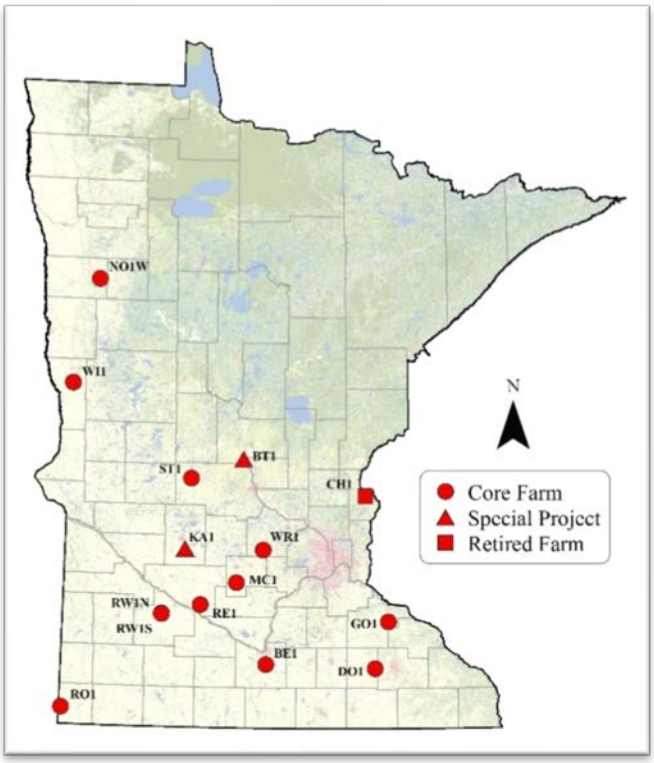
DISCOVERY FARMS MINNESOTA

2017 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 2017 (October 2016 through September 2017) to give a range of precipitation and runoff losses observed throughout the DFM monitoring network. In 2017, there were 9 core farm projects. Annual data is displayed in box plots which display the range of the data collected. Average annual or monthly values are also labeled on the box plots.

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.



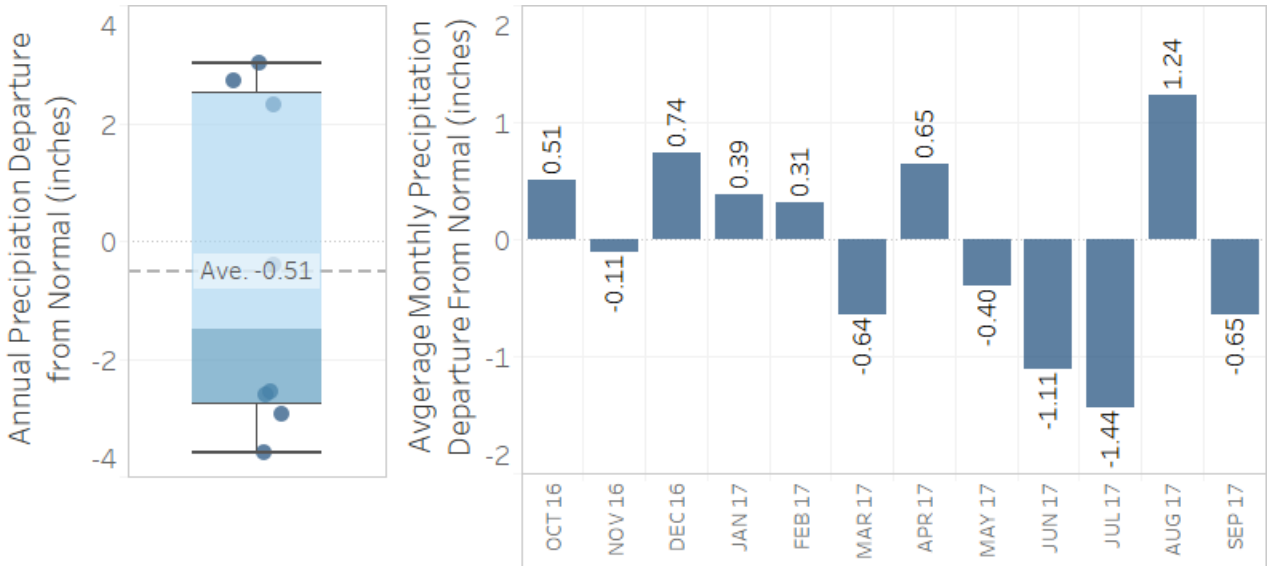
Discovery Farms project locations in Minnesota.

