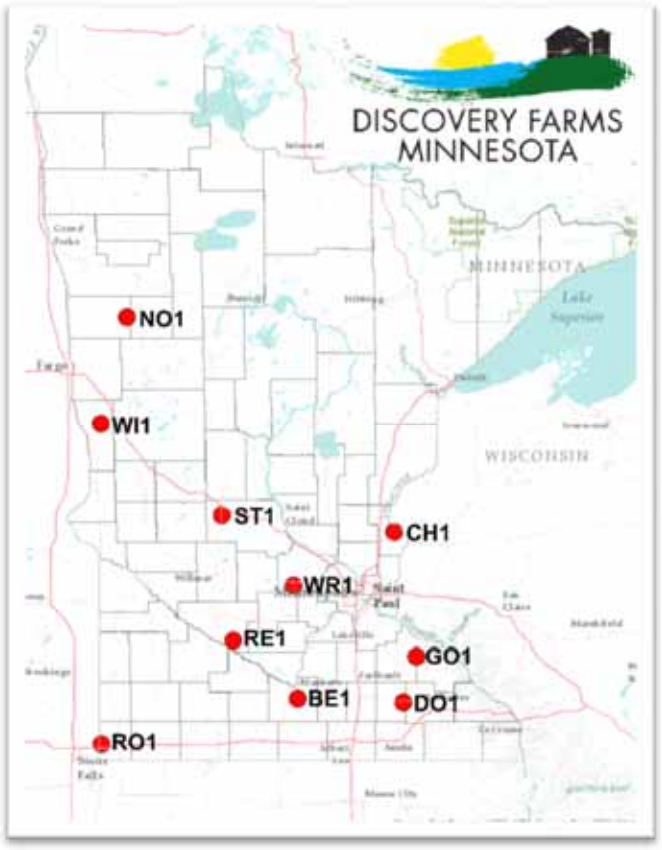
DISCOVERY FARMS MINNESOTA

2015 Year in Review

Discovery Farms Minnesota (DFM) is a farmer led water quality research and educational program. The mission of the program is to collect water quality information under real-world conditions to provide credible and practical information that supports better farm management decisions.

This factsheet summarizes data collected at core farms in water year 2015 (Oct 2014 through Sept 2015) to give a range of precipitation and runoff losses observed throughout the DFM monitoring network. There are currently 10 core farm projects in Minnesota. Annual data is displayed in box plots which display the range of the data collected. The middle line in the box plots represents the median, a number at which half of the values are above and half of the values are below.

The data presented in this factsheet are generated from edge-of-field monitoring sites. Water quality monitoring results from edge-of-field monitoring sites are different than stream monitoring data and standards. Therefore, direct comparisons of the two types of data should not be made. The information presented is only from one year of data collection. Past Discovery Farms research has shown that runoff losses can vary greatly from year to year due to weather conditions, landscape characteristics and farm management practices. Final conclusions should not be made from this information, but rather these data should be used as a point of context for information gained in future years.



