

ADDITIONAL RESEARCH ACTIVITIES

The Root River Field to Stream Partnership is conducting surface and ground water monitoring and also using eight complementary research tools.

Research Projects and Techniques

1. Evaluation of phosphorus contributions from edge-of-field and within streams
2. On-farm nitrogen rate and timing comparisons
3. Corn stalk testing to determine nitrogen availability to the crop
4. Springshed mapping using sinkhole dye tracing and intensive nitrate nitrogen sampling of groundwater-fed springs and tributaries
5. Digital terrain analysis to identify areas of the landscape where conservation practices may have the largest environmental benefit
6. Assessment of stream channel characteristics
7. Sediment fingerprinting to track sources of soil loss
8. A sediment budget for the Root River

Together these tools and techniques help to characterize water quality and hydrology and represent a scientific approach to understanding an entire watershed.

EDUCATION, OUTREACH AND CIVIC ENGAGEMENT

Education and outreach is a vital element of the Root River Field to Stream project. Farmers have been involved since the beginning and are valued for their expertise and knowledge of local issues. Educational outreach includes field days, small group meetings and one-on-one conversations.

Farmers and their crop advisors will be critical during Phase II and will be consulted regarding the selection and implementation of agricultural conservation practices.

FARMER SURVEYS

A voluntary survey is conducted with each farmer that manages fields within the study areas. The point of the survey is to document new and existing conservation practices being utilized and to gather field-specific management records related to tillage, nutrient and pesticide management. The information is important in helping scientists better understand the long-term relationship between agricultural land use and water quality.



PARTNERS AND FUNDING

The Root River Field to Stream Partnership is comprised of farmers and their advisors, the Minnesota Department of Agriculture, Minnesota Agricultural Water Resources Center, The Nature Conservancy, Fillmore County, Mower County and the Root River (Houston County) Soil and Water Conservation Districts, Monsanto, other state agencies, and academic researchers.

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ROOT RIVER FIELD TO STREAM PARTNERSHIP



Houston County
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*"If I'm losing my nutrients from my field,
I want to be the first to know."*

BUILDING PARTNERSHIPS AROUND GOOD SCIENCE

In 2009 a group of diverse organizations came together to form the Root River Field to Stream Partnership. Partners are working to better understand how agricultural practices affect the health of local rivers and streams. Together, project partners are addressing the following key questions:

- What is the range of sediment, nitrogen and phosphorus losses from agricultural fields on real farms in southeast Minnesota?
- How effective are new and existing agricultural conservation practices?
- What are the long-term trends and relationships between specific farming practices and water quality?

ABOUT THE RESEARCH AND MONITORING

The purpose of this project is to conduct intensive surface and groundwater monitoring at multiple scales to provide an assessment of the amount and sources of pollution. The two scales for monitoring are at the edge of agricultural fields and within streams.

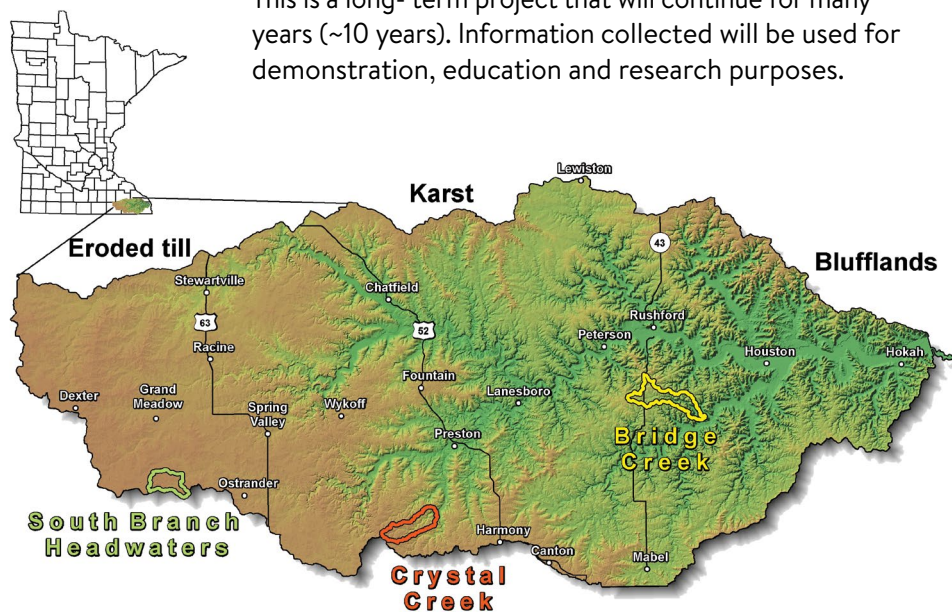
Phase I is about baseline monitoring. This will help answer the question, *what is water quality like today under current climatic conditions and management practices?*

Phase II is about working with local farmers to build on existing conservation practices. Partners, along with researchers, will use the data gathered throughout the baseline period to identify which practices are practical, best suited for field conditions and have the greatest potential benefit to water quality. The baseline data will enable researchers to evaluate the effectiveness of practices by comparing water quality data before and after practices are installed.

