Finding & Quantifying Offsets for Water Quality Trading & Adaptive Management

Training Opportunities

- Webinar 1. Overview
- Webinar 2. Finding and Quantifying Credits
- Webinar 3. Developing a Plan
- Webinar 4. Implementing and Verifying Offsets

ENVIRONMENTAL RESOURCES CENTER

WISCONSIN DEPT. OF NATURAL RESOURCES

UW Extension University of Wisconsin–Extension

Available Guidance

Adaptive Management Technical Handbook

Released: 01/07/2013

http://dnr.wi.gov/topic/SurfaceWater/AdaptiveManagement.html

(topic keyword: "adaptive management")

Implementing Water Quality Trading in WPDES Permits

Released: 08/21/2013

Water Quality Trading How-To Manual

Released: 09/09/2013

http://dnr.wi.gov/topic/SurfaceWater/WaterQualityTrading.html

(topic keyword: "water quality trading")

Agenda

- Finding Offsets
- Quantifying Offsets with SNAP+
- Converting Offset to Credits
- Questions

Trading and Adaptive Management Process

Step 1

- Decide if Adaptive Management/Trading is right for the point source & their partners

Step 2

- Work with partners to develop the Adaptive Management/Trading plan

Step 3

- Submit Plan to WDNR
- Permit will be reissued/modified to include Adaptive Management/Trading requirements (requirements differ between AM and trading)

Step 4

- Comply with permit requirements and implement Adaptive Management/Trading plan (requirements and timing differ between AM and trading)

Adaptive Management and WQT

- Voluntary compliance options for WPDES permit holders to comply with phosphorus requirements
- Options will be used when it is economically preferable to control nonpoint sources or other point sources of P
- Both require nonpoint and/or other point source reductions

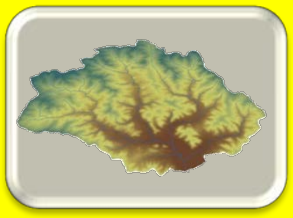
Finding Potential Reductions / Credits

- Determine your eligibility for the programs.
- Evaluate information contained in TMDLs and use DNR screening tools to evaluate potential opportunities.
- Work with the county LCDs, crop consultants, and watershed groups to refine information and help make contact with potential land users.
- Perform field scale analysis to quantify reductions and convert reductions to credits (WQT).

Determining NPS contributions and AM Eligibility (NPS>50%)

- PRESTO:
  - Calculates basin specific average annual phosphorus loads from point and nonpoint sources
  - Performs three tasks: Watershed Delineation, Effluent Aggregation, and Pollutant Runoff

Watershed Delineation



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Effluent Aggregation

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Pollutant Runoff

PRESTO
Pollutant Load Ratio Estimation Tool

PRESTO Online

- What's available?
  - Look up tool
  - GIS Model
  - User Manuel

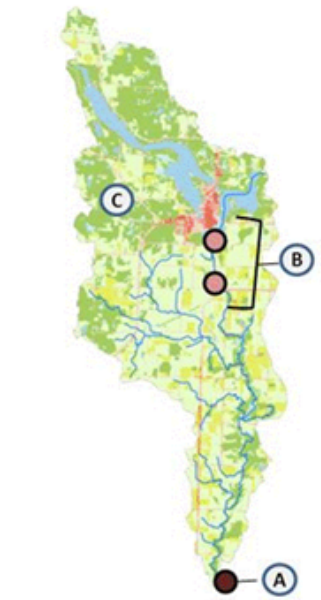
- http://dnr.wi.gov/, search "PRESTO"

Phosphorus tools

Pollutant Load Ratio Estimation Tool (PRESTO)

The Pollutant Load Ratio Estimation Tool (PRESTO) is a statewide GIS-based tool that compares the average annual phosphorus loads originating from point and nonpoint sources within a watershed. The comparison provides a screening tool for industrial and municipal dischargers to determine one of the conditions of eligibility for adaptive management as part of s. NR 217.18, Wisconsin Administrative Code.

