 - Representatives from MN Department of Agriculture, MN Pollution Control Agency, the Natural Resources Conservation Service (NRCS), and the MN Crop Production Retailers
 - A social scientist to study possible barriers to adoption and how to improve usability of the software
 We will conduct hands-on workshops and design online modules for educating users about the software. We also plan to continuously evaluate our progress and adoption rates through surveys and program evaluation.

- **ENRTF BUDGET:** \$695,062

Outcome	Completion Date
1. <i>Build and release initial version of MinnNAP (web-based nutrient management software)</i>	<i>June 30, 2021</i>
2. <i>Conduct user testing with focus groups and surveys to identify what people parts of the software that people struggle with (this will be on-going throughout the project)</i>	<i>June 30, 2023</i>
3. <i>Teach farmers/crop professionals about the software in hands-on workshops</i>	<i>June 30, 2023</i>
4. <i>Update software, work out bugs, and then release MinnNAP version 2</i>	<i>June 30, 2023</i>

ACTIVITY 2: *Update the Minnesota Phosphorus (P) Risk Tool and integrate it into MinnNAP*

- **Description:** The Minnesota P Risk Tool was previously developed to calculate the risk of phosphorus loss from agricultural fields to surface waters. It has not been updated with the latest scientific information since 2006, however. Our team of subject matter experts will update the calculations as needed and the software developers will integrate the P Risk Tool into the first version of MinnNAP. The next stage will be to incorporate GIS mapping to improve calculations in the P Risk Tool for soil loss on the field scale.



**Environment and Natural Resources Trust Fund (ENRTF)
2019 Main Proposal Template**

• **ENRTF BUDGET: \$724,051**

Outcome	Completion Date
1. Update the Minnesota P Risk Tool	June 30, 2020
2. Integrate the P Risk Tool into MinnNAP (the nutrient software program)	June 30, 2021
3. Conduct user testing with focus groups and surveys to identify what people parts of the software that people struggle with (this will be on-going throughout the project)	June 30, 2023
4. Integrate mapping software into MinnNAP version 2 to work with the P Risk Tool	June 30, 2023

ACTIVITY 3: Build mobile-friendly apps for “on-the-go” nutrient planning

- **Description:** Users have begun using mobile devices on a regular basis, and mobile-friendly applications, or apps, are growing in popularity. This type of software can become outdated within months, however, and require near-constant maintenance. By having staff on hand with the technical knowledge to continually update our apps, we will create a more user-friendly experience. Our software developers will create and maintain nutrient and manure planning apps in consultation with the Program Lead and subject matter experts. As with Activities 1 and 2, educational workshops, user testing, and surveying will be conducted.

• **ENRTF BUDGET: \$302,046**

Outcome	Completion Date
1. Build apps for calculating fertilizer application rates, determining nitrogen needs in-season, and calculating manure application rates	June 30, 2020
2. Update initial apps and release new versions if necessary.	June 30, 2021
3. Conduct user testing with focus groups along with surveys to identify additional apps that people would like to see (this will be on-going throughout the project)	June 20, 2023

III. PROJECT PARTNERS:

A. Partners receiving ENRTF funding – None.

B. Partners NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Carl Rosen	Department Head and Professor	University of Minnesota	Dr. Rosen is a horticultural crop nutrient specialist and will serve as a subject matter expert for developing the software.
Brad Redlin	Agricultural Water Quality Certification Program Manager	MN Department of Agriculture	Mr. Redlin will serve as a state agency advisor representing the MDA and will help with software design.
Steve Schmidt	East Unit Feedlot Supervisor	MN Pollution Control Agency	Mr. Schmidt will serve as a state agency advisor representing the MPCA and will help with software design.
Bill Bond	Executive Director	MN Crop Production Retailers	Mr. Bond will serve as an industry advisor representing the MN Crop Production Retailers and will help with software design.

IV. LONG-TERM-IMPLEMENTATION AND FUNDING: The deliverables from this project (the software toolbox) will be released and implemented online over the long-term and the University of Minnesota will continue to maintain and educate users about the tools. The software and corresponding apps will need to be continually updated as scientific information and state nutrient management policies and guidelines change. Once we demonstrate the initial success of our software products, we will seek funding from various state agencies, federal sources, and possibly non-profit or commodity groups to continue our work.

V. TIME LINE REQUIREMENTS: This project will take four years to complete.

2019 Proposal Budget Spreadsheet

Project Title: *Protecting water quality with comprehensive, integrated nutrient planning*

