

Controlling nutrient loss

Revised Winter 2019



DISCOVERY
FARMS
UW - Madison Division of Extension

UW Discovery Farms, a program of UW-Madison Division of Extension, works with Wisconsin farmers to identify the water quality impacts of different farming systems around the state. The 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.

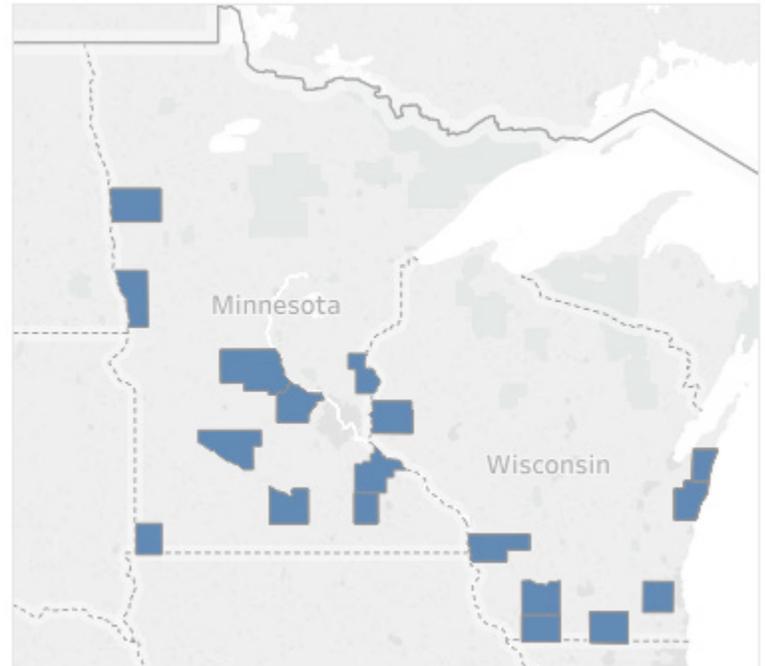
Discovery Farms has a large edge-of-field dataset from working farms.

24 Farms

36 Fields

217 Site Years

Edge-of-field water quality information has been collected from 24 farms and 36 fields starting in 2002. In total, Discovery Farms has 217 site years of data, and 134 site years of surface runoff data. This surface runoff data is valuable in making conclusions and recommendations about farming systems' impact 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. The Runoff Risk Advisory Forecast (manureadvisorysystem.wi.gov) is a great tool that provides maps showing short-term runoff risk for daily application planning.

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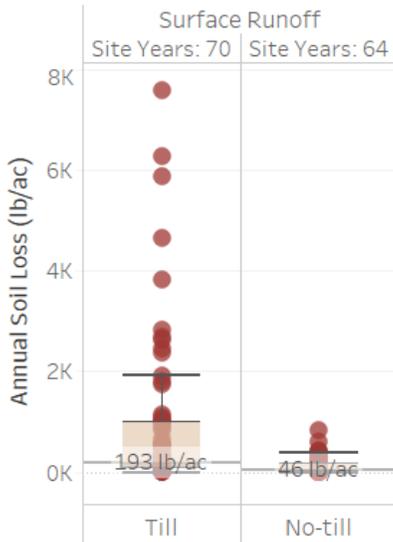
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Risk is high in April, May and June. Where does your water flow?

Field management doesn't significantly impact the amount of runoff during frozen or saturated conditions. The risk for runoff is highest in March and June. The risk for soil loss is highest in April, May and June because of saturated conditions and frequent showers. Take a drive during these months and watch where water flows.

Jan Feb Mar **Apr** **May** **Jun** Jul Aug Sep Oct Nov Dec

Control soil loss. Is your tillage landscape-appropriate?



Tillage must be well matched to the landscape to keep soil loss at a minimum. High annual soil losses, like the outliers on the tillage boxplot, suggest a need to re-evaluate tillage practices to match the landscape conditions (slope, soil type, slope length).

In addition to gully erosion, soil movement in a field is also indicated by sedimentation in the lower areas of the field, rills running down hillsides, and soil covered emerging crops.

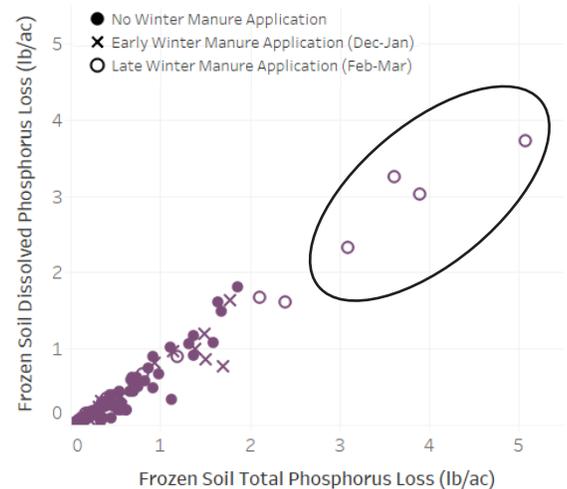
Regardless of the tillage type, conservation practices like waterways should be layered onto upland practices to prevent soil losses.

Carefully time manure applications. Can you avoid late winter?

Late winter manure application can increase phosphorus loss in snowmelt by 2 to 4 times. (dots in black circle on graph).

If you have storage, make sure that it is empty enough earlier in the winter to avoid spreading in February and March.

If you don't have storage or must spread to avoid overflow, work with your advisors to identify low-risk fields and watch the weather for a rain or melt event in the forecast. If possible, find areas with little snow cover or plow an area to try and get the manure to make soil contact.



Consider phosphorus placement. Can you get it below the surface?

Controlling erosion controls particulate P loss, the portion of P that moves with soil. It does not, however, control dissolved P losses. Thus similar Total Phosphorus (TP) losses have been seen in tillage and no-till systems (left two boxplots).

Dissolved P losses (right two box plots) can increase as a result of continuous surface applications.

Delivering nutrients below the surface reduces dissolved phosphorus loss, especially in winter runoff.