PRESTO was designed to be easily modified, transparent to the end user, and provide a consistent result based on readily available datasets. PRESTO performs three basic functions: watershed delineation, nonpoint source loading estimation, and point source loading aggregation. The PRESTO outputs include a delineated watershed, watershed land cover composition, the estimated average annual nonpoint source and measured point source phosphorus loads (pounds per year), and the ratio of point to nonpoint phosphorus at a watershed outlet.



Point : Nonpoint Source Ratio

(A) Point Source Load + (B) Sum of All Upstream Point Source Loads : (C) Nonpoint Estimation Load Model

Is my facility in a nonpoint source phosphorus dominated watershed?

To be eligible for adaptive management, a facility must be located within a nonpoint source dominated watershed (greater than 50% of the total phosphorus load must come from upstream nonpoint sources such as agricultural or urban runoff). To assist with the phosphorus source question PRESTO has been run for 606 municipal and industrial outfalls statewide. To determine if your facility is located in a nonpoint source dominated watershed, thus meeting one of the adaptive management eligibility requirements, download the "Facility Eligibility Lookup" document below, find your facility in the table, and look for the column called "Nonpoint Source Dominated?"

- Nonpoint Source Dominated Facility Lookup [PDF, 67KB]

Learn more about the other adaptive management eligibility requirements.

Surface water

- **Atlas Data & Webinar** — About Wisconsin's waters.
- **Standards** — Goals for water resources.
- **Monitoring** — Monitoring water quality.
- **Assessments & Reporting** — Evaluating condition.
- **Planning** — Planning for water quality.
- **Management** — Managing water resources.

Water Evaluation

- Use Designations
- ORW/ERW Waters
- Antidegradation
- Triennial Standards Review
- Phosphorus Rules
- Thermal Rules
- Water Quality Based Effluent Limitations

Water Resources

- Explore WI Waters
- Surface Water Viewer
- Water Search
- Watershed Search
- Project Search
- Impaired Search

Wisconsin State Codes

- ch NR 102
- ch NR 103

Evaluate Applicable TMDLs

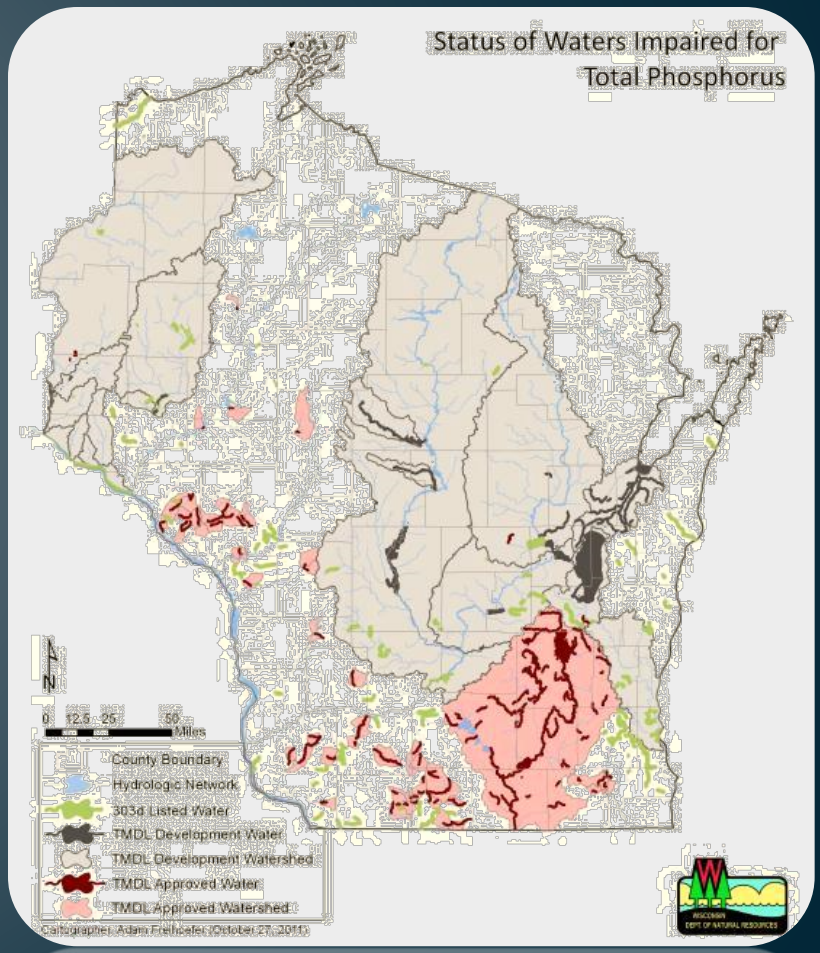
- Visit DNR website for information on TMDLs in the watersheds of interest:

