TECHNICAL NOTE

US DEPARTMENT OF AGRICULTURE **NATURAL RESOURCES CONSERVATION SERVICE**

Agronomy Technical Note - XXX

Phoenix
, Arizona
May, 2000

"DRAFT"
PHOSPHORUS ASSESSMENT TOOL
For Arizona

BACKGROUND

Water quality problems associated with phosphorus are generally confined to surface water. Phosphorus (P) in most Arizona soils is tightly held to soil particles and does not leach. However, the P held in organic phases from residues such as manure can dissolve in water and be lost if improperly managed. Adsorbed P on soil particles can cause surface water contamination as P containing sediments move off the land in agricultural runoff.

P is the second major element utilized by actively growing plants but differs considerably from nitrate in its water solubility and mobility. Soil solution P levels are typically less than 0.01 ppm in most soils, and ground water levels seldom exceed 0.05 ppm. Between 20 and 80% of the total P in soils is held in organically combined forms with a large amount of the organic-P held by the active microbial biomass. Much P fertilizer applied to soils is retained in the near-surface layer in various inorganic precipitates and organically combined forms that prevent it from leaching. Sandy soils may not retain or bind P to the same extent as previously discussed, but P migration downward to ground water is still generally minimal. The highly calcareous nature of our soils causes P to be very unavailable.

While the risk of ground water contamination by P from crop production systems can be assumed to be limited, the solid forms of P that accumulate in surface soil are subject to loss via erosion. Runoff losses to surface waters are the major water quality risk from P. Increased public and regulatory concern over the use and application of P to agricultural lands is based mainly upon the fact that increased P loading to surface waters can cause eutrophication. Algal and aquatic weed growth in most inland surface water systems is P-limited and elevated P loading leads to algal blooms and mats, heavy growth of aquatic plants and weeds, deoxygenation, and occasional problems with drinking water taste and odor.

P runoff from permanently vegetated areas such as hayland, pasture, rangeland or forest can be significant, and largely occurs as traces of orthophosphate ions in solution. Organic P additions from riparian leaf and stem inputs are also possible.

Where erosion risk increases, such as for annual crops with conventional tillage, the total-P loss increases greatly as the P is moved in solid particulate form from the eroding soil. Water-soluble P is immediately available for biological uptake when the sediment-bound or particulate P forms are released over longer periods and it is referred to as "bioavailable particulate P". The overall impact of a given production system on P loadings to local surface waters will therefore be primarily dependent upon relative rates of sediment loss and the system's influence on P levels in eroding soil surfaces.

P can easily enter surface water through dislocation and erosion of soil particles that maintain this tightly bound nutrient. Surface erosion can remove soil particles containing P. Surface soils, which are the most susceptible to erosion, generally have much higher P levels than deeper soil horizons due to applications of fertilizers, manure, roots, residue and sludge that contain this nutrient. The higher the P content of the soil, the more P will erode per ton of soil lost. Once into the surface water system, P is a major contributor to excessive algae growth which can have detrimental enviroArizonaental and aesthetic consequences. Little P is lost by leaching, though it moves more freely in sandy than in clay soils. Erosion and crop removal are the primary pathways for P removal for most soils in Arizona. Phosphorus dissolved in runoff water may be an additional P loss pathway for very high P amended soils and surface-applied organic material.

The interaction between the particulate and dissolved P in the runoff is very dynamic and the mechanism of transport is complex. Therefore, it is difficult to predict the transformation and ultimate fate of P as it moves through the landscape.

PURPOSE

The purpose of the Phosphorus Index is to provide field staffs, watershed planners, and land users with a tool to assess the various landforms and management practices for potential risk of phosphorus movement to water bodies. The Phosphorus Index ranks sites where the risk of phosphorus movement may be relatively higher than that of other sites. When the parameters of the index are analyzed, it is apparent that an individual parameter or parameters may be influencing the index disproportionately. These identified parameters are the basis for planning corrective soil and water conservation practices and management techniques.