Description of DFM core farm projects.

Site	Farm Enterprise	Data Collection	Monitoring Setup	Soil Texture	Average Slope	2017 Crop	Tillage	Manure History
CH1	Grain (corn-soybean)	2011-2016	Surface runoff (6.1 acres)	Loam (well drained)	3.4 %	-	No primary tillage	No
GO1	Swine farrow to wean and beef (corn-alfalfa)	2011-2017	Surface runoff (6.3 acres)	Silt loam (well drained)	6.7 %	alfalfa	Fall chisel, spring field cultivator	Yes
ST1	Dairy (corn-alfalfa)	2011-2017	Surface runoff (28.2 acres) and tile drainage (24.2 acres)	Loam (poorly drained)	4.1 %	alfalfa	Fall chisel, spring field cultivator	Yes
BE1	Swine finishing and grain (corn-soybean)	2011-2017	Surface runoff (14.3) and tile drainage (26.2 acres)	Silty clay loam (poorly drained)	1.4 %	corn	Fall chisel, spring field cultivator	Yes
WR1	Dairy (corn-alfalfa)	2012-2017	Surface runoff and tile drainage (23.9 acres)	Loam (poorly drained)	4.7 %	alfalfa	Fall chisel, spring field cultivator	Yes
RE1	Grain (corn-soybean/sweet corn-peas)	2012-2017	Tile drainage (81 acres)	Clay loam (poorly drained)	2.0 %	corn	Fall plow or chisel, spring field cultivator	No
DO1	Swine finishing and grain (corn-soybean)	2012-2017	Surface runoff and tile drainage (13.9 acres)	Silt loam (poorly drained)	2.9 %	corn	Fall chisel, spring field cultivator	Yes
WI1	Grain (corn-soybean)	2013-2017	Tile drainage (160 acres)	Very fine sandy loam (poorly drained)	1.1 %	corn	Fall chisel, spring field cultivator	No
NO1W	Grain (sugar beet-corn-dry bean-soybean-wheat)	2013-2017	Tile drainage (570.8 acres)	Fine sandy loam (poorly drained)	1.0 %	sugarbeet	Fall chisel, spring field cultivator	No
RO1	Beef and grain (corn, soybean, and alfalfa)	2014-2017	Surface runoff (25.5 acres)	Silt loam (well drained)	4.7 %	corn	Fall disk rip, spring field cultivator	Yes
MC1	Grain (corn-soybean)	2018	Surface runoff and tile drainage (56.7 acres)	Loam (moderately well drained)	2.8%	-	Fall disk rip, spring field cultivator	No
RW1N	Grain (corn-soybean)	2018	Surface runoff and tile drainage (12.2 acres)	Loam (well drained)	3.3%	-	Fall disk rip, spring field cultivator	No
RW1S	Grain (corn-soybean)	2018	Surface runoff and tile drainage (10.2 acres)	Loam (well drained)	2.6%	-	Fall disk rip, spring field cultivator	No

PRECIPITATION

Average annual precipitation for DFM sites in 2017 was 0.51 inches below normal, with a range of 3.60 inches below normal to 3.01 inches above normal. Precipitation in 2017 can be characterized by near normal conditions until June, a dry June and July, and wet August.

