Section 5. Soil and Risk Assessment Analysis

5.1. Soil Information

Field	Soil Survey	Map Unit	Soil Component Name	Surface Texture	Slope Range (%)	OM Range (%)	Bedrock Depth (in.)	Hydro-logic Group	T Fact (T/ac/yr)	Subsoil P	CEC
Range 1	163	8084A	Okaw	SIL	0-2%	1-2%		D	3.0	Low	High
Range 2	163	582B	Homen	SIL	2-5%	1-3%		C	5.0	Low	High
Range 3	163	884C3	Bunkum	SICL	5-10%	0.5-1%		C	5.0	Low	High
Range 4	163	884C3	Bunkum	SICL	5-10%	0.5-1%		C	5.0	Low	High
Range 5	163	884C3	Bunkum	SICL	5-10%	0.5-1%		C	5.0	Low	High
Range 6	163	884C3	Bunkum	SICL	5-10%	0.5-1%		C	5.0	Low	High
Rick Range	163	884C3	Bunkum	SICL	5-10%	0.5-1%		C	5.0	Low	High
Triefenbachs 1	163	517B	Marine	SIL	2-5%	1-3%		C	3.0	Med	Low
Triefenbachs 2	163	517B	Marine	SIL	2-5%	1-3%		C	3.0	Med	Low
Triefenbachs 3	163	517B	Marine	SIL	2-5%	1-3%		C	3.0	Med	Low
Triefenbachs 4	163	517B	Marine	SIL	2-5%	1-3%		C	3.0	Med	Low
Lenzburg North	163	517B	Marine	SIL	2-5%	1-3%		C	3.0	Med	Low
Lenzburg	163	880B2	Darmstadt	SIL	2-5%	1-2%		D	3.0	Med	High
Schickedanz	163	884C3	Coulterville	SICL	5-10%	0.5-1%		C/D	5.0	Med	Low
V Schickedanz	163	517B	Marine	SIL	2-5%	1-3%		C	3.0	Med	Low
McBride 120	163	517B	Marine	SIL	2-5%	1-3%		C	3.0	Med	Low
McBride 240	163	517B	Marine	SIL	2-5%	1-3%		C	3.0	Med	Low
Tilden 20	163	5C3	Blair	SICL	5-10%	0.5-1%		C	5.0	Low	High
Tilden 40	163	5C3	Blair	SICL	5-10%	0.5-1%		C	5.0	Low	High
CPS 25	163	5C3	Blair	SICL	5-10%	0.5-1%		C	5.0	Low	High
M&M Schillings	163	517A	Marine	SIL	0-2%	1-3%		C	3.0	Med	Low
Johama Pasture	163	880B2	Coulterville	SIL	2-5%	1-3%		C/D	3.0	Med	Low
Spalt	163	880B2	Coulterville	SIL	2-5%	1-3%		C/D	4.0	Med	Low
John Schad	163	878C3	Coulterville	SICL	5-10%	0.5-1.5%		C/D	3	Med	Low

5.2. Predicted Soil Erosion

Refer to RUSLE 2 Analysis in section 4.2 of this CNMP

5.3. Nitrogen and Phosphorus Risk Analysis

Illinois Phosphorus Risk Assessment

(Illinois NRCS – Nutrient Management Standard, Code 590)

Phosphorus (P) loading to surface water can accelerate eutrophication. The availability of other nutrients and light penetration into the water column will also influence the response of waterbodies to phosphorus. Land managers who desire to minimize transport of phosphorus need a practical assessment procedure to assist them in making decisions concerning the applications of phosphorus-containing materials.

Factors such as: the amount of erosion and runoff; the form, amount, and distribution of Phosphorus in the soil: and fertilizer and manure application rate, timing, and placement determine P loss from agricultural fields and the resulting P loading to water resources. Most phosphorus compounds found in soils have low water solubility. Consequently, P loss from agricultural land was once thought to be primarily associated with soil erosion. In many cases, sediment-bound P is still the dominant form in which P losses from agricultural fields occur. Over the past decade, research has shown that phosphorus can be lost in runoff in dissolved forms. High dissolved P concentration in runoff is more frequently observed where soil P levels are high particularly near the soil surface. High soil P levels, however, do not automatically equate to high dissolved P in runoff. As stated earlier, numerous factors interact to create the potential for P losses from agricultural fields. Many of the basic processes that govern P transport are known. It is difficult, however, to know at any given site which factor(s) influence P loss rates proportionally more than others. Insufficient data exist in Illinois to definitively guide landowners as to which factors in a specific field contribute the most to P losses. There are indications, however, that where solution P losses from crop fields are dominant, high soil P concentration at the surface are likely the most dominant factor.

