

## CONTROLLING NUTRIENT LOSS

Amber Radatz<sup>1</sup>

UW Discovery Farms, part of UW-Extension, works with Wisconsin farmers to identify the water quality impacts of different farming systems around the state. Discovery Farms programs of Wisconsin and Minnesota have collected water quality information from a wide variety of farming systems. There are many management styles and landscapes represented in the monitored fields.

### **Discovery Farms has a large edge-of-field dataset from working farms.**

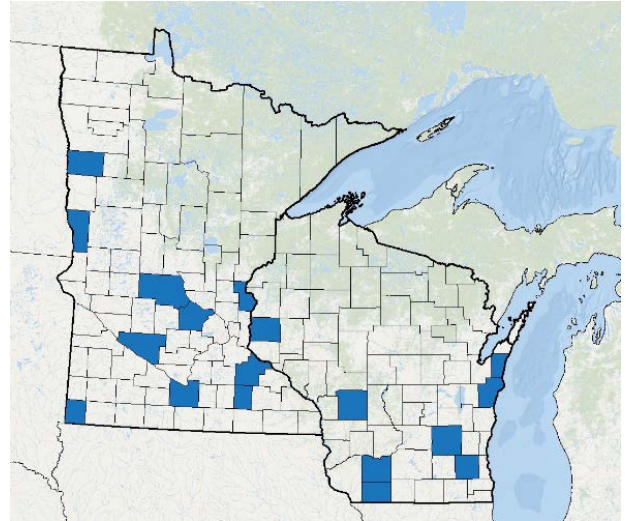
Edge-of-field water quality information has been collected from over 17 farms and 21 fields starting in 2002. In total, Discovery Farms has 200 site years of data, and 85 site years of surface runoff data. This surface runoff data is valuable in making conclusions and recommendations about farming systems' impacts on water quality.

### **There are several clear lessons learned from the dataset.**

Conservation practices still work and are still important. The first step to reducing phosphorus loss is to control soil loss. This means paying attention to farmed areas, non-farmed areas, and the points where these two intersect. Upland practices alone, like conservation tillage or no-till, are not enough to eliminate erosion. These beneficial upland practices must be paired with treatment practices like waterways for maximum erosion protection.

There are areas where tillage does not lead to large soil loss. Overall, our data shows that the soil losses for tillage sites and no-till sites are usually pretty similar. However, there are fields where tillage was too intense for the landscape conditions in which large soil losses were monitored. No-till practices do a good job of eliminating overall soil loss when paired with the appropriate conservation practices.

Once soil loss is controlled, the next step to reducing phosphorus loss involves fine tuning nutrient timing and placement. The average total phosphorus loss values between tillage and no-till farms is not significantly different. Some of the largest phosphorus losses monitored have resulted from nutrient applications shortly before runoff. When nutrients are applied to the surface, careful attention to the risk for runoff in the near future is necessary. Discovery Farms data indicate that the risk for runoff is highest in March and June.

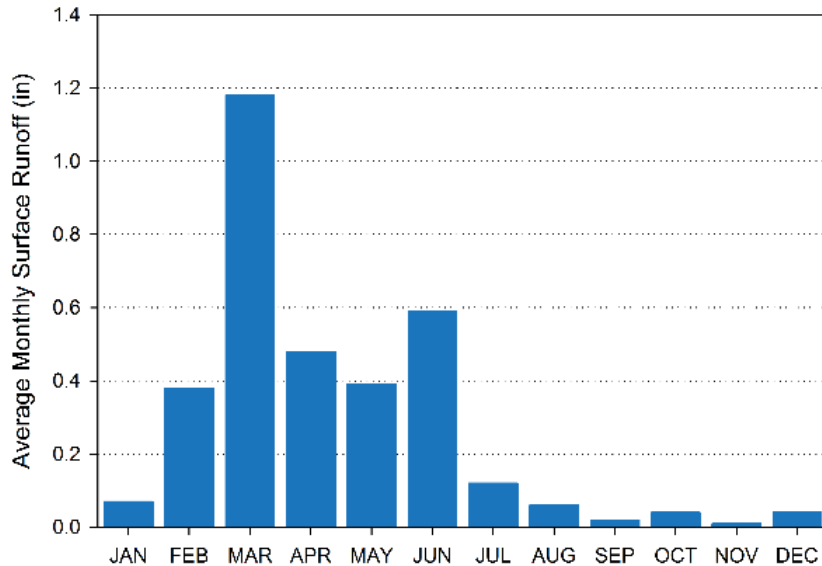


---

<sup>1</sup>Co-Director, UW Discovery Farms Program, UW Extension.

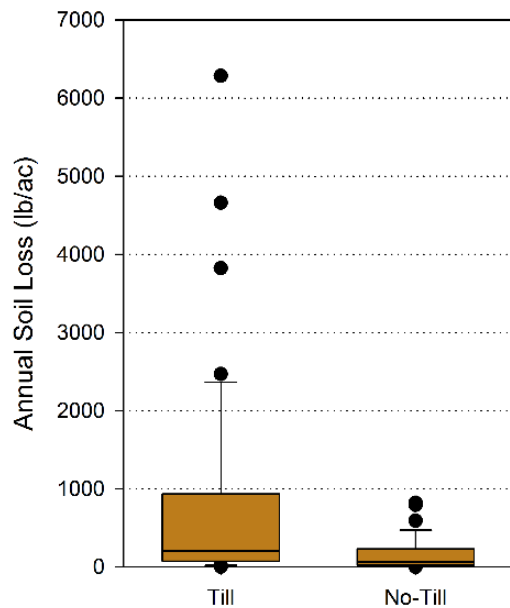
### Soil type, frozen soils and soil moisture largely determine runoff.

- While the soil is frozen or snow is melting, the amount of runoff that leaves the field is mostly dependent on weather factors.
- Field management does not significantly impact the amount of runoff during frozen or saturated conditions. The risk for runoff is highest in March and June. The months with the most risk for soil loss are April, May, and June because of saturated conditions and frequent showers.
- Recognize the different runoff potential of the soils in each field and the practices that can be used to minimize negative impacts from surface runoff.



### No-till systems minimize soil loss.

- Tillage must be well matched to the landscape to keep soil loss at a minimum. High annual soil losses suggest a need to re-evaluate tillage practices to match the landscape conditions (slope, soil type, slope length).
- A sustainable level of annual soil loss is below 1,000 pounds per year.
- In addition to gully erosion, soil movement in a field is also indicated by sedimentation in lower areas of the field, rills running down hillsides, and soil covered emerging crops.
- Regardless of the tillage type, conservation practices like waterways should be layered onto upland practices to prevent soil losses.



### Phosphorus loss is affected by placement and timing.

- Annual phosphorus loss of approximately one pound or less per acre is an achievable goal for most fields when erosion is controlled and applications are monitored closely.
- It takes more than a tillage adjustment to reduce total phosphorus losses. P loss is affected by placement of phosphorus and timing of application.
- Dissolved P losses can increase as a result of continuous surface applications of manure and manure applications shortly before runoff events. Late winter manure applications increase P concentrations in snowmelt by 2 to 4 times.
- In no-till systems, look for ways that nutrients can be delivered below the soil surface. This can reduce dissolved P loss, especially during winter runoff.