This index is used as a tool for understanding the relative contribution that individual landform and management parameters have toward risk of phosphorus movement and will provide a method for developing management guidelines for phosphorus at the site to lessen their impact on water quality.

SITE CHARACTERISTICS

A number of soil, hydrology, and land management site characteristics describe the landform. The **Phosphorus Index Rating for Arizona** (Table 1) uses parameters that can have an influence on phosphorus availability, retention, management, and movement. These include:

1. Available phosphorus soil test levels, given in soil laboratory test units. (Usually the Olsen-P method ($NaHCO_3$ extraction) for Arizona soils, neutral to calcareous soils).
2. Phosphorus fertilizer (both organic and inorganic) application rates, in pounds available phosphate (P_2O_5) per acre.
3. Organic phosphorus source application methods.
4. Phosphorus fertilizer application methods.
5. Proximity of nearest field edge to named stream or lake measured in feet.
6. The erosion rate, in tons per acre per year.
7. Potential Runoff using permeability and slope.
8. Irrigation erosion potential, based on slope (S) in percent and flow rate (Q) in gallons/min.
9. Grazing management, including imported feeds.
10. Field edge buffers.

Field specific data for the ten site characteristics of the Phosphorus Index are readily available at the field level. Some analytic testing of the soil and organic material is required to determine the rating levels. This soil and material analysis is considered essential as a basis for the assessment.

The P Index is a simple 10 by 5 matrix that relates site characteristics with a range of value categories. The ten characteristics are:

1) Soil Test P Level
2) P Application Rate
3) Organic P Source Application Method
4) Fertilizer P Application Method
5) Proximity of Nearest Field Edge to Named Stream or Lake
6) Soil Erosion
7) Runoff Class
8) Irrigation Erosion
9) Grazing Management
10) Conservation Buffers

The five value categories are:

Very low
Low
Medium
High
Very high

Each site characteristic is rated VERY LOW, LOW, MEDIUM, HIGH, or VERY HIGH, by determining the range rating for each value category. For example: Soil test P ranges of <8 ppm for very low, 8-14 ppm for low, 15-22 ppm for medium, 23-30 ppm for high, and >30 ppm for very high were assigned to each of the value categories.

DEFINITIONS

Soil Test P

Arizona soils are usually low in plant available phosphorus because phosphorus is quickly tied up in calcareous soils. The bicarbonate P soils test (also know as Olsen-P soil test or Sodium bicarbonate-P test), it measures water soluble P, highly soluble calcium P, and organic P. This type of test should be specified for most soils in Arizona, except if the soil is on the acid side (pH < 7). Low pH soils should use a Bray test for P.

For cropland, take soil samples from the top 12 inches to assess the level of "available P" in the surface layer of the soil. For pasture or hayland, the sample should be 4 to 6 inches. At least 10 subs-samples should be taken in the field of concern. The "available P" is the level customarily given in a soil test interpretation by the Cooperative Extension Service or commercial soil test laboratories. The soil test P range in each value category are: Very Low, <8 ppm; Low, 8-15 ppm; Medium, 15-23 ppm; High, 23-30 ppm; and Very High, >30 ppm.

The soil test level for "available P" does not ascertain the total P in the surface soil. It does however, give an indication of the amount of total P that may be present because of the general relationship between the forms of P (organic, adsorbed, and labile P) and the solution P available for crop uptake.

P Application Rate

The P application rate is the amount, in pounds per acre (lbs/ac), of phosphate (P_2O_5) from all sources that is applied to the soil. The rate ranges in each value category ate: Very Low, none applied; Low, 1-30 lbs/ac; Medium, 31-90 lbs/ac; High, 91-150 lbs/ac; and Very High, >150 lbs/ac.

