N & P ASSESSMENT

Nitrogen and Phosphorus Risk Analysis

Illinois Phosphorus Risk Assessment

Field	Crop Year	Soil Loss Risk	Prox to Wtr Risk	Runoff Risk	Soil Test P Risk	P Input Risk
Aebley 1 (843)	2008			Medium	Medium	Low
Aebley 1 (843)	2009			Medium	Medium	N/A
Aebley 1 (843)	2010			Medium	Medium	N/A
Aebley 1 (843)	2011			Medium	Medium	Low
Aebley 2 (843)	2008			Medium	High	N/A
Aebley 2 (843)	2009			Medium	High	N/A
Aebley 2 (843)	2010			Medium	High	Low
Aebley 2 (843)	2011			Medium	High	Low
CAPS 1 (1123)	2008		High	Medium	High	Low
CAPS 1 (1123)	2009		High	Medium	High	Low
CAPS 1 (1123)	2010		High	Medium	High	N/A
CAPS 1 (1123)	2011		High	Medium	High	N/A
CAPS 2 (1123)	2008			Medium	Medium	N/A
CAPS 2 (1123)	2009			Medium	Medium	Low
CAPS 2 (1123)	2010			Medium	Medium	N/A
CAPS 2 (1123)	2011			Medium	Medium	N/A
CAPS 3 (1123)	2008		High	Medium	Medium	Low
CAPS 3 (1123)	2009		High	Medium	Medium	Low
CAPS 3 (1123)	2010		High	Medium	Medium	N/A
CAPS 3 (1123)	2011		High	Medium	Medium	N/A
FRANK'S (1123)	2008		High	Medium	High	N/A
FRANK'S (1123)	2009		High	Medium	High	Low
FRANK'S (1123)	2010		High	Medium	High	N/A
FRANK'S (1123)	2011		High	Medium	High	N/A
HOME 1 (1113)	2008		High	Medium	High	N/A
HOME 1 (1113)	2009		High	Medium	High	Low
HOME 1 (1113)	2010		High	Medium	High	N/A
HOME 1 (1113)	2011		High	Medium	High	N/A
HOME 2 (1113)	2008		High	Medium	High	N/A
HOME 2 (1113)	2009		High	Medium	High	Low
HOME 2 (1113)	2010		High	Medium	High	Low

Nitrogen and Phosphorus Risk Analysis

Illinois Phosphorus Risk Assessment

Field	Crop Year	Soil Loss Risk	Prox to Wtr Risk	Runoff Risk	Soil Test P Risk	P Input Risk
Aebley 1 (843)	2008			Medium	Medium	Low
Aebley 1 (843)	2009			Medium	Medium	N/A
Aebley 1 (843)	2010			Medium	Medium	N/A
Aebley 1 (843)	2011			Medium	Medium	Low
Aebley 2 (843)	2008			Medium	High	N/A
Aebley 2 (843)	2009			Medium	High	N/A
Aebley 2 (843)	2010			Medium	High	Low
Aebley 2 (843)	2011			Medium	High	Low
CAPS 1 (1123)	2008		High	Medium	High	Low
CAPS 1 (1123)	2009		High	Medium	High	Low
CAPS 1 (1123)	2010		High	Medium	High	N/A
CAPS 1 (1123)	2011		High	Medium	High	N/A
CAPS 2 (1123)	2008			Medium	Medium	N/A
CAPS 2 (1123)	2009			Medium	Medium	Low
CAPS 2 (1123)	2010			Medium	Medium	N/A
CAPS 2 (1123)	2011			Medium	Medium	N/A
CAPS 3 (1123)	2008		High	Medium	Medium	Low
CAPS 3 (1123)	2009		High	Medium	Medium	Low
CAPS 3 (1123)	2010		High	Medium	Medium	N/A
CAPS 3 (1123)	2011		High	Medium	Medium	N/A
FRANK'S (1123)	2008		High	Medium	High	N/A
FRANK'S (1123)	2009		High	Medium	High	Low
FRANK'S (1123)	2010		High	Medium	High	N/A
FRANK'S (1123)	2011		High	Medium	High	N/A
HOME 1 (1113)	2008		High	Medium	High	N/A
HOME 1 (1113)	2009		High	Medium	High	Low
HOME 1 (1113)	2010		High	Medium	High	N/A
HOME 1 (1113)	2011		High	Medium	High	N/A
HOME 2 (1113)	2008		High	Medium	High	N/A
HOME 2 (1113)	2009		High	Medium	High	Low
HOME 2 (1113)	2010		High	Medium	High	Low