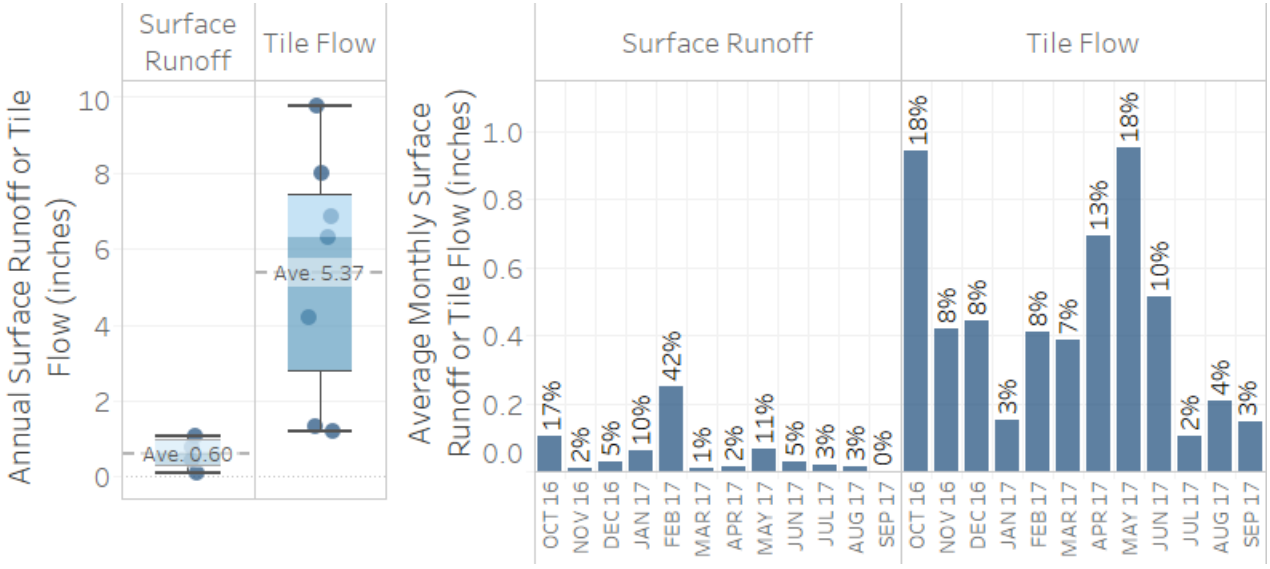


Annual and monthly precipitation departure from normal in water year 2017.

RUNOFF

Surface runoff was lower and tile flow was similar in 2017 compared to past years. Average surface runoff in 2017 was 0.60 inches with a range from 0.11 to 1.09 inches. Across the DFM network, 52% of the annual surface runoff occurred during frozen soil conditions in January and February. Compared to past years there was more surface runoff than usual in October. Most of the surface runoff occurred in October, February, and May. Average tile flow was 5.37 inches with a range from 1.18 to 9.75 inches. Tile flow was relatively consistent from October through June with lower amounts in July, August, and September.

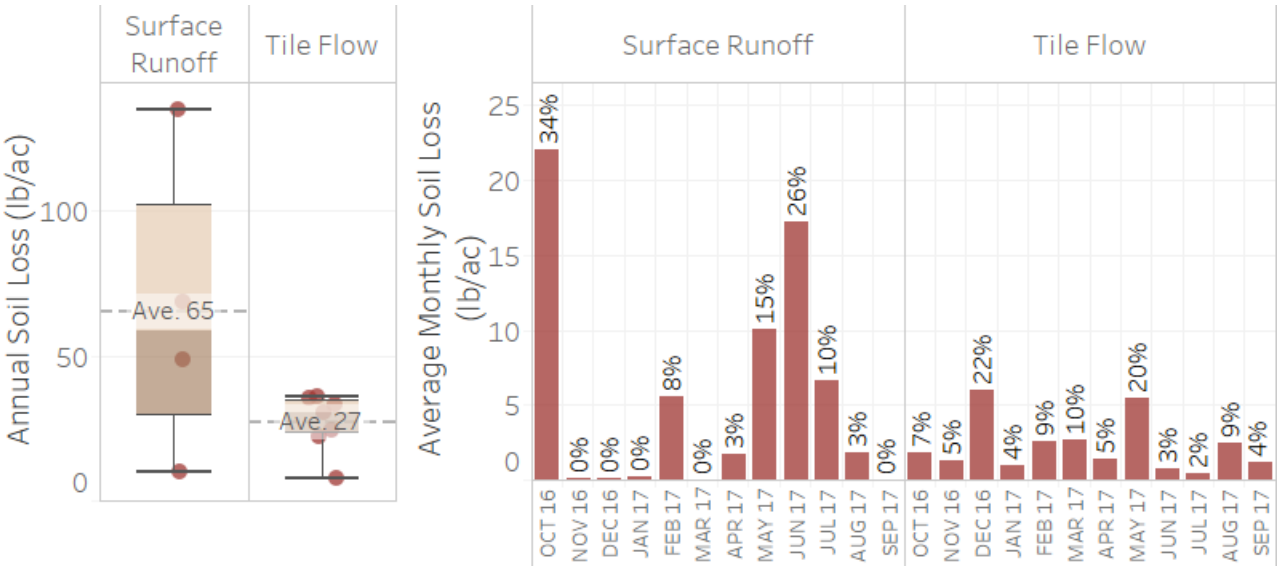
An average of 2% and 18% of the annual precipitation left the monitored fields as surface runoff and tile flow, respectively. Surface runoff was variable throughout the year with an average of 12 cumulative days of flow. Tile flow was more constant with an average of 248 cumulative days of flow.