WATER QUALITY MONITORING

The Root River watershed is located in southeastern Minnesota. The watershed covers over one million acres and has very diverse landscape features and farming practices. For this reason, the watershed has been divided into three smaller areas referred to as sub-watersheds. At least one edge-of-field and one in-stream monitoring station is located in each of the three areas. Sampling began with snowmelt in the spring of 2010.

This is a long-term project that will continue for many years (~10 years). Information collected will be used for demonstration, education and research purposes.



EDGE-OF-FIELD MONITORING

Edge-of-field sites provide information about the amount of runoff, soil and nutrients moving off a given field into an adjacent waterway. In addition to measuring surface water runoff, equipment has been installed at one station to also measure sub-surface tile drainage. Each site captures water from an area of between 17 and 95 acres.

Five edge-of-field monitoring sites have been installed. This monitoring equipment is located at the edge of actual working farms. Each site is fully automated to collect water samples whenever runoff occurs. Water samples are analyzed for nitrogen, phosphorus, and sediment. In addition, water moving through the soil is monitored for nitrate-nitrogen. Monitoring occurs 365 days per year.

Field 1 – Headwaters- Corn/soybean rotation with sub-surface tile drainage, silty clay loam soils on 0-2% slopes. Both surface and drainage tile runoff is measured at this site.

Field 2 – Crystal Creek- Continuous corn silage with injected dairy manure, silt loam soils on 6% slopes.

Field 3 – Crystal Creek- Corn, soybean and hay, injected hog manure on soybean stubble, silt loam soils on 6-8% slopes.

Field 4 – Bridge Creek- Continuous corn grain or silage with injected dairy manure, silt loam soils on 8% slopes.

Runoff is very episodic at these locations, with an average of 20-25 runoff generating events each year. These are often triggered by snowmelt runoff and rainfall runoff during periods of the year when the crop canopy is not well established.

IN-STREAM MONITORING

In-stream monitoring sites are located at the outlet of three small watersheds (South Branch of the Root River Headwaters, Crystal Creek and Bridge Creek). Each site captures water from an area of 2,800 – 4,700 acres. Each sub-watershed represents one of the three unique landscapes found in the greater Root River watershed. Those landscapes include the glacial till area in the west, central karst terrain and bluff landscape in the east. In-stream sites are equipped to continuously monitor flow, precipitation, nitrogen, phosphorus, sediment, and turbidity (or clarity of the water) during ice-free periods.

DESCRIPTION OF THREE SUB-WATERSHEDS

One or two edge of field and one in-stream monitoring station is located in each of the three study areas.



Moving from West to East in the Root River Watershed

South Branch of the Root River Headwaters is located in the glacial till uplands region in the western portion of the Root River watershed. The sub-watershed is nearly 2,800 acres and is dominated by flat terrain with poorly drained soils. Sub-surface pattern tile drainage is used to improve the farmability of soils in this watershed.

- The Headwaters sub-watershed does not consistently flow during the winter months and is only monitored during ice free periods (April 1st to November 1st) to avoid damage to the monitoring equipment.
- There are 16 farm operators in this sub-watershed. The average field size is 130 acres and the major crops grown are corn and soybeans. Approximately 91% of the watershed is managed for a corn and soybean rotation.

Crystal Creek is located in the karst region of the Root River watershed. The sub-watershed is nearly 3,800 acres and is dominated by rolling hills made up of carbonate bedrock with distinct karst features such as sinkholes, sinking streams and groundwater springs.

- The Crystal Creek sub-watershed is a spring-fed trout stream that allows for year-round monitoring.
- Monitoring of groundwater springs is conducted to characterize surface-groundwater interactions common in the region.
- There are 19 farm operators in this sub-watershed. The average field size is 25 acres and the major crops grown are corn, soybeans and alfalfa.

Bridge Creek is located in the bluff land region of the Root River watershed. This sub-watershed is nearly 4,700 acres and the landscape consists of deeply dissected hills and valleys with steep forested slopes that often exceed 30%. This is where the Root River flows into the Mississippi River.

- The Bridge Creek sub-watershed is a spring-fed trout stream that allows for year-round monitoring.
- There are 15 farm operators in this sub-watershed. The average field size is 16 acres and the major crops grown are corn, soybeans and alfalfa.