Illinois Phosphorus Risk Assessment

Operation: MEIER FARMS
Plan File: MEIER FARMS.mmp
Plan Folder: C:\Program Files\MMP 0.20

Plan Saved: 9/13/2008
Init. File Rev: 5/3/2007
Soils File Rev: 2/27/2007

Field ID/Subfield ID		Soil Erosion Loss (1)	T	Risk	Proximity to Water Distance	Risk	Solution Runoff Hyd. Group	Risk	Soil Test Phosphorus Lbs/Ac	Risk
Aebley 1	843		4				B	**Medium**	36	**Medium**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Corn)	69	235	Yes	**Low**
2009 (Soybean)	47	0		**N/A**
2010 (Wheat)	48	0		**N/A**
2011 (Corn)	69	233	Yes	**Low**

Field ID/Subfield ID		Soil Erosion Loss (1)	T	Risk	Proximity to Water Distance	Risk	Solution Runoff Hyd. Group	Risk	Soil Test Phosphorus Lbs/Ac	Risk
Aebley 2	843		4				B	**Medium**	102	**High**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Soybean)	47	0		**N/A**
2009 (Wheat)	48	0		**N/A**
2010 (Corn)	69	236	Yes	**Low**
2011 (Corn)	69	224	Yes	**Low**

Field ID/Subfield ID		Soil Erosion Loss (1)	T	Risk	Proximity to Water Distance	Risk	Solution Runoff Hyd. Group	Risk	Soil Test Phosphorus Lbs/Ac	Risk
CAPS 1	1123		5		25	**High**	B	**Medium**	112	**High**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Corn)	69	305	Yes	**Low**
2009 (Corn)	69	224	Yes	**Low**
2010 (Soybean)	47	0		**N/A**
2011 (Wheat)	48	0		**N/A**

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Field ID/Subfield ID		Soil Erosion Loss (1)	T	Risk	Proximity to Water Distance	Risk	Solution Runoff Hyd. Group	Risk	Soil Test Phosphorus Lbs/Ac	Risk
CAPS 2	1123		5				B	**Medium**	58	**Medium**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Corn)	69	0		**N/A**
2009 (Corn)	69	235	Yes	**Low**
2010 (Soybean)	47	0		**N/A**
2011 (Wheat)	48	0		**N/A**

Field ID/Subfield ID		Soil Erosion Loss (1)	T	Risk	Proximity to Water Distance	Risk	Solution Runoff Hyd. Group	Risk	Soil Test Phosphorus Lbs/Ac	Risk
CAPS 3	1123		5		25	**High**	B	**Medium**	56	**Medium**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Corn)	69	304	Yes	**Low**
2009 (Corn)	69	226	Yes	**Low**
2010 (Soybean)	47	0		**N/A**
2011 (Wheat)	48	0		**N/A**

Field ID/Subfield ID		Soil Erosion Loss (1)	T	Risk	Proximity to Water Distance	Risk	Solution Runoff Hyd. Group	Risk	Soil Test Phosphorus Lbs/Ac	Risk
FRANK'S	1123		5		16	**High**	B	**Medium**	94	**High**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Corn)	69	0		**N/A**
2009 (Soybean)	47	186	Yes	**Low**
2010 (Wheat)	48	0		**N/A**
2011 (Corn)	69	0		**N/A**

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Field ID/Subfield ID		Soil Erosion Loss (1)	T	Risk	Proximity to Water Distance	Risk	Solution Runoff Hyd. Group	Risk	Soil Test Phosphorus Lbs/Ac	Risk
HOME 1	1113		5		20	**High**	B	**Medium**	88	**High**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Corn)	69	0		**N/A**
2009 (Corn)	69	235	Yes	**Low**
2010 (Soybean)	47	0		**N/A**
2011 (Wheat)	48	0		**N/A**