Annual and monthly surface runoff and tile flow in water year 2017.

SOIL LOSS

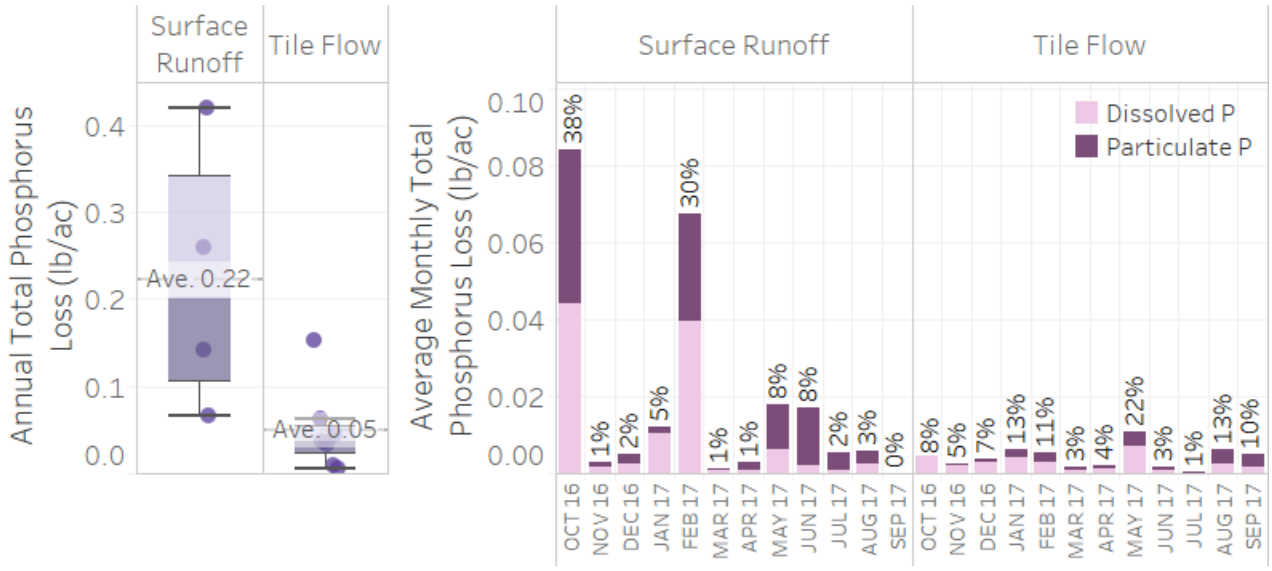
Soil loss is measured by total suspended solids (TSS), which are mineral and organic solids in water that can be trapped by a filter. Soil loss is driven by surface runoff during non-frozen soil periods. In 2017, soil losses were lower than past years. The timing of soil loss was somewhat different compared to past years. Usually, the time after planting until the crop canopy is established is the most critical time for soil loss. About one third all the soil loss in 2017 was observed in October. Average soil loss from surface runoff in 2017 was 65 lb/ac with a range from 10 to 135 lb/ac. Average soil loss from tile flow was 27 lb/ac with a range from 8 to 36 lb/ac.



Annual and monthly soil loss in water year 2017.