Organic P Source Application Method

The manner in which organic P material is applied to the soil and the time that the organic material is exposed on the soil surface until crop utilization can determine potential P movement. Incorporation implies that the organic P material is buried below the soil surface at a minimum of three to six inches. The value categories of increasing severity, ranging from no application to surface applied more than 3 months before planting, and depicts the longer surface exposure time between organic P material application, incorporation, and crop utilization. The longer the material sits on the soil surface the greater the chance for surface runoff.

Fertilizer P Application Method

The manner in which P fertilizer is applied to the soil and the amount of time that the fertilizer is exposed on the soil surface until crop utilization effects potential P movement. Incorporation implies that the fertilizer P is buried below the soil surface at 3 to 6 inches. The value categories of increasing severity, ranging from no application to surface applied more than 3 months before planting, depict the longer surface exposure time between fertilizer application, incorporation, and crop utilization. The longer the material sits on the surface the greater the potential for surface runoff.

Nearest Field Edge to Named Stream or Lake

This factor considers the potential flow distance from the edge of the field closest to the water body to the water body. The closer the water body to the edge of the field, the higher the parameter category value. These values should consider the local topography, existing setback, and buffer regulations for application of nutrient sources. Local or state guidelines should be used where available.

Soil Erosion

Soil erosion is defined as the loss of soil along the slope or unsheltered distance caused by the processes of water and wind. Soil erosion is estimated from erosion prediction models including the Revised Universal Soil Loss Equation (RUSLE), for water erosion and Wind Erosion Equation (WEQ), for wind erosion. Erosion induced by irrigation is calculated by other convenient methods. The value category is given in tons of soil loss per acre per year (ton/acre/year). These soil loss prediction models do not predict sediment transport and delivery to a water body. The prediction models are used in this index to indicate a movement of soil, thus potential for sediment and attached phosphorus movement across the slope or unsheltered distance and toward a water body.

Runoff Class

The runoff class is the runoff potential of soluble P moving from locations of placement. The runoff class of the site can be determined from soil survey data and slope measurements in the field. Guidance in determining the runoff class is based on soil permeability classes and the percent slope of the site (**Table 2** – Adapted from the USDA-NRCS National Soil Survey Handbook). The result of using the matrix relating soil permeability class and slope provides the value categories: NEGLIGIBLE, VERY LOW, LOW, MEDIUM, HIGH, and VERY HIGH. Note NEGLIBLE and VERY LOW are combine so that a 5 factor rating for the matrix can be maintained.

Surface Irrigation Erosion

Potential P loss resulting from furrow irrigation-induced erosion is considered by inclusion of a rating system based on soil susceptibility to particle detachment by hydraulic shear and flow rate of water in the furrow. The susceptibility to detachment is given by a relative ranking of soil erodibility classes under furrow irrigation (**Table 3**). These classes are an initial attempt at a relative ranking based on inherent stable and static soil properties (i.e., texture and clay mineralogy). There are temporal variations

in the relative erodibility and actual amount of erosion with furrow erosion. These changes in erodibility are a function of soil properties and management. However, no attempt is made to consider temporal soil properties or management factors in the rating. The introduced flow rate in the furrow (Q) is given by the irrigation water management plan and recorded as gallons per minute (gal/min). The furrow slope (S) of the site is given as a percentage (feet per 100 feet). (See USDA-NRCS National Engineering Handbook 15, chapter 5). The product of flow rate (Q) and slope (S) is used to determine the value category.

Grazing Management

Grazing management relates to the recycling of phosphorus nutrients by grazing fields that are also manure application fields. Supplemental feeding in the application field imports additional P with feed and concentrates in animals, increasing the rating. There are 5 value categories based on how grazing is done. They are Not Grazed, Grazed Crop Residues, Pasture with less than 30% of the feed needed brought in, Pasture with 30 to 80% of the feed needed brought in, and Pasture with 80 to 100% of the feed needed brought in.