  http://dnr.wi.gov/topic/tmdls/

- Review TMDL reports to evaluate potential needed load reductions.

- TMDLs may have ranked watersheds by loadings or characterized different reductions scenarios.

- For WQT, TMDLs set the credit threshold and for AM provide an estimate of reductions needed to reach water quality criteria.



Prioritizing Water-Quality Improvement Efforts on Agricultural Lands

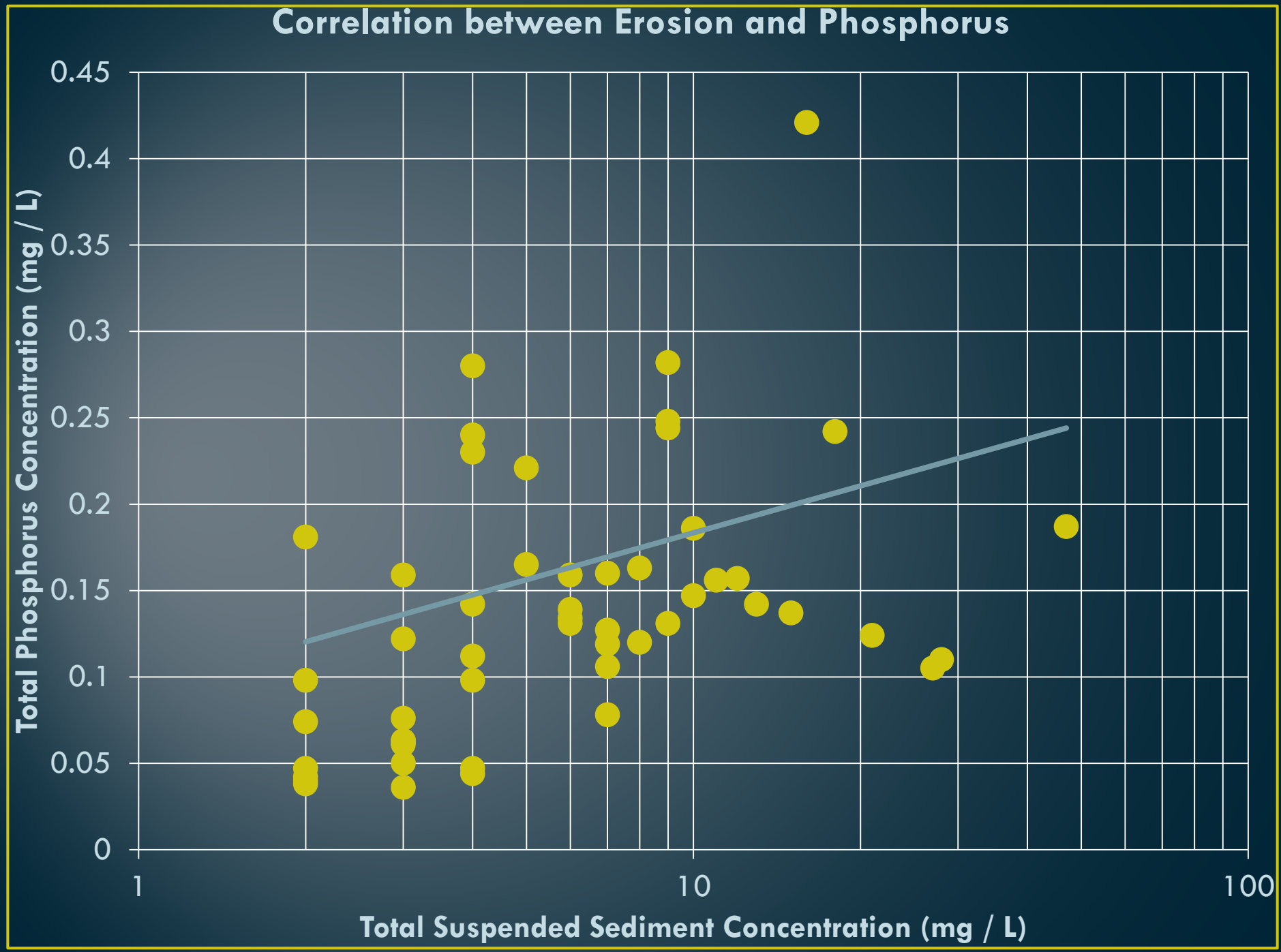
- A screening / potential index model developed by:

Aaron Ruesch and Theresa Nelson, P.E.

Wisconsin Department of Natural Resources

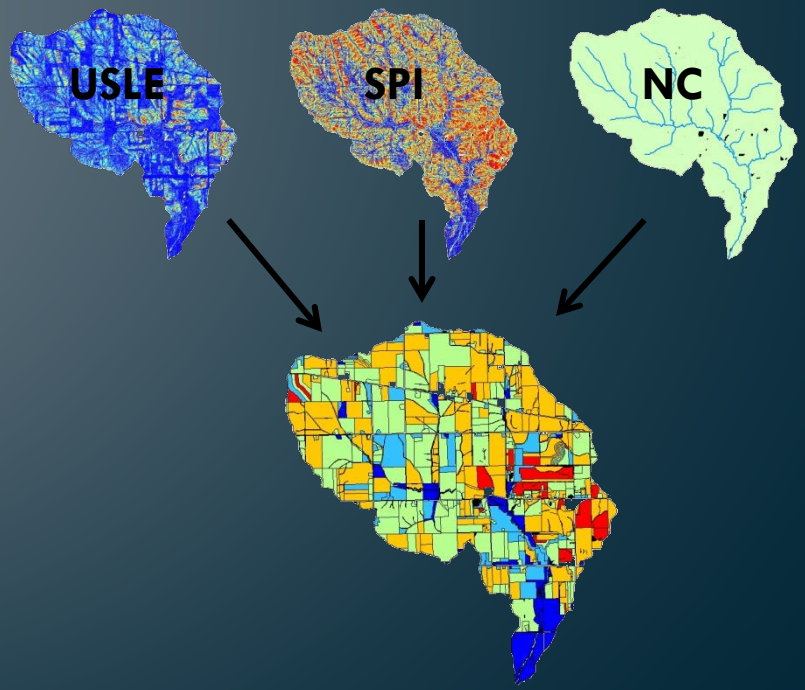
- The Model **DOES NOT** estimate a mass load (pounds/acre) of pollutants.

- The model does reduce the need to inventory all fields in watershed every year and helps focus efforts on high risk areas.