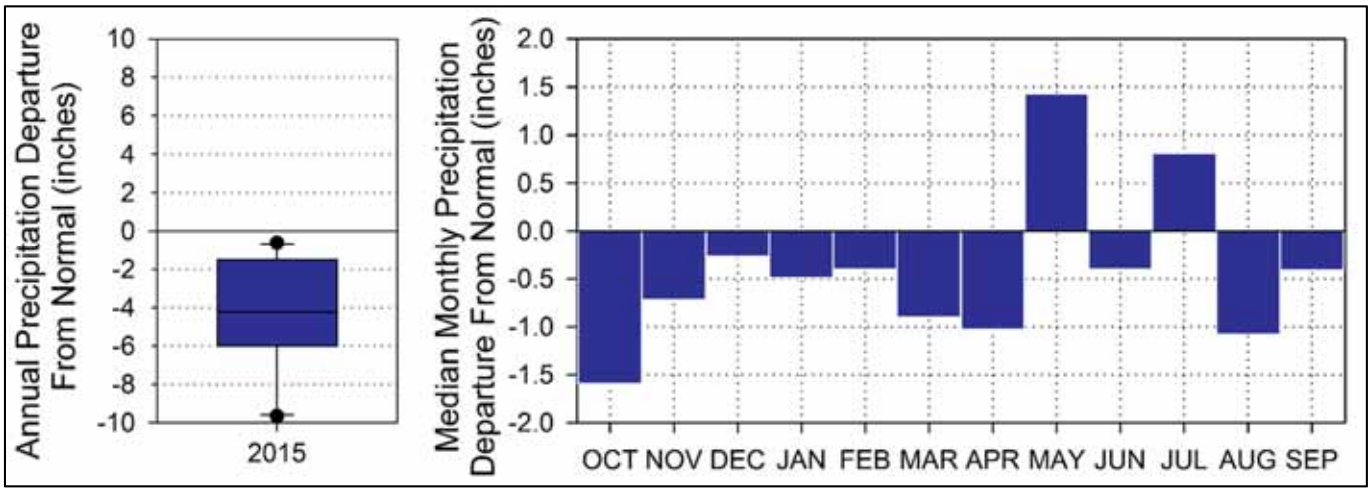
DFM core farm locations

Description of DFM core farm projects

Field ID	Farm Enterprise	Start of Project	Monitoring Setup	Soil Texture	Average Slope	2015 Crop	Tillage	Manure History
GO1	Swine farrow to wean and beef (corn-alfalfa)	Sep-10	Surface runoff (6.3 acres)	Silt loam (well drained)	6.7 %	corn	Fall chisel, spring field cultivator	Yes
ST1	Dairy (corn-alfalfa)	Mar-11	Surface runoff (28.2 acres) and subsurface tile drainage (24.2 acres)	Loam (poorly drained)	4.1 %	alfalfa	Fall chisel, spring field cultivator	Yes
CH1	Grain (corn-soybean)	Mar-11	Surface runoff (6.1 acres)	Loam (well drained)	3.4 %	corn	No primary tillage	No
BE1	Swine finishing and grain (corn-soybean)	Jun-11	Surface runoff (14.3) and subsurface tile drainage (26.2 acres)	Silty clay loam (poorly drained)	1.4 %	corn	Fall chisel, spring field cultivator	Yes
WR1	Dairy (corn-alfalfa)	Dec-11	Surface runoff and subsurface tile drainage (23.9 acres)	Loam (poorly drained)	4.7 %	alfalfa	Fall chisel, spring field cultivator	Yes
RE1	Grain (corn-soybean/sweet corn-peas)	Dec-11	Subsurface tile drainage (81 acres)	Clay loam (poorly drained)	2.0 %	corn & soybean	Fall plow or chisel, spring field cultivator	No
DO1	Swine finishing and grain (corn-soybean)	Oct-12	Surface runoff and subsurface tile drainage (13.9 acres)	Silt loam (poorly drained)	2.9 %	corn	Fall chisel, spring field cultivator	Yes
WI1	Grain (corn-soybean)	Oct-12	Subsurface tile drainage (160 acres)	Very fine sandy loam (poorly drained)	1.1 %	corn	Fall chisel, spring field cultivator	No
NO1W	Grain (sugarbeet-corn-dry bean-soybean-wheat)	Oct-12	Subsurface tile drainage (570.8 acres)	Fine sandy loam (poorly drained)	1.0 %	corn	Fall chisel, spring field cultivator	No
RO1	Beef and grain (corn, soybean and alfalfa)	Oct-13	Surface runoff (25.5 acres)	Silt loam (well drained)	4.7 %	corn	Fall disk rip, spring field cultivator	Yes

PRECIPITATION

Median annual precipitation for DFM sites in 2015 was 4.21 inches below normal, with a range of 8.97 inches below normal to 0.61 inches below normal. Every farm had below normal annual precipitation. Precipitation in 2015 can be characterized by a dry fall heading into winter, lower than normal snowfall, a dry Aril, wet May through June, and dry August.