Conservation Buffers

Conservation buffers are areas or strips of land maintained in permanent vegetation to help control pollutants and manage other environmental problems. Contour Buffer Strips, Field Borders, Filter Strips, Grass Waterways with Vegetated Filters, and Riparian Forest Buffers are examples of conservation buffers. Conservation buffers clean runoff, by helping stop sediment, and adsorb P. With buffers, wider is better. Points are assigned based on the buffer width.

PROCEDURES FOR MAKING AN ASSESSMENT

Each site characteristic has been assigned a weighting value based on reasoning that one particular site characteristic may be more prominent than another at allowing potential phosphorus movement from the site. There is scientific basis for concluding that these relative differences exist; however, the absolute weighting factors given are currently based on professional judgment. The site characteristic weighting factors are:

Site Characteristics Factors	Weighting
Soil Test P Level	1
Phosphorus Application Rate	1
Organic Phosphorus Source Application Method	1
Phosphorus Fertilizer Application Method	1
Proximity of Field Edge to Named Stream or Lake	1.5
Soil Erosion	1.5
Runoff Class	1.5
Irrigation Erosion	1.5
Grazing Management	0.5
Conservation Buffers	1.5

The value categories are rated using a log base of 2. The greater the ratings, the proportionally higher are the values. The higher the value, the higher potential for significant problems related to phosphorus movement.

The value ratings are:

None or very low	= 0
low	= 1
medium	= 2
high	= 4
very high	= 8

The P Index Worksheet for Arizona can be used to record the values from the index for a specific field. To make an assessment using the P Index, use **Table 1** (P Index Worksheet for Arizona), select a rating value for each site characteristic using the categories NONE or VERY LOW, LOW, MEDIUM, HIGH, or VERY HIGH. The value in the table is the result of multiplying the site characteristic weighting factor by the rating value to get the weighted value for that characteristic (see index value). Proceed to rate and factor each characteristic of the index. Sum the values for all ten characteristics, and compare the total using the Phosphorus Index Rating for Arizona, Weighted Factor Chart (**Table 4**). A description of site vulnerability by the Hazard Class Rating is given to describe the potential loss of P for a given field.

A Microsoft Excel spreadsheet is available (PI-ARIZONA.xls) to automate the evaluation. The file is posted on the NRCS ARIZONA web site. The file name is **PI-ARIZONA.xls**. The location of the file on the web is **www.Arizona.usda.gov/techserv/techres1.htm**. If unable to down load, contact the state agronomist.

INTERPRETATIONS OF SITE VULNERABLITY RATINGS (P HAZARD CLASS) FOR THE P INDEX

P Hazard Class Rating Described

VERY LOW OR LOW – A field that has a VERY LOW OR LOW potential for P movement offsite. If farming practices were maintained at current levels, the probability of an adverse impact to surface water resources from P losses from the field would be very low or low. **Nutrient application can be based on nitrogen for all sources.**

MEDIUM – A field that has a MEDIUM potential for P movement offsite. The probability for an adverse impact to surface water resources is greater than that from a LOW vulnerability rated site. Some remedial action should be taken to lessen the probability of P movement. **Nutrient application can be based on nitrogen for all sources.**

HIGH- This site has a HIGH potential for P movement from the site. There is a high probability for an adverse impact to surface water resources unless remedial action is taken. Soil and water conservation as well as phosphorus management practices are necessary to reduce the risk of P movement and probable water quality degradation. **Nutrient application must be P based at 1.5 times crop removal when manure or other organic by-products are applied.** When inorganic fertilizer is applied, its rate must follow the Land Grant University's P recommendation for crop production.