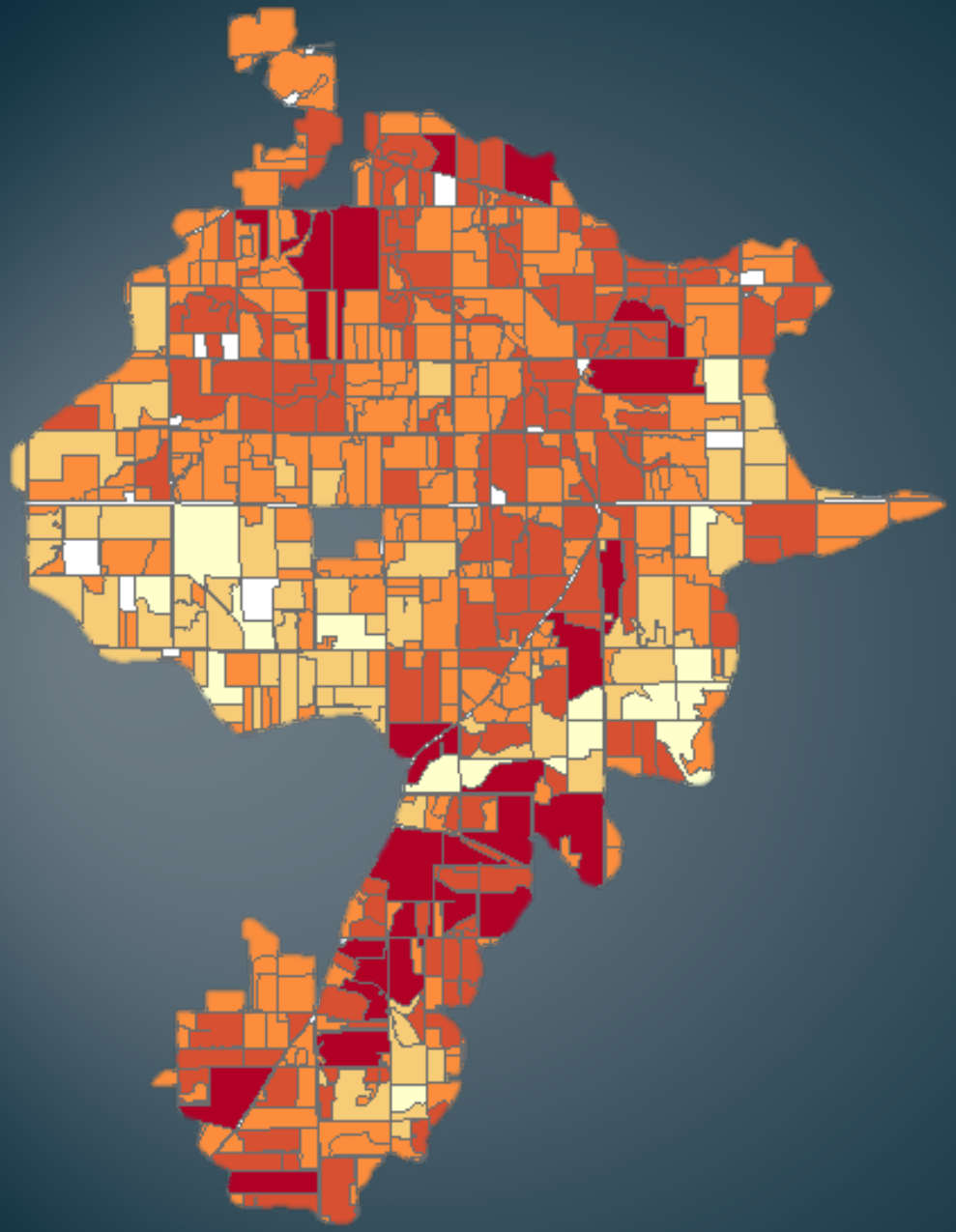

Correlation between Erosion and Phosphorus
Total Phosphorus Concentration (mg / L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
10
100
Total Suspended Sediment Concentration (mg / L)

Agricultural Prioritization

- LiDAR-Based GIS Tool
  - Uses readily available data
  - Helps prioritize fields most vulnerable to erosion and phosphorus export
- Combines 3 components:
  - USLE (sheet erosion)
  - Stream Power Index (gullies)
  - Non-contributing areas



