Applying knowledge to improve water quality

National Water Program

A Partnership of USDA CSREES & Land Grant Colleges and Universities

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Paired Watershed Studies for Nutrient Reductions in the Minnesota River Basin

GREAT LAKES REGION

National Themes:
Watershed Management, Nutrient and Pesticide Management

Project Description

This project uses a coalition of producers, agency personnel, and researchers at the University of Minnesota to evaluate best management practices (BMPs) on two adjacent watersheds in Nicollet County, Minnesota.

Project Goals

- Accelerate the voluntary adoption of BMPs
- Evaluate the effectiveness of BMPs at improving water quality
- Achieve measurable improvements in water quality using a paired watershed approach
- Develop and disseminate farmer-led and farmer-sanctioned water quality initiatives in the Minnesota River Basin

Actions

This project uses two adjacent 2800 acre agricultural watersheds in Nicollet County, Minnesota. These watersheds each have approximately 3 miles of county ditch. Along the ditch are fifteen producers who farm corn and soybeans with a mix of hog and dairy operations. Farmer surveys (to determine management practices and production costs) and water testing were done in both the treatment and control watersheds for the three years preceding to BMP implementation.

After a one-year baseline monitoring period, farmers in the treatment watershed were visited to discuss the types of changes in management they would be willing to make to improve water quality. BMPs were implemented in the treated watershed in the 2003, 2004 and 2005 crop years. These BMPs include grid soil sampling for phosphorus (41% of crop acres), conversion from moldboard plowing to multi-tool plowing on corn ground (70% of eligible acreage, 20% of total watershed acreage), fall no-tillage of soybean residue (10% of eligible acreage), manure hauling, replacing surface tile inlets with buried rock inlets (33% of inlets), replacing surface tile inlets with hikenbottom risers (20% of inlets), and installation of riparian buffer strips (12 acres along 1 mile of drainage ditch). Farmers were paid to install BMPs at rates typically found in state and federal programs. No changes in management were made in the control watershed.

PROJECT CONTACTS

David Mulla
Dept. Soil, Water & Climate
1991 Upper Buford Circle
Borlaug Hall Rm. 439
University of Minnesota
St. Paul, MN 55108
Phone: (612) 625-6721
Email: mulla003@umn.edu

Adam Birr
Minnesota Dept. of Agriculture
2300 Silver Creek Road
Rochester, MN 55906
Office: (507) 285-7198
Cell: (320) 760-4562
Email: Adam.Birr@state.mn.us

PROJECT PARTNERS

Minnesota Department of Agriculture

Nicollet County Soil and Water Conservation District

Nicollet County Environmental Services

United Farmers Cooperative

26 producers in the studied watersheds

For more information about the Great Lakes Regional Water Program, please contact:

Rebecca Power
University of Wisconsin
Regional Water Liaison
Phone: (608) 263-3425
rebecca.power@uwex.edu

Outcomes/Impacts

Erosion and phosphorus modeling were conducted on each of 220 fields located in the control and treated portion of the watersheds. Erosion modeling with RUSLE2 showed a 41% reduction in sediment delivered from fields that had been converted from moldboard plowing to combination tool plowing. Phosphorus modeling with the Minnesota Phosphorus Index showed that 20% of the watershed area was in the high or very high risk categories for phosphorus loss to surface waters.

Implementation of BMPs was estimated to reduce phosphorus risks from high or very high on this 20% area to very low, low, or moderate risks. Water quality monitoring data to date have not shown significant differences between sediment, phosphorus or nitrogen loads at the mouths of the control and treated watersheds. This is likely due to several factors, including the length of time needed to see water quality changes as a result of installing BMPs, and larger storms that occurred on the treated watershed in comparison to the control watershed. Water quality monitoring from 2005 is in the process of being evaluated.

Although farmers were willing to make changes in their management practices to improve water quality, the level of adoption depended on their age, farm size, economic situation and production characteristics. The BMPs that farmers were most likely to adopt include reduced tillage of corn residue, grid soil sampling for variable rate phosphorus application and elimination of surface tile inlets. Farmers were moderately receptive to BMPs such as installation of riparian filter strips and fall no-tillage of soybean residue. Farmers were very resistant to BMPs involving changes in nitrogen fertilizer management.

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www.uwex.edu/ces/regionalwaterquality

This publication on the web at:
www.usawaterquality.org/integrated/MNRiver.html

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