VERY HIGH - This site has a VERY HIGH potential for P movement from the site. The probability for an adverse impact to surface water resources is very high. Remedial action is required to reduce the risk of P movement. All necessary soil and water conservation practices plus a phosphorus management plan must be put in place to reduce the potential of water quality degradation. **Nutrient application must be P based at crop removal when manure or other organic by-products are applied.**

EXCESSIVE- This site has a VERY, VERY HIGH potential for P movement from the site. The probability for an adverse impact to surface water resources is extreme. Remedial action is required to reduce the risk of P movement. All necessary soil and water conservation practices plus a phosphorus management plan must be put in place to reduce the potential of water quality degradation. **No application of P is permitted.**

PRECAUTIONS IN THE USE OF THE PHOSPHORUS INDEX

The Phosphorus Index is an assessment tool intended to be used by planners and land users to assess the risk that exists for phosphorus leaving the landform site and travelling toward a water body. It also can be used to identify the critical parameters of soil, topography, and management that most influence the movement. Using these parameters, the index can then help select in the selection of management alternatives that would significantly address the potential impact and reduce the risk. The index is intended to be part of the planning process that takes place between the land user and resource planner. It can be used to communicate the concept, process, and results that can be expected if various alternatives are used in the management of the natural resources at the site. THE PHOSPHORUS INDEX IS NOT INTENDED TO BE AN EVALUATION SCALE FOR DETERMINING WHETHER LANDUSERS ARE ABIDING WITHIN WATER QUALITY OR NUTRIENT MANAGEMENT STANDARDS THAT HAVE BEEN ESTABLISHED BY LOCAL, STATE, OR FEDERAL AGENCIES. Any attempt to use this index as a regulatory scale would be grossly beyond the intent of the assessment tool and the concept and philosophy of the working group that developed it. As discussed in this technical note, this Phosphorus Index has been adapted to local conditions by a process of regional adaptations of the site characteristic parameters. This local development involves those local and state agencies and resource groups that are concerned with the management of phosphorus. After this index was adapted to this locality, it was tested by the development group to assure that the assessments are giving valid and reasonable results for the region. Field testing of the index was used to assess the value of the index.

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TABLE 1. PHOSPHORUS INDEX WORKSHEET FOR ARIZONA

PHOSPHORUS INDEX WORKSHEET for Arizona						
Client Name:		**Field(s):**		**Date:**		
Planner:		**Location:**		**Crop:**		
Permeability (in/hr):		**Slope (%):**		**Planned/Exist.:**		

Site Characteristic	Place an X in the appropriate box for each of the Site Characteristic listed					Subtotal
Soil Test P Level	Very Low <8 ppm	Low 8-15 ppm	Moderate 15-23 ppm	High 23-30 ppm	Very High >30 ppm	
						1
Phosphorus (P_2O_5) Application Rate	None Applied	1-30 lbs/ac P_2O_5	30-90 lbs/ac P_2O_5	90-150 lbs/ac P_2O_5	>150 lbs/ac P_2O_5	
						2
Organic Phosphorus Source Application Method	None Applied	Placed with Planter Deeper than 2 in.	Incorporated Immediately before Planting	Incorp. >3 Mo. Before Planting **or** Surface Applied <3 Mo. before Planting	Surface Applied >3 Months Before Planting	
						3
Phosphorus Fertilizer Application Method	None Applied	Placed with Planter Deeper than 2 in.	Incorporated Immediately before Planting	Incorp. >3 Mo. Before Planting **or** Surface Applied <3 Mo. before Planting	Surface Applied >3 Months Before Planting	
						4
Proximity of Nearest Field Edge to Named Stream or Lake	Very Low >1000 feet	Low 500-1000 feet	Medium 200-500 feet	High 30-200 feet	Very High <30 feet	
						5
Soil Erosion (WEQ & RUSLE)	Very Low <1 t/ac	Low 1-3 t/ac	Medium 3-5 t/ac	High 5-15 t/ac	Very High >15 t/ac	
						6
Runoff Class (Runoff Class Table 2)	Very Low	Low	Medium	High	Very High	
						7
Irrigation Erosion (furrow)	Not Irrigated or No Furrow Irrigation	Tailwater Recover **or** QS<6 for very erodible soils **or** QS<10 for resistant soils	QS>10 for erosion resistant soils	QS>10 for erodible soils	QS>6 for very erodible soils	
						8
Grazing Management	Not Grazed	Graze Crop Residues	Pasture <30% Dry Matter as Supplemental Feed	Pasture 30 to 80% Dry Matter as Supplemental Feed	Pasture 80 to 100% Dry Matter as Supplemental Feed	
						9
Vegetative Buffers	>100 ft wide	65-100 ft wide	20-65 ft wide	<20 ft wide	No buffer	
P Hazard Class:					**Total Index Points:**	45
			Phosphorus Application Classification:			