Source: NRCS



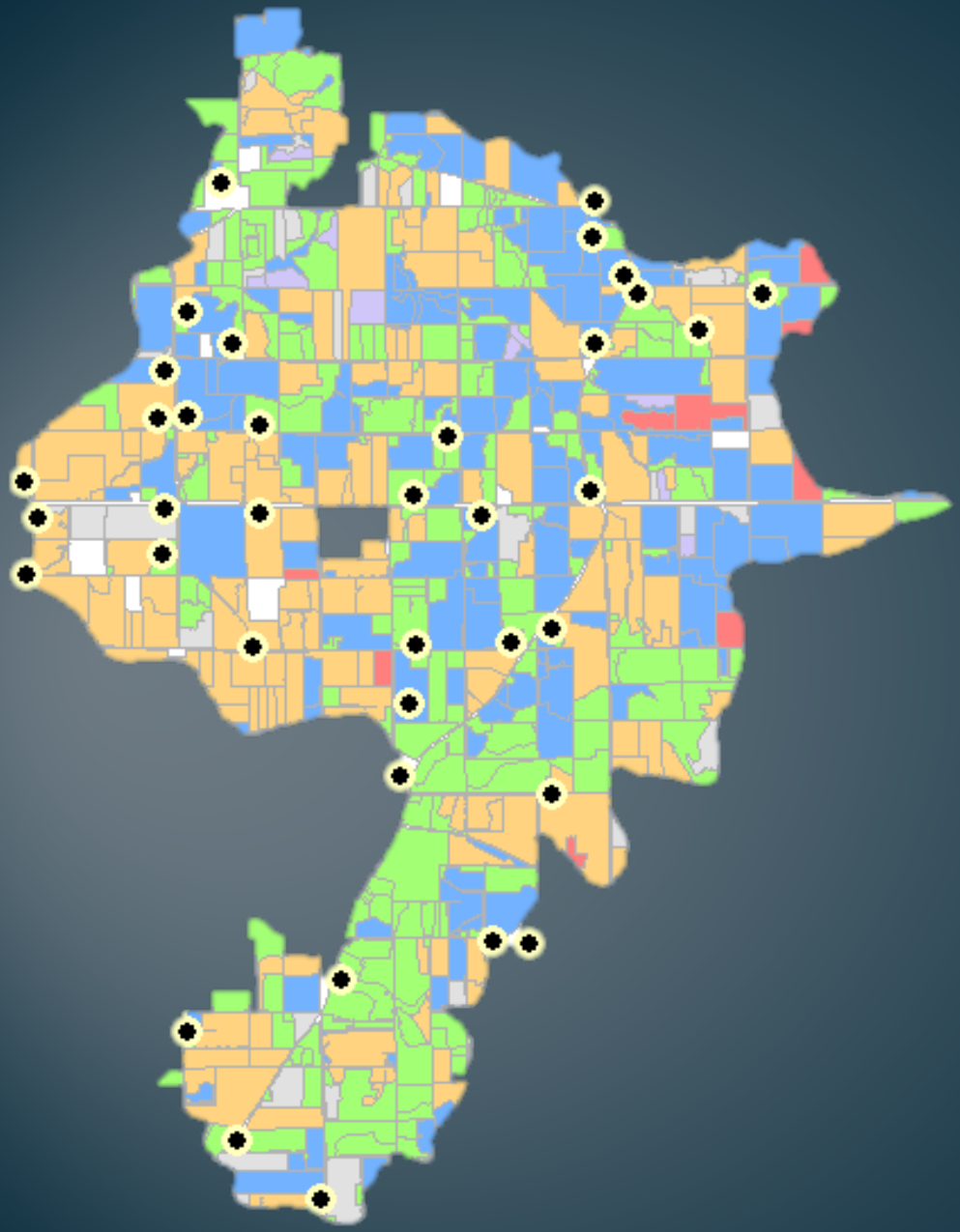
Overall erosion "score"

