**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**

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| **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. |

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| **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:**

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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.