Field ID/Subfield ID		Soil Erosion Loss (1)	T	Risk	Proximity to Water Distance	Risk	Solution Runoff Hyd. Group	Risk	Soil Test Phosphorus Lbs/Ac	Risk
HOME 2	1113		5		100	**High**	B	**Medium**	122	**High**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Soybean)	47	0		**N/A**
2009 (Corn)	69	55	Yes	**Low**
2010 (Corn)	69	235	Yes	**Low**
2011 (Soybean)	47	0		**N/A**

Field ID/Subfield ID		Soil Erosion Loss (1)	T	Risk	Proximity to Water Distance	Risk	Solution Runoff Hyd. Group	Risk	Soil Test Phosphorus Lbs/Ac	Risk
HOME 4	1113		5				B	**Medium**	54	**Medium**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Corn)	77	220	Yes	**Low**
2009 (Soybean)	47	0		**N/A**
2010 (Corn)	77	214	Yes	**Low**
2011 (Soybean)	47	0		**N/A**

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Field ID/Subfield ID	Soil Erosion Loss (1)	Soil Erosion T	Soil Erosion Risk	Proximity to Water Distance	Proximity to Water Risk	Solution Runoff Hyd. Group	Solution Runoff Risk	Soil Test Phosphorus Lbs/Ac	Soil Test Phosphorus Risk
Messman E 856		5		40	**High**	B	**Medium**	108	**High**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Soybean)	47	0		**N/A**
2009 (Wheat)	48	0		**N/A**
2010 (Corn)	69	235	Yes	**Low**
2011 (Corn)	69	294	Yes	**Low**

Field ID/Subfield ID	Soil Erosion Loss (1)	Soil Erosion T	Soil Erosion Risk	Proximity to Water Distance	Proximity to Water Risk	Solution Runoff Hyd. Group	Solution Runoff Risk	Soil Test Phosphorus Lbs/Ac	Soil Test Phosphorus Risk
Messman W 855		4				B	**Medium**	56	**Medium**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Soybean)	47	0		**N/A**
2009 (Wheat)	48	0		**N/A**
2010 (Corn)	69	235	Yes	**Low**
2011 (Corn)	69	224	Yes	**Low**

Field ID/Subfield ID	Soil Erosion Loss (1)	Soil Erosion T	Soil Erosion Risk	Proximity to Water Distance	Proximity to Water Risk	Solution Runoff Hyd. Group	Solution Runoff Risk	Soil Test Phosphorus Lbs/Ac	Soil Test Phosphorus Risk
Stanley S 1125		3				B	**Medium**	40	**Medium**

Year (Crop)	P Removed	P Applied (2)	Incorporated (3)	P Input Risk
2008 (Wheat)	48	0		**N/A**
2009 (Corn)	69	235	Yes	**Low**
2010 (Corn)	69	0		**N/A**
2011 (Soybean)	47	0		**N/A**

Illinois Phosphorus Risk Assessment

Operation:	MEIER FARMS	***Plan Saved:***	9/13/2008
Plan File:	MEIER FARMS.mmp	***Init. File Rev:***	5/3/2007
Plan Folder:	C:\Program Files\MMP 0.20	***Soils File Rev:***	2/27/2007

Field ID/Subfield ID		***Soil Erosion*** Loss (1)	T	Risk	***Proximity to Water*** Distance	Risk	***Solution Runoff*** Hyd. Group	Risk	***Soil Test Phosphorus*** Lbs/Ac	Risk
Stanley N	1125		5				B	**Medium**	30	**Low**

Year (Crop)	***P Removed***	***P Applied (2)***	***Incorporated (3)***	***P Input Risk***
2008 (Corn)	69	0		**N/A**
2009 (Soybean)	47	0		**N/A**
2010 (Wheat)	48	0		**N/A**
2011 (Corn)	69	235	Yes	**Low**

Field ID/Subfield ID		***Soil Erosion*** Loss (1)	T	Risk	***Proximity to Water*** Distance	Risk	***Solution Runoff*** Hyd. Group	Risk	***Soil Test Phosphorus*** Lbs/Ac	Risk
HOME 3	1113		5		100	**High**	B	**Medium**	122	**High**

Year (Crop)	***P Removed***	***P Applied (2)***	***Incorporated (3)***	***P Input Risk***
2008 (Soybean)	47	0		**N/A**
2009 (Corn)	69	186	Yes	**Low**
2010 (Soybean)	47	0		**N/A**
2011 (Corn)	69	184	Yes	**Low**

1 - Sheet and rill erosion as measured by the most current version of the Revised Universal Soil Loss Equation (RUSLE)
2 - Includes both organic and commercial fertilizer sources
3 - For multiple applications, indicates worst case (i.e. unincorporated, if any)

Source: Illinois NRCS 590 Standard (January 2002), Phosphorus Risk Assessment Procedure, pp. 11-12.

