

# Manure application through the seasons

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Discovery Farms has monitored water quality on farms that utilize manure for over a decade. Results offer insight into manure management strategies that minimize nitrogen and phosphorus loss.

There is tremendous power in understanding the conditions that lead to runoff and a heightened risk for nutrient loss. Using that knowledge to make small tweaks can pay big dividends towards achieving sustainable levels of nutrient loss.

## BEFORE PLANTING

*One Discovery Farms participant reduced phosphorus loss from nearly four pounds per acre to one pound per acre annually just through closely watching weather conditions and finding ways to avoid spreading right before runoff.*

### Watch for dissolved phosphorus loss.

Things like depth of snow, how it melts, how frozen the soil is, and rain, all determine the amount of runoff during the winter and specifically, March. Discovery Farms data shows that dissolved phosphorus loss is two times higher in March than any other month. Land use does not play much of a role in the volume of runoff during this time period. Land use does, however, factor into what nutrients leave in runoff. Use these three management strategies when applying manure before planting.

#### Avoid manure application shortly before snowmelt or runoff.

The soil and snow conditions of late winter are riskier for nutrient loss than early winter. Discovery Farms data shows that late winter manure applications lead to phosphorus losses two to four times higher than early winter or no winter manure application. The Runoff Risk Advisory Forecast can be a great tool for your toolbox to make decisions about when to spread.

#### Consider placement.

Using no till or limited tillage does a great job of minimizing soil loss. However, continuous surface application of manure without incorporation creates high levels of phosphorus in the upper soil layer that can lead to increased dissolved phosphorus runoff. It is a real challenge to get good placement of nutrients without doing too much disturbance and causing soil loss. Placement of phosphorus is a subtle adjustment that needs more attention, but not at the expense of soil conservation.

#### Identify lower risk fields.

If you must spread manure every month of the year, work with your conservation resource person to identify fields that are at a lower risk for surface runoff or groundwater impact.

## GROWING SEASON

### Early growing season manure is at risk to run off.

June is the next highest month for runoff behind March, and is a time when crops start to use nutrients for rapid growth. With historically normal weather patterns, there is a good chance there will be runoff in June. There are times when manure needs to be hauled or crops need nutrients from fertilizer in the growing season. When runoff risk is high, make sure to understand conditions and crop needs.

On one participating farm, N, P and K were applied as part of a blend in June, after first cutting of alfalfa. A runoff event occurred within a week of application two years in a row. P and N losses spiked to 1.5 to 2 lbs/ac. in June alone, a dramatic increase compared to the first two years of the study when June P and N losses were less than a .25 lbs/ac.

### Understand crop needs.

Base crop nutrient decisions on soil test results and research based recommendations, and be sure to accurately credit N-P-K delivered with livestock manure. There is seldom a time when a healthy alfalfa field needs nitrogen fertilizer. Extra potassium (potash) may be the only nutrient needed on a hay field in a livestock farming system. If the crop doesn't need it, don't put it on.

### Manure applied in June comes with risk.

Similar to the side story, manure applied in June, after first crop hay, could contribute to nutrient loss in a runoff event. If manure needs to be applied to accommodate storage capacity or to fertilize, July and August have a much lower risk for runoff.

### Be aware of summer manure applied on tile drained land.

Dry soil cracking and earthworm macropores can create unhindered openings from the soil surface down to tile.



## AFTER HARVEST Be mindful of soil temperatures.

On one participating farm, a fall manure application made when the soil was 50 degrees F increased N concentration in tile lines the following spring. The highest N concentration from the previous two years was 40 ppm, while the spring following the fall application had N concentrations ranging from 40 to 70 ppm.

Life in soil is much more active in September than in December. In particular, nitrifying bacteria are very active in soil until soil temperatures dip consistently below 50 degrees F. When manure is applied while nitrifying bacteria are still active, nitrogen concentrations in tile lines increase. If you don't have tile lines, that leached nitrogen could make its way towards groundwater sources. Use these three considerations for fall manure applications.

### Wait to apply until soil temperatures have cooled down.

By late October (after the 20th), soil temperatures have usually cooled enough to slow bacterial activity and decrease the risk for nitrogen loss.

### Use a nitrification inhibitor to reduce the activity of nitrifying bacteria if you need to spread manure in the fall on warmer soils.

This solution may allow you to spread two-three weeks earlier, but the risk protection does not extend much beyond that.

### Establish a cover crop that could take up some nitrogen for putting growth on before winter.

Harvesting the cover crop for extra forage may mean that you can open up another manure application window in the spring or fall before the next crop.