The purpose of this guide is to (1) help land managers identify factors in agricultural fields known to contribute to “P” runoff loss and, (2) identify practices that can reduce phosphorus loss from agricultural fields. The factors most commonly associated with both dissolved and sediment-bound P loss are presented. For each factor, guidance is provided to help land managers estimate the relative potential for P transport to surface water. It is important to realize that the procedure is not a predictive tool for P loading. It is merely a tool for assessing the relative potential for phosphorus transport.

Use of P Risk Assessment:

When possible, land managers should adopt management practices that minimize phosphorus loss risk factors. If phosphorus containing materials need to be applied to fields that have medium or high risk potentials, recommended management practices should be used to reduce the risk of phosphorus transport.

Practices to Reduce Phosphorus Risk Potential

Soil Erosion Control

- Use residue management and/or structural practices to reduce sheet and rill erosion
- Install filter strips, riparian forest buffers, contour buffer strips, field borders, or wetlands

Minimize Connectivity to Water Bodies

- Install water and sediment control basins to reduce quantity of sediment transported offsite
- Install conservation buffers adjacent to water resources to create nutrient application setbacks

Reduce Runoff Potential

- Terrace fields to reduce slope length
- Contour strip cropping, contour buffer strips, cover crops, crop rotations that include meadow and/or small grains, and crop residue management

Lower Soil Test Phosphorus

- Sample soils on high testing fields to determine vertical distribution of the phosphorus
- If phosphorus is concentrated in the top two inches of soil, invert the soil (e.g. moldboard plow) where soil erosion will not be a problem
- Avoid stratification by placing phosphorus materials beneath the top two inches of the soil surface

Practice Nutrient Management

- Apply no more than maintenance levels of phosphorus when soil test P reaches the levels described in the Illinois Agronomy Handbook, Chapter 11.
- When soil test P levels reach 300 lb/acre, only maintenance P levels may be applied to land.

Site Characteristic Definitions

1. **SOIL EROSION –** Sheet and rill erosion as measured by the most current version of the Revised Universal Soil Loss Equation (RUSLE).
   (Low = < T, Medium = >T, ≤ 2T, High = > 2 T)

2. **CONNECTIVITY TO WATER –** Defines the potential for P to be transferred from the site to a perennial stream or water body. The more closely connected the runoff is from the field via concentrated flow (from a defined grassed waterway or surface drain) to a perennial stream or water body the higher the potential for P transport.
   (Low = > 1,000', Medium = < 1,000', ≥ 200', High = < 200')

3. **RUNOFF CLASS –** Represents the effects of the Hydrologic Soil Group (A, B, C, D) on runoff. This factor represents the site's runoff vulnerability.
   (A = Low, B = Medium, C,D = High)

4. **SOIL "P" TEST (Bray P1 or Mehlich 3) –** Soil test procedure using the Bray P1 extraction, or other extraction test calibrated to bray P1, that provides an index of plant available P expressed in lbs. P/Acre (PPM x 2 = lbs./Acre where soil samples are obtained to the 6 2/3" depth)
   (Low = < 35 lbs/acre, Medium = 35-70 lbs/acre, High = > 70 lbs/acre)

5. **P INPUTS –** Represents the combined effect of application method and application rate on the potential for phosphorus to be transported in runoff in both dissolved and sediment-bound phases. Phosphorus application rate is expressed in terms of the University of Illinois maintenance phosphorus recommendations applicable to crops/yields grown on the site being evaluated. Phosphorus may be in the form of commercial fertilizer or organic materials such as manure, animal waste lagoon supernatant, wastewater from municipal or agricultural sources or nonagricultural biosolids such as sewage sludge or landscape waste. When using the "P Inputs Matrix", it is assumed that soil incorporation is performed prior to runoff events. Instances where incorporation is typically not performed prior to runoff events will be considered as non-incorporated surface applications.
   (See P Input Matrix Below)

P INPUT MATRIX

	Application Rate		
Application Method	**≤ UI Recommendations**	**> UI – 150% UI**	**> 150% UI**
Incorporation or injection > 3" below surface	Low	Low	Low
Shallowly incorporated surface applications < 3"	Low	Medium	High
Non-incorporated surface applications	Medium	High	High

Phosphorus Risk Assessment for Individual Fields

The table below identifies specific risk factors that may be present in a given field. No attempt has been made to "average" the factors and assign a composite rating for the field. It is recognized that risk factors do not act independently to influence phosphorus loss from agricultural fields and P loading into water resources. Simple averaging however, assumes that all risk factors have the same amount of influence. Attempts to objectively weight some factors more or less than others would be desirable, but difficult without supporting data. The phosphorus assessment procedure is not a process based or empirical model. The procedure was developed as a conservation planning tool. The tool is designed to provide guidance to select and plan conservation measures that will lower the potential for phosphorus loss from agricultural fields and P loading into water resources.