Nitrogen Risk Assessment

Field ID	Soil Type	Soil Texture
Aebley 1	Oneco SIL	Silty Loam
Aebley 2	Dodgeville SIL	Silty Loam
CAPS 1	Radford SIL	Silty Loam
CAPS 2	Myrtle SIL	Silty Loam
CAP 3	Batavia SIL	Silty Loam
Frank's	Batavia SIL	Silty Loam
Home 1	Myrtle SIL	Silty Loam
Home 2	Myrtle SIL	Silty Loam
Home 4	Myrtle SIL	Silty Loam
Messman E	Myrtle SIL	Silty Loam
Messman W	Oneco SIL	Silty Loam
Stanley S	Hitt SIL	Silty Loam
Stanley N	Ogle SIL	Silty Loam
Home 3	Myrtle SIL	Silty Loam

* Refer to Table 1. Nitrogen Risk Assessment in this section to determine nitrate loss potentials based on application timing.

APPENDIX B

RECOMMENDED MANAGEMENT PRACTICES TO REDUCE NITROGEN AND PHOSPHORUS LOSSES

Nitrogen:

1. Set realistic yield goals and follow University of Illinois' nitrogen recommendations.
2. Take credit for nitrogen from all sources: previous legume crop, incidental nitrogen contained in diammonium phosphate (DAP) and other fertilizers, manure applications, etc.
3. Determine nitrate loss potential using Table 1 (following this Appendix). Use this as a guideline to determine application timing for fields with various soil textures. (More detailed information on total nitrogen loss potential is available in the University of Illinois Agricultural Experiment Station Bulletin 784, Nitrogen-Loss Potential Ratings for Illinois Soils.)
4. In fields where spring applications are not usually troublesome, apply the majority of the nitrogen shortly before or after planting.
5. For fall applications, use a nitrification inhibitor or wait until the soil has cooled down to 50° F. Even when applying a nitrification inhibitor, do not apply nitrogen until soil has cooled to 60° F. Probable dates when these soil temperatures are expected are contained in the *Illinois Agronomy Handbook*. In most cases, fall nitrogen applications should not begin prior to the third week in October.
6. Use adequate levels of phosphorus, potassium, and other nutrients to ensure optimum yields and nitrogen use efficiency.
7. Conduct a post-harvest evaluation of the nitrogen program:
   - Compare actual yields vs. yield goal;
   - Evaluate factors affecting yields and nitrogen use efficiency;
   - Consider using plant tissue analyses and an end-of-season corn stalk nitrate test to evaluate plant nitrogen sufficiency;
   - Refine nitrogen rates for future years.
8. Review each nutrient management plan annually to determine if changes in the nutrient budget are needed.
9. Calibrate application equipment annually, at minimum, to ensure uniform distribution of material at planned rates.
10. Use filter strips and riparian forest buffers to intercept nutrients transported surface runoff to the stream. (Note: these practices will have minimal effect in areas with extensive subsurface drainage.)
11. Avoid applying nitrogen around environmentally sensitive areas such as sinkholes, wells, gullies, ditches, surface inlets, or rapidly permeable areas.
12. Use cover crops, such as rye, to capture residual nitrogen after harvest and prevent nitrogen from being lost between harvest and planting of the next crop.
13. Utilize water table management to reduce artificial drainage when it is not needed for crop growth or field operations.

14. Utilize water table management to reduce artificial drainage when it is not needed for crop growth or field operations.
15. Outlet tiles into constructed wetlands to remove a portion of the nitrogen before tile effluent discharges into lakes or streams.