IV. TOTAL ENRTF REQUEST BUDGET 4 years

BUDGET ITEM (See "Guidance on Allowable Expenses")	AMOUNT
Personnel: <i>To be hired:</i> Software developers: 4 years, 2 @ 100% time, 2% raise each year, 66.5% salary and 33.5% fringe - \$880,378 Program Lead: 4 years, 100% time, 2% raise each year, 66.5% salary and 33.5% fringe - \$357,654 Social Scientist: 3 years, 50% time, 2% raise each year, 66.5% salary and 33.5% fringe - \$112,356 Undergraduate Interns (2): 4 summers at 100% time and 10 hrs/wk for 39 weeks during 4 academic years, \$15/hr 100% salary and 0% fringe - \$93,600 <i>Subject matter experts</i> Principal Investigator - Melissa Wilson: 4 years, 240 hrs/year (15% time), 2% raise each year, 66.5% salary and 33.5% fringe - \$70,023 Dan Kaiser: 4 years, 160 hrs/year (10% time), 2% raise each year, 66.5% salary and 33.5% fringe - \$50,338 Fabian Fernandez: 4 years, 160 hrs/year (10% time), 2% raise each year, 66.5% salary and 33.5% fringe - \$53,407 Paulo Pagliari: 4 years, 160 hrs/year (10% time), 2% raise each year, 66.5% salary and 33.5% fringe - \$50,003 Lindsay Pease: 4 years, 160 hrs/year (10% time), 2% raise each year, 66.5% salary and 33.5% fringe - \$46,630	\$ 1,714,389
Professional/Technical/Service Contracts: N/A	
Equipment/Tools/Supplies: Printing and copying fees for surveys, usability testing, software manuals, and semi-annual reports	\$ 1,300
Acquisition (Fee Title or Permanent Easements): N/A	
Travel: <i>All travel expenses will be determined via University of Minnesota's Travel Policies</i> In-state instructor travel to software training workshops for farmers, Certified Crop Advisors, and Technical Services providers: 15 trips, avg 350 miles per trip, \$0.545/mile - \$2,862 In-state team travel to meet w/ advisory committee: 1 meeting/year, 3 cars/year, avg. 107 miles, \$0.545/mile - \$700 In-state focus group/usability testing workshops: 10 trips, avg 350 miles per trip, \$0.545/mile - \$1,908	\$ 5,470
Additional Budget Items: N/A	
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 1,721,159

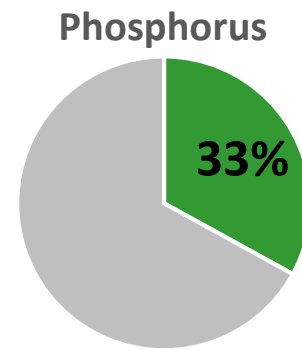
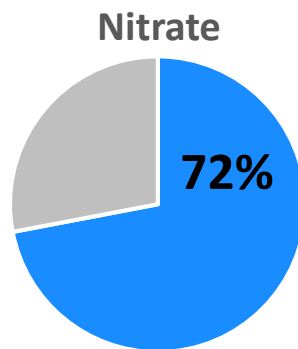
V. OTHER FUNDS (This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period:	N/A	N/A
Other State \$ To Be Applied To Project During Project Period: Unrecovered University of Minnesota overhead costs (33% of modified total direct costs)	N/A	N/A
In-kind Services To Be Applied To Project During Project Period:	\$ 567,982	<i>secured</i>
Past and Current ENRTF Appropriation:	N/A	N/A
Other Funding History:	N/A	N/A

Protecting water quality with comprehensive, integrated nutrient planning



Agriculture's Contribution to Surface Waters



What can the University do?

Help farmers improve fertilizer & manure efficiency!



Make fertilizer & manure plans easy with online software



Improve the MN Phosphorus Risk Tool



Create “on-the-go” fertilizer and manure planning apps

Project Manager Qualifications and Organization Description

Project Manager Qualifications

Dr. Melissa Wilson is an Assistant Professor and Extension Specialist in the Department of Soil, Water, and Climate at the University of Minnesota. Her research and Extension programs focus on manure nutrient management for crops and reducing impacts on water quality in Minnesota. Her interest in this topic started during her graduate work. She earned M.S. and Ph.D. degrees at the University of Minnesota in Water Resources Science where she studied agricultural water quality issues, mainly those related to nitrogen management. Her research topics involved a broad range of techniques to reduce nitrogen losses from fields, including enhanced efficiency fertilizers and cover crops. Following graduation, her work experience at the University of Maryland led her in a new, but related direction: fertilizer and manure management planning to reduce water quality issues. She gained significant experience working with Maryland's nutrient management planning software, Nutrient Management Pro, or NuMan Pro, and feels this experience will be integral in bringing together a team to develop software for Minnesota.

Previous work experience:

- Nutrient Management Specialist. Agricultural Nutrient Management Program (ANMP) - University of Maryland Extension. College Park, MD.
- Assistant Professor of Environmental Science. Physical Science Department - Community College of Baltimore County. Baltimore, MD.
- Graduate Research Assistant, Department of Soil, Water, and Climate – University of Minnesota. Saint Paul, MN.

Select publications:

- **Wilson ML**, Allan DL, Baker JM. 2014. Aerially seeding cover crops in the northern US Corn Belt: Limitations, future research needs, and alternative practices. *Journal of Soil and Water Conservation* 69(3): 67A-72A.
- **Wilson ML**, Baker JM, Allan DL. 2013. Factors affecting successful establishment of aerially seeded winter rye. *Agronomy Journal* 105(6): 1868-1877.
- **Wilson ML**, Rosen CJ, Moncrief JF. 2010. Effects of polymer-coated urea on nitrate leaching and nitrogen uptake by irrigated potato. *Journal of Environmental Quality* 39: 492-499.

Responsibilities for this project:

Dr. Wilson will be responsible for the overall progress of the project, planning, writing of reports, and communication with the LCCMR staff. She will also be participating as a subject matter expert in nutrient management for development of the software tools.

Organization Description

The University of Minnesota is one of the country's original land-grant institutions and is dedicated to its mission of promoting access to higher education and collaborating to advance knowledge benefiting communities, the state, and world.