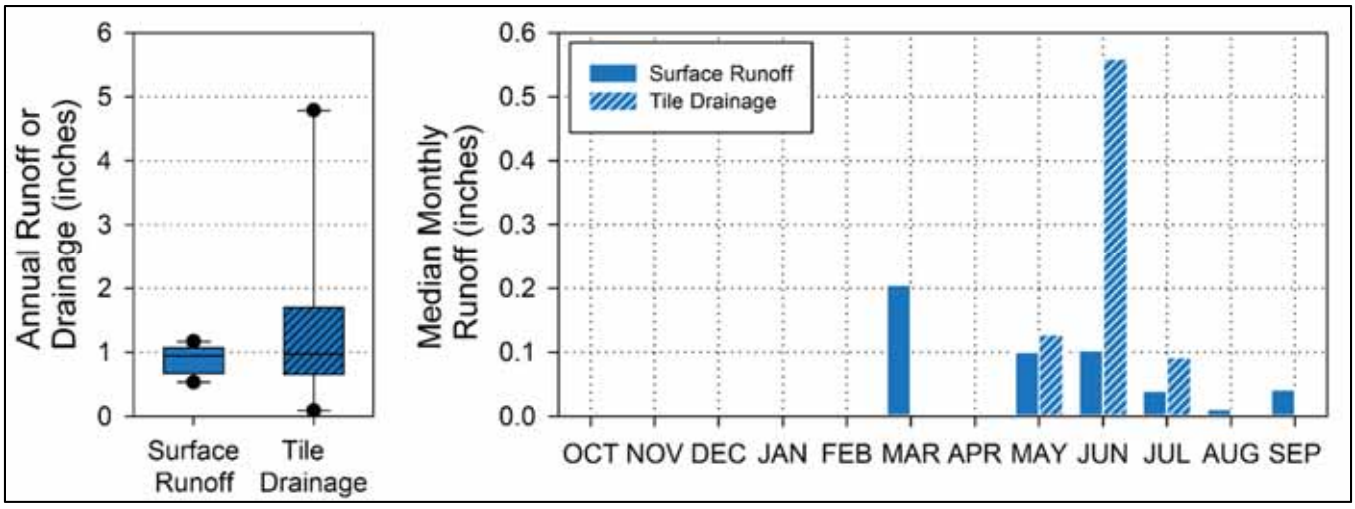


Annual and monthly precipitation departure from normal

RUNOFF

Runoff and drainage were lower in 2015 compared to past years. Median surface runoff in 2015 was 0.94 inches with a range from 0.53 to 1.17 inches. Across the DFM network, 26% of the annual surface runoff occurred during frozen soil conditions, which is lower than in past years of DFM monitoring. There was little snowpack at most sites reducing the amount of frozen soil runoff. Most of the surface runoff occurred in March, May, and June. Median tile drainage was 0.97 inches with a range from 0.09 to 4.79 inches. Only 1% of the subsurface tile drainage was observed during frozen soil conditions with most of the subsurface tile drainage occurring from May through July.

On average, 3% and 6% of the annual precipitation left the monitored fields as surface runoff and tile drainage, respectively. Surface runoff was variable throughout the year with an average of 4 cumulative days of flow. Tile drainage was more constant with an average of 106 cumulative days of flow.

