

Phosphorus Index for Nutrient Management

Purpose:

The Phosphorus Index (P Index) is a tool that can identify fields with a high risk potential for phosphorus (P) in surface waters. Given the high cost of nutrient inputs, it is imperative to maintain the nutrients on site and applied at the appropriate times for utilization. Using the P Index can help a land user identify fields and management practices that can have positive economic benefits, address pertinent resource concerns as well as assess the greatest potential to impact bodies of water with phosphorus. The P index can help land users assess management strategies to minimize P loss from agricultural areas.

Concept:

On agricultural land when annual application of phosphorus exceeds its removal by crops, then phosphorus will accumulate in soils. Phosphorus accumulation in soils leads to high soil test values for phosphorus. A soil testing high for P can be a source of excess phosphorus. Movement of phosphorus from fields into bodies of water may lead to excessive growth of algae (algal bloom). Algal bloom adds easily decomposable organic matter to water. Decomposition of organic materials requires oxygen. Thus, algal bloom caused by phosphorus movement to a body of water leads to reduction of oxygen in water. This lack of oxygen can kill aquatic animals such as fish. However, most P initially added to land through fertilizer or manure reacts with soil components, converting to an insoluble form or attaching to soil particles. Thus, most P loss in agriculture is associated with loss of soil particles.

A large number of factors determine phosphorus loss from a field. These include a soil test value for phosphorus; source, method, rate, and timing of P application; susceptibility of a given soil to erosion; and management practices. The P index quantitatively determines the relative risk of P movement from a given field by considering most of the factors that govern P losses. The P Index for a field can be calculated by using the following worksheet.

Worksheet for Calculating P Index for a Field

P Index rating value from soil test value

- If soil test value is 0 to 50 lbs P/acre, enter 1 in box A.
- If soil test value is 51 to 80 lbs P/acre, enter 2 in box A.
- If soil test value is 81 to 200 lbs P/acre, enter 4 in box A.
- If soil test value is more than 200 lbs P/acre, enter 8 in box A.

Box A _____

P Index rating value from manure/fertilizer type (Based on phosphorus source coefficients)*

- If applying all other biosolids, enter 2 in box B.
- If applying Alum treated manures, enter 4 in box B.
- If applying BPR & BNR biosolids, enter 6 in box B.
- If applying beef, dairy or poultry manure, enter 6 in box B.
- If applying swine manure, enter 8 in box B.
- If applying inorganic P fertilizer, enter 8 in box B.

Box B _____

P Index rating value from manure/fertilizer application method

- If incorporating/injecting manure/fertilizer immediately before crop utilization, enter 1 in box C.
- If surface applying manure/fertilizer less than 3 months before crop utilization or at time of utilization, enter 2 in box C.
- If incorporating manure/fertilizer more than 3 months before crop utilization, enter 4 in box C.
- If surface applying manure/fertilizer more than 3 months before crop utilization, enter 8 in box C.

Box C _____

P Index rating value from soil erosion (RUSLE2 values)

- If soil loss from this field is T or less, enter 0 in box D.
- If soil loss from this field is $> T$ but $< 2T$, enter 5 in box D.
- If soil loss from this field is $2T$ to $< 3T$, enter 10 in box D.

Box D _____

P Index rating value from sediment delivery (RUSLE2 values)

If sediment delivery to edge of field is < .25 ton, enter 1 in box E.

If sediment delivery to edge of field is .25 - .49 ton, enter 2 in box E.

If sediment delivery to edge of field is .50 - 1.0 ton, enter 4 in box E.

If sediment delivery is > 1.0 ton, enter 8 in box E.

Box E _____

P Index rating value from soil drainage class

Well Drained, enter 0 in box F.

Moderately Well Drained, enter 4 in box F.

Somewhat Poorly Drained, enter 8 in box F.

Poorly Drained, enter 8 in box F.

Very Poorly Drained, enter 8 in box F.

Excessively Drained, enter 4 in box F.

Box F _____

Total P Index rating value for the site

Add the P Index value points from boxes A, B, C, D, E and F then, enter the total in box G.

The value in box G represents Total P Index value for the site.

Box G _____

Site vulnerability to P-loss as a function of Total P Index rating values

Phosphorus Index Rating	Phosphorus Application
Low Risk - <=15	Nitrogen Based
Medium Risk 16 – 25	Nitrogen Based
High Risk 26 – 35	Phosphorus Based (Crop Removal)
Very High Risk > 35	Phosphorus Based (No Application)

Low to medium site vulnerability ratings indicate that current management practices are adequate for protection of surface waters from phosphorus pollution. High and very high site vulnerability ratings indicate a need for improved management practices.

*Water Extractable Phosphorus Test through WVDA Lab Moorefield.

DRAFT