Farm and Monitoring Site Selection

The initial site visit occurred in 2010, with a tour of the field to evaluate potential sites for surface water and sub-surface drainage monitoring. The farm was selected for the Discovery Farms Minnesota Program because the cropping practices and landscape are typical of the region and there was a field site capable of generating a robust and reliable dataset.

The site selected for monitoring provides an edge-of-field water quality evaluation of fields with a corn-soybean rotation, conventional tillage and both manure and commercial fertilizer application. The field selected has pattern drainage tile at 80 foot spacing. The site for monitoring of surface runoff was placed where a berm had previously been constructed. This berm was originally installed to slow runoff before it entered a stream; it helped to reduce soil loss from both the field and adjacent ravine.

Minnetonka silty clay loam, a common soil type in the area, dominates the field where the monitoring takes place. This soil is poorly drained and was formed from lacustrine sediments over glacial till. Tile drainage is required for optimum economic production.

The tile lines capture water from approximately 26.2 acres. The surface structure collects water from approximately 14.3 acres. The Minnetonka silty clay loam soil has an available water holding capacity of approximately 2 inches per foot of soil to a depth of about 2 feet. This water holding capacity is nearly the same throughout the active root zone. Soil samples (0 to 6 inches) were collected from the field in the fall of 2012. The results of the analysis of those samples are summarized in the following table. Values shown are averages for four samples.

Soil Sample Analysis of the Monitored Field

SOIL PROPERTY	VALUE
Organic matter, %	6.5
pH	5.8
phosphorus (Bray), ppm	21
potassium, ppm	131
zinc, ppm	1.1

For phosphorus, the soil test value is borderline between high and very high. This is representative of soils with repeated application of swine manure. The organic matter content and soil pH are typical for actively formed prairie soils in south central Minnesota. Values for potassium and zinc are in the high range consistent with repeated application of manure.

Equipment Installation and Sample Collection

Water samples are collected automatically, whenever runoff occurs. This field was originally part of a drainage study conducted by the Water Resources Center at Minnesota State University, Mankato from 2008-2010. In spring 2011 the field and monitoring equipment were adopted by Discovery Farms Minnesota, with some minor upgrades needed. A 1.5 foot H flume was added in summer 2011 and the berm directing the water into the flume was also constructed at that time. Weather station equipment to measure precipitation, temperature, relative humidity, soil temperature and volumetric water content has also been installed.

Samples collected are analyzed for sediment, total phosphorus, phosphate phosphorus, chloride, total kjeldahl nitrogen, ammonia nitrogen, and nitrate-nitrogen. By combining a measure of water flow with sediment and nutrient concentrations, it is possible to calculate total sediment and nutrient movement.

Conclusion

The Discovery Farms Minnesota monitoring site at the Half Century Farm is designed to provide information that will lead to an understanding of how farm management practices can impact sediment and nutrient movement to surface waters (rivers and streams). It is anticipated that monitoring will continue for five to seven years. Monitoring at Half Century Farm will help to identify strengths and challenges of similar farming systems and landscapes.

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MINNESOTA DEPARTMENT OF AGRICULTURE

MAWRC MINNESOTA AGRICULTURAL WATER RESOURCE CENTER

CLEAN WATER LAND & LEGACY AMENDMENT

HALF CENTURY FARM
Farm, Site and Study Design

DISCOVERY FARMS MINNESOTA

Overview Of Operation

Located in Rapidan Township in Blue Earth County, Half Century Farm is owned and operated by Doug and Deb Hager. Doug works on the farm full time. Deb has a career in Mankato, but helps on the farm during the busy seasons. A close family friend, Mark Meyer, also helps out when needed.

After high school graduation, Doug completed a two-year Agri Business degree at South Central Technical College in Mankato. Then, he went to work as a mechanic in Mankato for several years and helped his dad (Mike) with the family farm. Doug assumed full management of the farm in the late 1990's. The farm produces corn, soybeans and hogs. Doug is a contract finisher in the hog industry.

Since most of Half Century Farm is bordered by rivers, streams, and ravines, there have always been erosion concerns. Doug and his dad own their own excavation and tiling equipment and much of the off-season time is spent maintaining waterways and tile outlets which drain water from the farm.

Doug's spare time is consumed by Le Sueur County Pioneer Power Association, where he is on the Board of Directors and active in running the association. He is also on the AgriHall committee of Farmamerica.

Doug agreed to participate in the Discovery Farm program because he wanted to know how his farming practices are affecting the amount of sediment, nitrogen, and phosphorus moving over the landscape or into tile drains. He is a strong advocate for conservation. He believes that "if you farm in Blue Earth County, you should be concerned about conservation". Doug realizes that the soil resource cannot last forever without protection. Profitable farming will only be possible in the future if the soil resource is preserved.

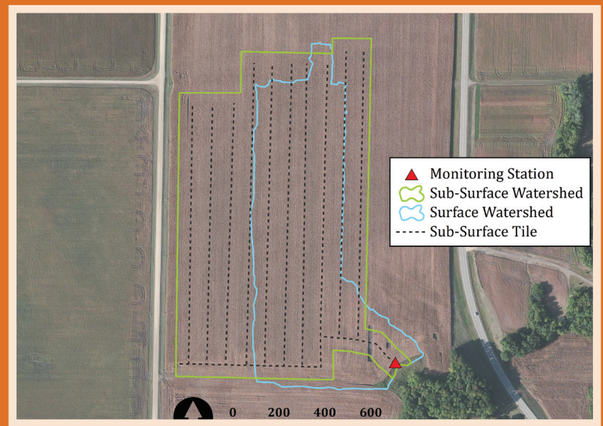
Cropping Sequence

The traditional corn-soybean rotation is used on Half Century Farm, one year of corn followed by one year of soybeans. The Half Century Farm uses conventional tillage practices. Fields are fall chiseled following corn and soybean harvest. With this rotation, half of the acres are planted to corn and half to soybeans. Swine manure for the next corn crop is injected into the soybean stubble, as needed, prior to the fall chisel plow tillage. For both corn and soybeans, a field cultivator is used for secondary tillage in the spring before planting. Corn is usually planted at 33,000 plants per acre in late April. Early May is the usual planting date for the soybean crop. Glyphosate (Roundup) and Callisto are used at recommended rates for weed control.

Location and Climate

Half Century Farm is located in the Western Corn Belt Plains region of south central Minnesota. The region is characterized by small streams that drain directly into the Minnesota River. Row crop agriculture is the main land use in the area, with corn and soybean production accounting for approximately 90% of cropped lands. Water leaving the farm flows first to the Big Cobb River, a tributary of the Le Sueur and Minnesota Rivers.

Average maximum summer temperature is 80° to 85° F with an average minimum in the low 60's. For the winter, average daily maximum temperature is 29° F with an average low temperature of 9° F. Average snowfall is 37 inches. Average rainfall is 29 inches with approximately 70% falling during the growing season.



The area outlined in blue delineates the surface monitoring area. The area outlined in green delineates the sub-surface monitoring area. All runoff within each respective area moves in the same direction and flows through a water monitoring station. The triangle indicates the location of the water monitoring station.