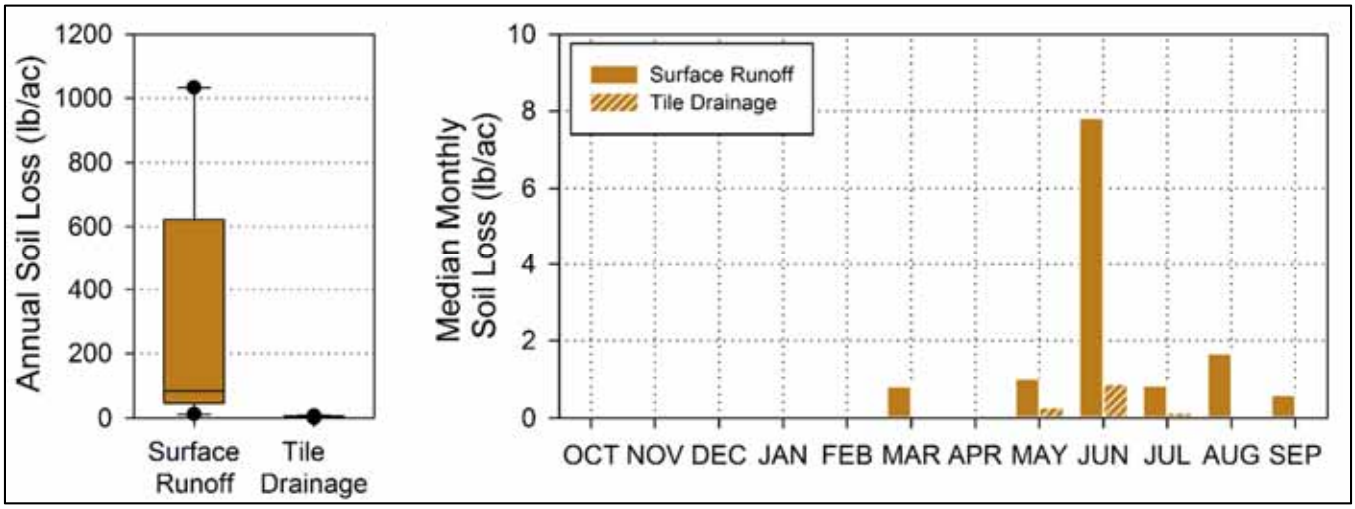


Annual and monthly surface runoff and tile drainage

SOIL LOSS

Soil loss is measured by total suspended solids (TSS), which are mineral and organic solids in water that can be trapped by a filter. Soil loss is driven by surface runoff during non-frozen soil periods. Soil loss timing was similar to past years of

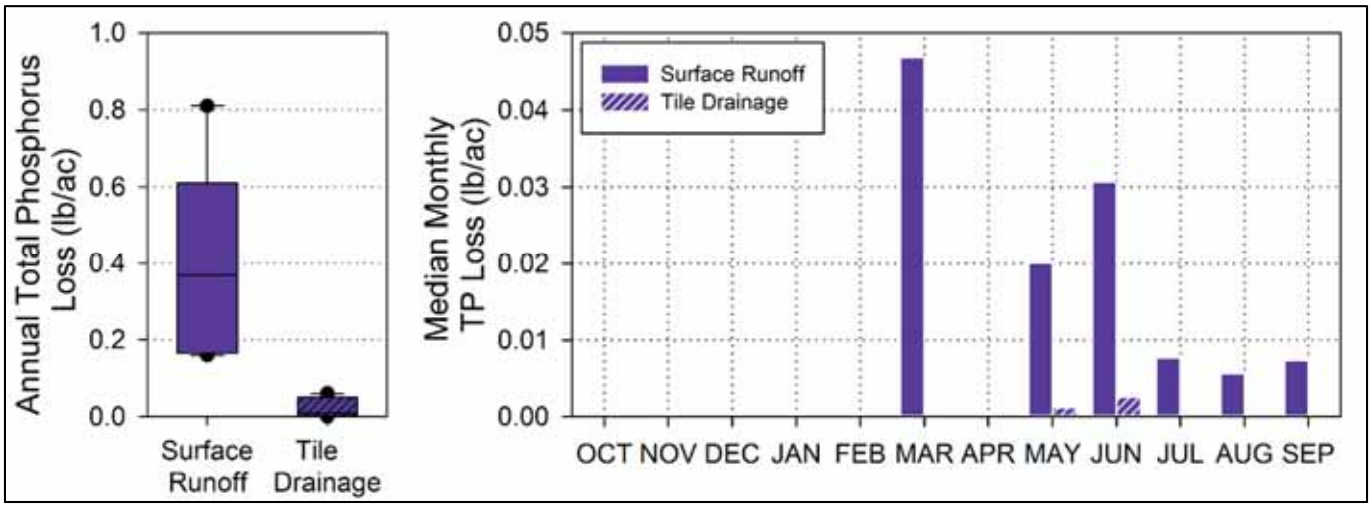
Discovery Farms research with the time period after planting until the crop canopy is established the most critical time for soil loss. Overall losses were lower due to limited surface runoff in 2015. Median soil loss from surface runoff in 2015 was 85 lb/ac with a range from 12 to 1033 lb/ac. Almost all of the surface runoff soil loss was observed in June. Median soil loss from tile drainage was 3 lb/ac with a range from <1 to 7 lb/ac.



Annual and monthly soil loss

PHOSPHORUS LOSS

Total phosphorus (TP) refers to the combined total of particulate phosphorus, which is attached to soil particles, and dissolved phosphorus, which is not attached to soil particles. Phosphorus loss is driven by surface runoff. Results from 2015 were similar in timing to past years of DFM research, however total losses were lower due to decreased surface runoff. Median TP loss from surface runoff in 2015 was 0.4 lb/ac with a range from 0.2 to 0.8 lb/ac. Median TP loss from tile drainage was <0.1 lb/ac with a range from <0.1 to 0.1 lb/ac. The timing of phosphorus loss mimicked the timing of surface runoff. Frozen soils in March contributed 15% of the annual TP loss and during this month, most of the TP loss was in the dissolved form. Seventy-three percent of the annual TP loss occurred in May, June, and July and during these months most of the TP loss was in the particulate form.