Explanation of General Risk Assessment Ratings

Low – Low potential for P movement from the field. No adverse impacts to surrounding areas (i.e. surface waters) are anticipated if current farming practices are continued.

Medium – Medium potential for P movement from the field.

High - High potential for P movement from the field. Adverse impacts to surface waters from excess P loading may occur.

Very High - Very high potential for P movement from the field. Adverse impacts to surface waters are likely. No manure shall be applied until conservation practices are put into place to reduce the potential for P movement.

Explanation of Using P Risk Assessment for Manure Applications

Soil Erosion – No manure will be applied to any field unless it rates "Low"

Connectivity to Surface Water – 200' setbacks around all surface water will bring all fields under the "Medium" rating

P soil test – Fields in this plan have "Medium/Optimum" ratings for P soil tests. Planned manure applications will maintain P, and avoid excessive buildup.

Illinois P Risk Assessment

Field	Crop Year	Soil Erosion	Solution Runoff Potential	Soil Test Phosphorus	Phosphorus Inputs
Range 1	Average	Low	High	High	High
Range 2	Average	Low	High	High	High
Range 3	Average	Low	High	High	Medium
Range 4	Average	Low	High	High	High
Range 5	Average	Low	High	High	Medium
Range 6	Average	Low	High	High	Medium
Rick Range	Average	Low	High	Low	High
Triefenbachs 1	Average	Low	High	Low	High
Triefenbachs 2	Average	Low	High	Low	High
Triefenbachs 3	Average	Low	High	Low	High
Triefenbachs 4	Average	Low	High	Low	High
Lenzburg North	Average	Low	High	Medium	High
Lenzburg	Average	Low	High	Medium	Low
Schickedanz	Average	Low	High	Medium	High
V Schickedanz	Average	Low	High	Medium	High
McBride 120	Average	Low	High	Medium	High
McBride 240	Average	Low	High	Medium	High
Tilden 20	Average	Low	High	Low	High
Tilden 40	Average	Low	High	Medium	High
CPS 25	Average	Low	High	High	High
M&M Schillings	Average	Low	High	Low	High
Johama Pasture	Average	Low	High	Low	Low
Spalt	Average	Low	High	Medium	High
John Schad	Average	Low	High	High	Medium

Nitrogen Risk Assessment

(Illinois NRCS-Nutrient Management Standard, Code 590)

	Soil Texture[2]		
Application Timing & Temp[1]	**Coarse**	**Medium**	**Fine**
Fall with inhibitor > 60°F	High	High	High
Fall with inhibitor < 60°F	High	Medium	Medium
Fall w/out inhibitor > 60°F	High	High	High
Fall w/out inhibitor < 60°F	High	Medium	Medium
Spring w/out inhibitor	Medium	Medium	Medium-Low
Spring with inhibitor	Medium-Low	Low	Low
Spring split-applied or sidedress	Medium-Low	Low	Low

[1] Temperatures refer to soil temperature measured at a depth of 4 inches. For this assessment, inhibitors refer to nitrification inhibitors

[2] Soil Texture: Coarse: sand, loamy sand, sandy loam
Medium: silt, silt loam, loam
Fine: silty clay loam, silty clay, clay, clay loam, sandy clay, loam, sandy clay

Fields are categorized according to the predominant soil type of the field.

Coarse:

Medium: *All fields in this plan are predominantly silt loams*

Fine:

Nitrogen Risk Assessment for Individual Fields

All fields in this plan have the same risk potential for N leaching under the following levels of management.

- High potential if applied in the fall with an inhibitor when soil temperature at a depth of 4" is greater than 60°F.
- Medium potential if applied in the fall with an inhibitor when soil temperature at a depth of 4" is less than 60°F.
- High potential if applied in the fall without an inhibitor when soil temperature at a depth of 4" is greater than 50°F.
- Medium potential if applied in the fall without an inhibitor when soil temperature at a depth of 4" is less than 50°F.
- Medium (medium soils) or medium-low (fine soils) potential if applied in the spring without an inhibitor.
- Low potential if applied in the spring with an inhibitor.
  Low potential if applied in the spring split applied or sidedressed.