Phosphorus Index Classification		
Index Pts.	**P Haz. Class**	**P Application Classification**
0-10	Very Low	N Based
10-17	Low	N Based
17-27	Medium	N Based
27-37	High	P Based (1.5 x crop removal)
37-47	Very High	P Based (at crop removal)
>47	Excessive	No P application allowed

TABLE 2. RUNOFF CLASS BASED ON FIELD SLOPE AND PERMEABILITY CLASS

Runoff Class Based on Field Slope and Permeability Class[1]								
Slope %	**Very Rapid >20**	**Rapid 20-6**	**Moderately Rapid 6-2**	**Moderate 2-0.6**	**Moderately Slow 0.6-0.2**	**Slow 0.2-0.06**	**Very Slow 0.06-0.0015**	**Impermeable <0.0015**
	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)	(in/hr)
Level or Concave	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**VH**
>0 to 1	**N**	**N**	**N**	**N**	**L**	**M**	**H**	**VH**
1 to <5	**N**	**N**	**VL**	**L**	**M**	**H**	**VH**	**VH**
5-<10	**VL**	**VL**	**L**	**M**	**H**	**VH**	**VH**	**VH**
10-<20	**VL**	**VL**	**L**	**M**	**H**	**VH**	**VH**	**VH**
>20	**L**	**L**	**M**	**H**	**VH**	**VH**	**VH**	**VH**

Note: Adapted from the National Soil Survey Handbook.

[1]Based on the most restrictive horizon above 20 inches. If the most restrictive horizon is between 20 and 40 inches. The runoff estimate should be reduced by one class (e.g., medium to low). If the most restrictive layer in the soil is below 40 inches, use the lowers class that occurs above 40 inches.

Runoff Classes: N-negligible, VL-very low, L-low, M-medium, H-high, VH-very high

Special Rule 1 - A soil horizon that has a seasonal water table is assumed to have very slow permeability.

Special Rule 2 - Runoff is rated as "negligible" (N) if the soil is in a depression, regardless of the permeability.

Assumptions:	**1.** Bare soil surface.
	2. Low water retention due to ground surface irregularities.
	3. Steady ponded infiltration rate.
	4. Bulk density of upper 10" is within normal range for the soil.

TABLE 3. FURROW IRRIGATION EROSION SITE CHARACTERISTICS

I. QS value

Q = flow rate of water introduced into the furrow (in gallons per minute, GPM).
S = furrow slope (in feet per 100 feet, percent).

Example: For a 5 gpm flow rate and a 2% furrow grade:
QS = 5 gpm * 2% grade = 10

II. Relative ranking of soil erodibility under furrow irrigation

Use local criteria to determine the relative erodibility of the soil in question. If no local criteria are established, use the following for guidance:

A. <u>Very Erodible Soils</u>

Soils in which the surface layer texture is silt, or silt loam with < 15% nonmontmorillonitic clay, or fine and very fine sandy loam with < 15% nonmontmorillonitic clay, or loamy fine sand, or loamy very fine sand. Contact a soil scientist for clay content and mineralogy.

