

# TECHNICAL NOTE

AGRONOMY TECHNICAL NOTE NO. 18

June 2015

## Assessing the Risk of Phosphorus Loss to South Dakota (SD) Surface Water Resources

### Introduction

Phosphorus is a nutrient that is essential for plant growth. It is applied extensively on agricultural lands across SD, either as a commercial fertilizer or as a naturally occurring component of organic materials such as manure. Phosphorus also promotes growth of aquatic forms of vegetation, both microscopic and macroscopic. Over-enrichment of surface waters with phosphorus may result in accelerated biologic activity and eutrophication, reducing a waterbody's fitness to meet its intended use.

There is a risk that phosphorus applied as a plant nutrient on upland may be transported by water or wind to a waterbody. The level of risk is relative to:

- the concentration of water-soluble phosphorus on or near the soil surface.
- the concentration of plant available phosphorus in the soil (as measured by soil test).
- the potential of the soil being transported by erosion to a waterbody.

The following matrix should be used to assess the level of that risk. It should also be used to develop mitigation strategies to reduce that risk, and to identify conditions under which no phosphorus should be applied.

South Dakota Phosphorus Loss Risk Assessment						
Soil Test Phosphorus (ppm)		Predicted annual soil erosion = sum of wind and water				
		<6 <i>tons per acre per</i>		6 - 8 <i>tons per acre per</i>		>8 <i>tons per acre per year</i>
		100' vegetative buffer		100' vegetative buffer		
Olson	Bray-1	yes	no	yes	no	
0-25	0-35	Low	Low	Low	Low	Moderate
26-50	36-75	Low	Low	Low	Moderate	High
51-75	76-110	Low	Moderate	Moderate	Moderate	High
76-100	111-150	High	High	High	High	No application
>100	>150	No application	No application	No application	No application	No application

**Low Risk** - Phosphorus can be applied at rates greater than crop phosphorus removal not to exceed the nitrogen requirement for the succeeding crop.

**Moderate Risk** - Phosphorus can be applied not to exceed crop phosphorus removal for up to a five year crop sequence. Application cannot exceed the nitrogen requirement for the succeeding crop.

**High Risk** - Phosphorus can be applied not to exceed one year crop phosphorus removal. Application cannot exceed the nitrogen requirement for the succeeding crop. The following requirements must also be met:

1. A soil phosphorus drawdown strategy has been implemented.
2. A site assessment for nutrients and soil loss has been conducted to determine if mitigation practices are required to protect water quality.
3. Any deviation from these high risk requirements must have the approval of the Chief of the NRCS.

## **Planning Considerations:**

Calculate wind erosion using the Wind Erosion Prediction System (WEPS) for all fields with predominate soils having a Wind Erodibility Index (WEI) of 134 or greater, or if a wind erosion resource concern exists.

Crop removal is the amount of phosphorus used in one crop year according to SDSU-Extra 8009, "Quantities of Nutrients Contained in Crops."

All commercial fertilizer phosphorus sources should be placed below the soil surface (surface application followed shortly with tillage is considered below the surface). However, surface application is permitted on no-till cropland, pastureland, or hayland. In all other cropland tillage systems, phosphorus sources will be placed below the soil surface.

Winter manure applications are allowed only when all of the following conditions are met:

1. When incidental amounts of manure are collected during feedlot snow removal or cleaning of feed bunks or enclosed pens to facilitate livestock feeding and handling.
2. Winter manure applications will not exceed the rate per acre calculated in the nutrient budget for the application field based on fall soil test results.
3. Set back distances from surface waters or water conveyances will be 300 feet and 1,000 feet from named lakes, rivers, and perennial streams.
4. Winter manure applications are prohibited on floodplains with soils classified as frequently or occasionally flooded as listed in National Cooperative Soil Survey.
5. Applications will only be allowed on fields with slopes less than four percent slope and be prioritized based on the water erosion prediction technology as listed in the SD Technical Guide.
6. Fields with lowest predicted soil loss (water erosion) will generally have the highest priority for winter applications.
7. Manure will be uniformly spread.