PHOSPHORUS LOSS

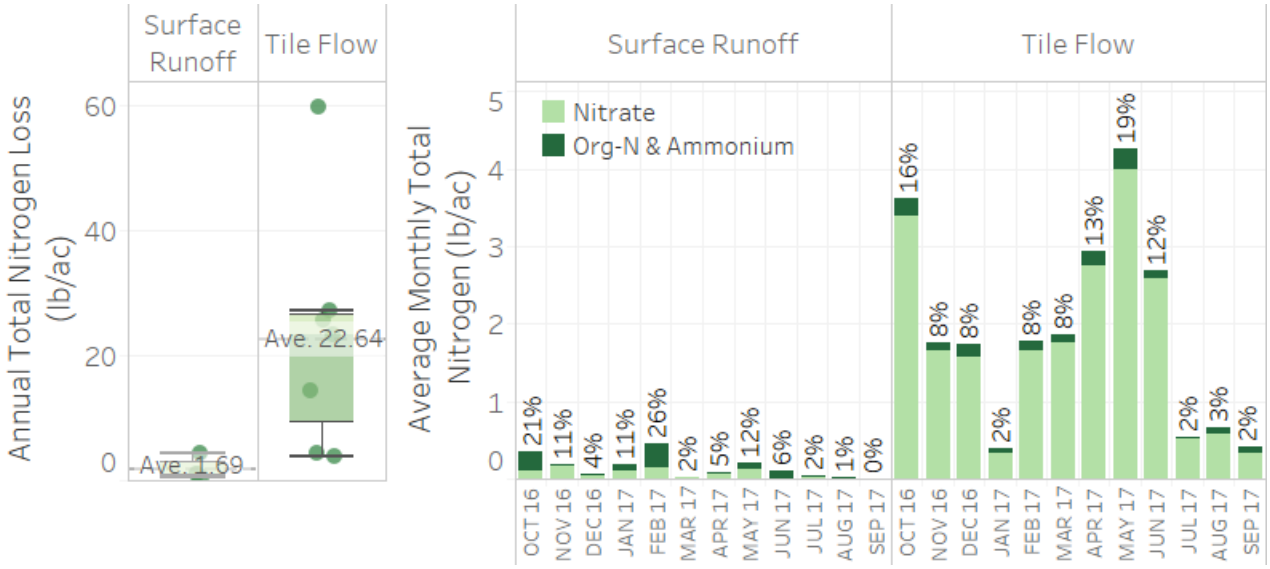
Total phosphorus (TP) refers to the combined total of particulate phosphorus, which is attached to soil particles, and dissolved phosphorus, which is not attached to soil particles. Surface runoff primarily drives phosphorus loss. Phosphorus losses in 2017 were lower compared to previous years. Average TP loss from surface runoff in 2017 was 0.22 lb/ac with a range from 0.07 to 0.42 lb/ac. Fifty-one percent of the surface runoff TP loss was in the dissolved form. Most of the surface runoff TP loss was in October and February. Average TP loss from tile flow was 0.05 lb/ac with a range from <0.01 to 0.15 lb/ac.



Annual and monthly total phosphorus loss in water year 2017.

NITROGEN LOSS

Total nitrogen (TN) refers to the combined total of nitrate nitrogen, ammonium nitrogen, and organic nitrogen. Tile flow primarily drives nitrogen loss. Average TN loss from surface runoff in 2017 was 1.69 lb/ac with a range from 0.41 to 4.27 lb/ac. Surface runoff losses were 47% nitrate-N and 53% organic nitrogen and ammonia. Average TN loss from tile flow was 22.64 lb/ac with a range from 3.90 to 59.70 lb/ac. Ninety-three percent of the tile flow TN loss was in the nitrate-N form. The timing of tile flow paralleled the timing of TN loss, with relatively consistent loss from October through June. Tile total nitrogen concentrations and losses in 2017 were similar compared to past years of DFM research. Historically, the months of May and June have the most activity for total N loss.



Annual and monthly total nitrogen loss in water year 2017.

CONCLUSION

The data collected by the Discovery Farms program is building an understanding of actual surface runoff, tile flow, 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 tile flow 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

Jerome Lensing
(507) 251-9101
jlensing@mawrc.org

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

MAWRC MINNESOTA AGRICULTURAL WATER RESOURCE CENTER

CLEAN WATER LAND & LEGACY AMENDMENT

DEPARTMENT OF AGRICULTURE