B. <u>Erosion-Resistant Soils</u>

Soils that have the following characteristics in the upper 5 cm of the surface layer:
silty clay, clay, or sandy clay texture, weak or massive structure, and mixed or montmorillonitic clay mineralogy.

other soils that have medium or coarse blocky structure or coarse granular structure (i.e. natural aggregates > 10 mm) and very firm or firmer rupture resistance class in the moist state (i.e. requires at least strong force between thumb and forefinger to cause failure of a moist soil aggregate).

See the Soil Survey Manual (1993), chapter 3 for description of soil structural aggregates (peds), and table 3-14 for soil rupture-resistance classes.

C. <u>Erodible Soils</u>

Soils that have a surface layer not fitting any of the above criteria.

TABLE 4. PHOSPHORUS INDEX RATING FOR ARIZONA: WEIGHTING FACTOR CHART

Phosphorus Index Rating for Arizona						
		Weighting Factor Times the Column Factor				
Site Characteristic	**Wt. Factor**	**None or Very Low**	**Low**	**Medium**	**High**	**Very High**
		0	**1**	**2**	**4**	**8**
Soil Test P Level	**1**	Very Low <8 ppm	Low 8-15 ppm	Moderate 15-23 ppm	High 23-30 ppm	Very High >30 ppm
		0	**1**	**2**	**4**	**8**
Phosphorus (P_2O_5) Application Rate	**1**	None Applied	1-30 lbs/ac P_2O_5	30-90 lbs/ac P_2O_5	90-150 lbs/ac P_2O_5	>150 lbs/ac P_2O_5
		0	**1**	**2**	**4**	**8**
Organic Phosphorus Source Application Method	**1**	None Applied	Injected 3-6 inch below surface	Incorporated Immediately before Planting	Incorporated >3 Months Before Planting **or** Surface Applied <3 Months before Planting	Surface Applied
		0	**1**	**2**	**4**	**8**
Phosphorus Fertilizer Application Method	**1**	None Applied	Placed with Planter Deeper than 2 in.	Incorporated Immediately before Planting	Incorporated >3 Months Before Planting **or** Surface Applied <3 Months before Planting	Surface Applied
		0	**1**	**2**	**4**	**8**
Proximity of Nearest Field Edge to Named Stream or Lake	**1.5**	Very Low >1000 feet	Low 500-1000 feet	Medium 200-500 feet	High 30-200 feet	Very High <30 feet
		0	**1.5**	**3**	**6**	**12**
Soil Erosion (WEQ & RUSLE)	**1.5**	Very Low <1 t/ac	Low 1-3 t/ac	Medium 3-5 t/ac	High 5-15 t/ac	Very High >15 t/ac
		0	**1.5**	**3**	**6**	**12**
Runoff Class (Runoff Class Table 2)	**1.5**	Negligible & Very Low	Low	Medium	High	Very High
		0	**1.5**	**3**	**6**	**12**
Irrigation Erosion	**1.5**	Not Irrigated **or** No Furrow Irrigation	Tailwater Recover **or** QS<6 for very erodible soils **or** QS<10 for other soils	QS>10 for erosion resistant soils	QS>10 for erodible soils	QS>6 for very erodible soils
		0	**1.5**	**3**	**6**	**12**
Grazing Management	**0.5**	Not Grazed	Only Graze Crop Residues	Pasture <30% Dry Matter as Supp. Feed	Pasture 30 to 80% Dry Matter as Supplemental Feed	Pasture 80 to 100% Dry Matter as Supp. Feed
		0	**0.5**	**1**	**2**	**4**
Vegetative Buffer	**1.5**	>100 ft wide	65-100 ft wide	20-65 ft wide	<20 ft wide	No Buffer
		0	**1.5**	**3**	**6**	**12**

Phosphorus Index Classification		
Index Pts.	**P Hazard Class**	**P Application Classification**
0-10	Very Low	N Based
10-17	Low	N Based
17-27	Medium	N Based
27-37	High	P Based (1.5 x crop removal)
37-47	Very High	P Based (at crop removal)
>47	Excessive	No P application allowed