How to Calculate the NY Phosphorus Index

The NY Phosphorus Runoff Index (NY P Index) is designed to assist producers and planners to identify fields or portions of fields that are at highest risk of contributing phosphorus (P) to lakes and streams. The NY P Index is not a measure of actual P loss, but rather an indicator of potential loss. A high or very high PI score is a warning to further examine the causes; a low P Index score means the risk of P loss is reduced, but probably not eliminated.

Fields with high or very high site vulnerability should be managed to minimize P loss. A low or medium score implies management can be N based (Table 1). In this fact sheet we explain how you can calculate the NY P Index scores for a field.

Table 1: NY P Index scores, vulnerability rankings and management implications.

Ranking Values	Site Vulnerability	Management
< 50	Low	N based management.
50 – 74	Medium	N based management with best management practices.
75 – 99	High	P applications to crop removal.
≥ 100	Very High	No P fertilizer or manure application.

The NY P Index assigns two scores to each field based upon field characteristics and planned management practices. The **Dissolved P Index** addresses the risk of loss of water-soluble P from a field (flow across the field or through the soil profile) while the **Particulate P Index** estimates the risk of loss of P attached to soil particles and manure. Both P forms are a concern for water quality and should be managed jointly.

There are two parts for each of the PI scores: potential sources of P ("**source score**") and potential movement of P ("**transport score**"). The final score is obtained by multiplying the source score by the transport score:

Dissolved P index = P Source score * Dissolved P Transport score
Particulate P index = P Source score * Particulate P Transport score

P Source Score

Soil test P, manure and fertilizer additions contribute to the source score:

P Source Score = Soil Test P + Fertilizer P + Organic P

The soil test P portion of the score is obtained by multiplying Morgan soil test P by 1.25:

Soil Test P Score = 1.25 * Morgan's Soil Test P (lbs P/acre)

Soil test P results based on Mehlich-3 and modified Morgan must be converted to a Morgan P equivalent (see Agronomy Fact Sheet #18: Phosphorus soil testing). The fertilizer and organic P scores are first determined by a multiplication of application rate (lbs P_2O_5/acre) by the weighting factors for application timing and method (Table 2), and then the scores are added to the Soil Test P score.

Table 2: To obtain the fertilizer and manure P scores the P_2O_5 application rate, timing and method scores are multiplied.

Fertilizer or manure P = P_a * P_t * P_m

P application rate (P_a)	lbs P_2O_5 / acre (if fertilizer) 0.75 * lbs P_2O_5 / acre (if manure)				
P application timing (P_t)	May – August	Sept. – Oct.		Nov. – Jan.	Feb. – April
	0.4	0.7		0.9	1.0
P application method (P_m)	Injected or subsurface banded	Broadcast and incorporated within 1-2 days	3-5 days	Surface applied or broadcast + incorporated >5 days after application	Surface applied on frozen, snow covered or saturated ground
	0.2	0.4	0.6	0.8	1.0

Transport Scores

To assess dissolved P transport, the NY P Index considers soil drainage class, flooding frequency and predominant water flow path distance to a stream (Table 3).

Dissolved P Transport Score =
Soil drainage + Flooding frequency + Flow distance to stream

The soil drainage classification is determined directly from the soil survey and should not be changed even if tile drainage has been installed. The flooding frequency is also determined from the soil survey (this information may be available on flood hazard boundary maps as well). The flow distance is the predominant edge of "field" drainage path that excess water takes as it leaves a field and finds its way downhill to a watercourse ("blue line stream"). The dissolved and particulate P transport scores are set to 1.0 when the various transport components add to more than one. Thus, the P transport scores represent a percentage of the P source factor.

Table 3: The *Dissolved P Transport* score is obtained by adding factors for soil drainage, flooding frequency and predominant flow distance to a stream. The *Particulate P Transport* score is obtained by adding factors for soil erosion, flooding frequency, predominant flow distance to a stream and the presence/absence of concentrated flows.

Dissolved Transport P = D + F + FLD
Particulate Transport P = R + F + FLD + CF

Soil Drainage (**D**)	Well / Excessive-ly well drained **0.1**	Modera-tely-well drained **0.3**	Some what poorly drained **0.7**	Poorly / very poorly drained **1.0**
Soil Erosion (**R**)	**0.1 * RUSLE Erosion rate (tons/acre)**			
Flooding frequency (**F**)	Rare/never > 100 years **0**	Occasional 10-100 years **0.2**	Frequent < 10 years **1.0**	
Flow distance to blue line stream as depicted on topographic map (or equivalent) Intermittent Stream = dashed blue line. Perennial Stream = solid blue line. (**FLD** in feet)	Intermittent Stream >200 feet Perennial Stream >300 feet **0**	Intermittent Stream 25 to 200 feet: **1– [(FLD–25)/175]** Perennial Stream 50 to 300 feet: **1– [(FLD–50)/250]**	Intermittent Stream <25 feet Perennial Stream < 50 feet **1.0**	
Concentra-ted flow (**CF**) present?	No **0**	Yes **0.2**		

The particulate P component of the NY P Index is similar to the dissolved P component in that flooding frequency and the predominant water flow distance to a stream are again considered (Table 3). Additionally, particulate P loss potential is influenced by soil erosion and the presence of concentrated flow paths.

Particulate P Transport Score =
Soil erosion + Flooding frequency + Flow distance to stream + Concentrated flow path

Soil erosion rate is estimated using the (Revised) Universal Soil Loss Equation ([R]USLE). The determination of concentrated flow paths is best done through field observation (the current resolution of contour lines on topographic maps may not be sufficient).

In Summary

The NY P Index helps producers to identify fields that pose a high risk of P loss. The NY-PI assesses current and past management practices by including soil test P and expected manure and fertilizer rate, timing and method of application (P "sources"). It also assesses fields for the likelihood of contributing runoff by including soil drainage class, erosion, flooding frequency, presence of significant concentrated flows, and the distance from the edge of the field that runoff has to flow to reach a stream or ditch (P "transport"). Fields with a high or very high NY P Index should be targeted for more careful management.

Additional Resources:

- NY P Index website: http://nmsp.css.cornell.edu/publications/pindex.asp.
- NY P Index spreadsheet calculator: http://nmsp.css.cornell.edu/publications/pindex.asp.
- NY P Index user's manual and documentation: http://nmsp.css.cornell.edu/publications/Pindex/PI_User_Manual.pdf.

For more information

Cornell University Cooperative Extension

Nutrient Management Spear Program
http://nmsp.css.cornell.edu

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