Erosion "Score"

High

Medium

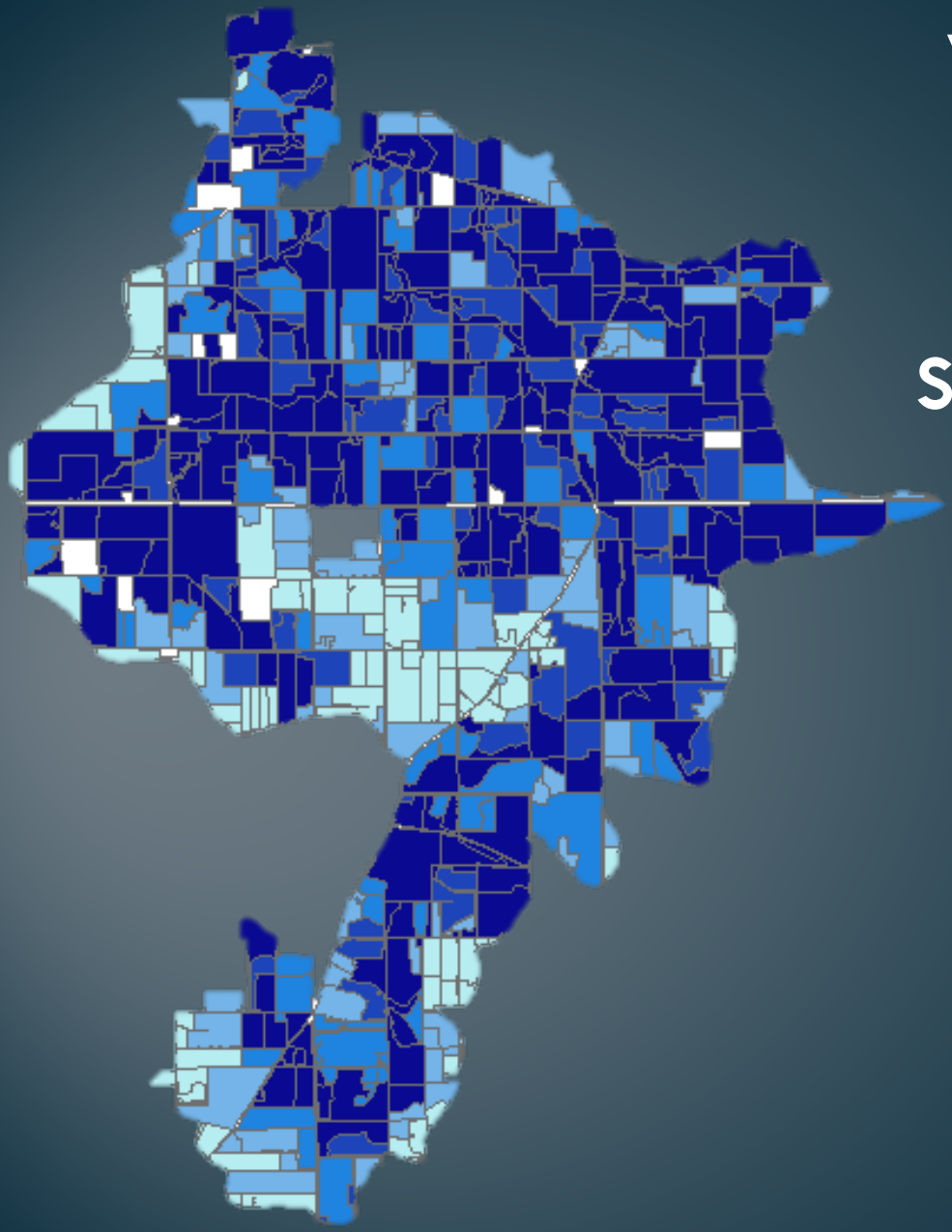
Low



Where are the animals?