Phosphorus:

1. Perform soil test regularly (minimum of every four years) and follow University of Illinois' recommendations for application rates.
2. Do not maintain excessively high phosphorus soil test levels, especially in areas prone to phosphorus transport.
3. Use variable rate applications to increase the precision of phosphorus applications and to maintain rates needed for optimal crop production.
4. In areas where phosphorus losses occur primarily from surface runoff, incorporate or inject phosphorus beneath the soil surface.
5. Control soil erosion to 'T' or less.
6. Utilize agronomic practices that optimize crop production to maximize phosphorus utilization.
7. Use filter strips or riparian forest buffers to reduce offsite transport of particulate phosphorus.
8. Avoid applying nutrients when soils are frozen or covered with ice or snow.
9. Fall applications of phosphorus that are not incorporated into the soil should not be applied on slopes greater than 5% unless runoff control measures such as heavy residue cover, contour mulch tillage, contour strip cropping, or terraces have been applied.
10. Minimize surface runoff of water by reducing compaction, maintaining high crop residue levels, installing runoff control structures such as terraces, etc.
11. Avoid stratification on soils that are susceptible to runoff and erosion.

PHOSPHORUS RISK ASSESSMENT PROCEDURE

Risk Factor	Phosphorus Risk Potential		
	Low	Medium	High
1. Soil Erosion	<= "T"	> "T" - <= 2"T"	> 2"T"
2. Connectivity to Water. Does runoff from the application area enter a waterway, tile inlet, or surface drain outlet into a perennial surface water body e.g. stream, pond, lake, or wetland? If so what is the distance from the application area to the water body.	> 1000'	<= 1000' – 200'	< 200'
3. Runoff Potential	See "Runoff Matrix" Below		
4. Soil Test Phosphorus Levels 0 - 6 2/3" sample depth	<35 lbs. P/ac	35-70 lbs. P / ac	> 70 lbs. P/ac
5. P Inputs	See "P Inputs Matrix" Below		

Phosphorous Risk Assessment - 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).

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 of P transport.

3. RUNOFF CLASS – Represents the effect of the Hydrologic Soil Group (A, B, C, D) on runoff. This factor represents the site's runoff vulnerability. See the Solution Runoff Class Matrix below.

4. SOIL "P" TEST (BRAY P1 or Mehlich 3) – The 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/ac (PPM X 2 = lbs./ac where soil samples are obtained to the 6 2/3" depth).

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. See the "P Inputs Matrix" below. 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 Input 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.

Solution Runoff Class Matrix

Hydrologic Soil Group			
A	B	C	D
Low	Medium	High	High

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 inches	Low	Medium	High
Non-incorporated surface applications	Medium	High	High

The table below identifies specific risk factors that may present in a given field. No attempt should be made to "average" the factors and assign a composite rating for the field. It is recognized that the 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.

Phosphorus Risk Potential	
Risk Factor	Site value
Soil Erosion	
Proximity to water	
Solution Runoff Potential	
Soil Test Phosphorus	
Phosphorus Inputs	

References:

- Sharpely, A.N., Determining An Environmentally Sound Soil Phosphorus Value, Journal Of Soil and Water Conservation, 1996.
- Sharpley, A.N., T. Daniel, T. Sims, J. Lemunyon, R. Stevens, and R. Parry. 1999. Agricultural Phosphorus and Eutrophication. U.S. Department of Agriculture, Agricultural Research Service, ARS-149, 42 pp.

Table 1. Nitrogen Risk Assessment

Nitrate loss potentials based on soil texture, timing, and nitrification inhibitors			
Application Timing[1]	Soil Texture[2]		
	Coarse	Medium	Fine
Fall with an inhibitor > 60° F	High	High	High
Fall with an inhibitor < 60° F	High	Medium	Medium
Fall without an inhibitor > 50° F	High	High	High
Fall without an inhibitor < 50° F	High	Medium	Medium
Spring without an inhibitor	Medium	Medium	Medium-Low
Spring with an inhibitor	Medium-Low	Low	Low
Spring split applied or sidedress	Medium-Low	Low	Low

Foot notes:

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

When developing recommendations to be included in a nutrient management plan, the planner needs to use the results of the assessment above with knowledge of locally significant transport processes.

For example, in large areas of northern and central Illinois, nitrates are detected in surface water resources at concentrations above 10 part per million. Soils in much of the region only have a moderate nitrogen loss potential. The presence of extensive tile drainage, however, increases the risk of nitrate transport to surface water resources.

By contrast, in southern Illinois, there are large areas of level, poorly drained soils. The climate is warmer and there is more rainfall than in northern and central Illinois. The conditions favor the formation of nitrate. The loss of nitrate, however, is primary to the atmosphere due to denitrification.