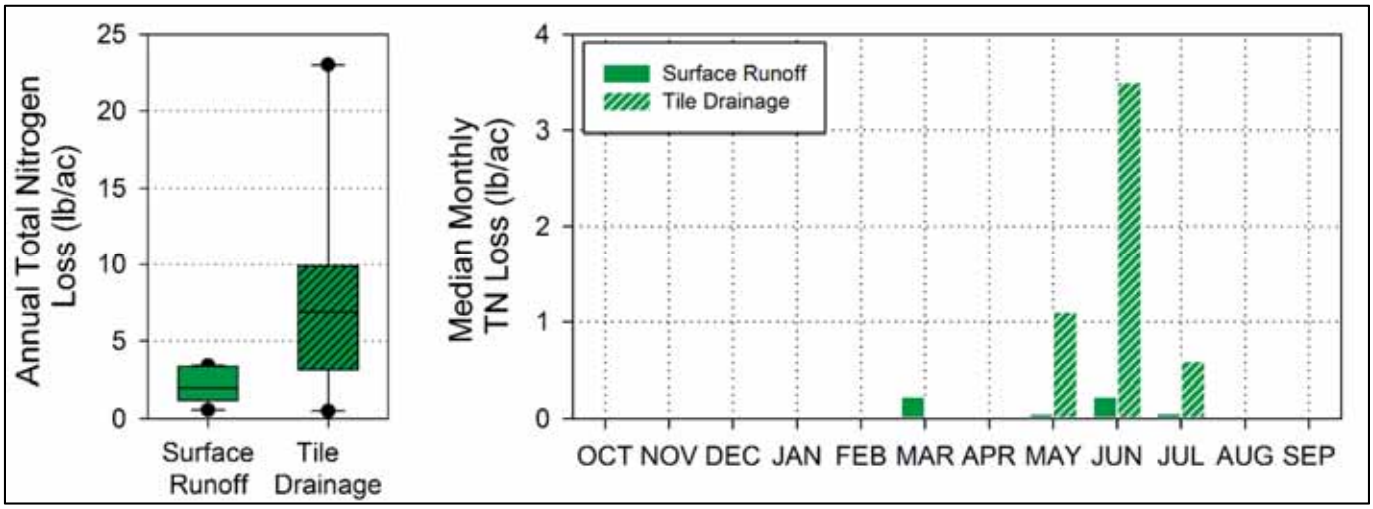


Annual and monthly total phosphorus loss

NITROGEN LOSS

Total nitrogen (TN) refers to the combined total of nitrate nitrogen, ammonia nitrogen and organic nitrogen. Nitrogen loss is primarily driven by tile drainage. Median TN loss from surface runoff in 2015 was 2.0 lb/ac with a range from 0.6 to 3.4 lb/ac. Surface runoff TN loss was mostly in the organic nitrogen form. Median TN loss from tile drainage was 6.9 lb/ac with a range from 0.5 to 23 lb/ac. Almost all of the tile drainage TN loss was in the nitrate-nitrogen form. The timing of tile

drainage paralleled the timing of TN loss, with May through July being the most active. Total nitrogen concentrations in 2015 were similar to past years of DFM research, however, TN losses from 2015 were lower than past years because of decreased amount of tile drainage.



Annual and monthly total nitrogen loss

CONCLUSION

The data collected by the Discovery Farms program is building an understanding of actual surface runoff, tile drainage, sediment loss and nutrient loss at the edge of field on representative farms across the state. While there are opportunities to improve soil and nutrient losses throughout the DFM network, many of the locations are doing an excellent job protecting water resources. Soil and phosphorus losses, which are surface runoff concerns, and nitrogen losses, which are a subsurface tile drainage concern, are relatively low throughout the DFM monitoring network except for a few locations. The program will work to implement management practices to reduce soil, phosphorus, and nitrogen losses at those locations. The DFM program will continue to document the good practices that protect water quality while also helping identify areas for potential improvement.

For more information about Discovery Farms Minnesota, please contact:

Tim Radatz
(608) 443-6587
radatz@mawrc.org

George Rehm
(507) 263-9127
rehmx001@umn.edu

Scott Matteson
(507) 344-3201
Scott.Matteson@state.mn.us

MAWRC
MINNESOTA AGRICULTURAL WATER RESOURCE CENTER

CLEAN WATER LAND & LEGACY AMENDMENT

MINNESOTA DEPARTMENT OF AGRICULTURE