- Animal lots

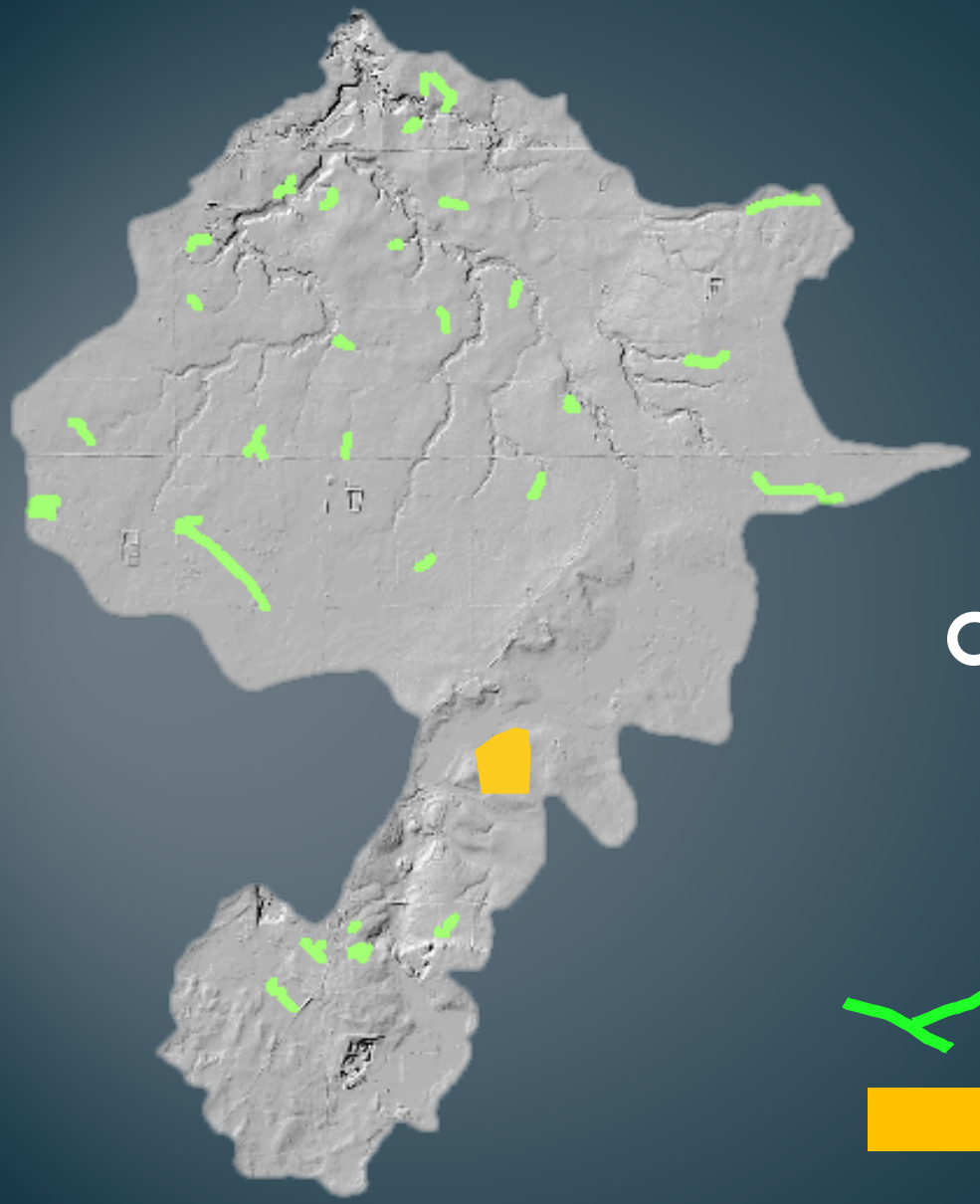
Which fields are near surface water pathways?



Minimum Distance

On stream

Far Away

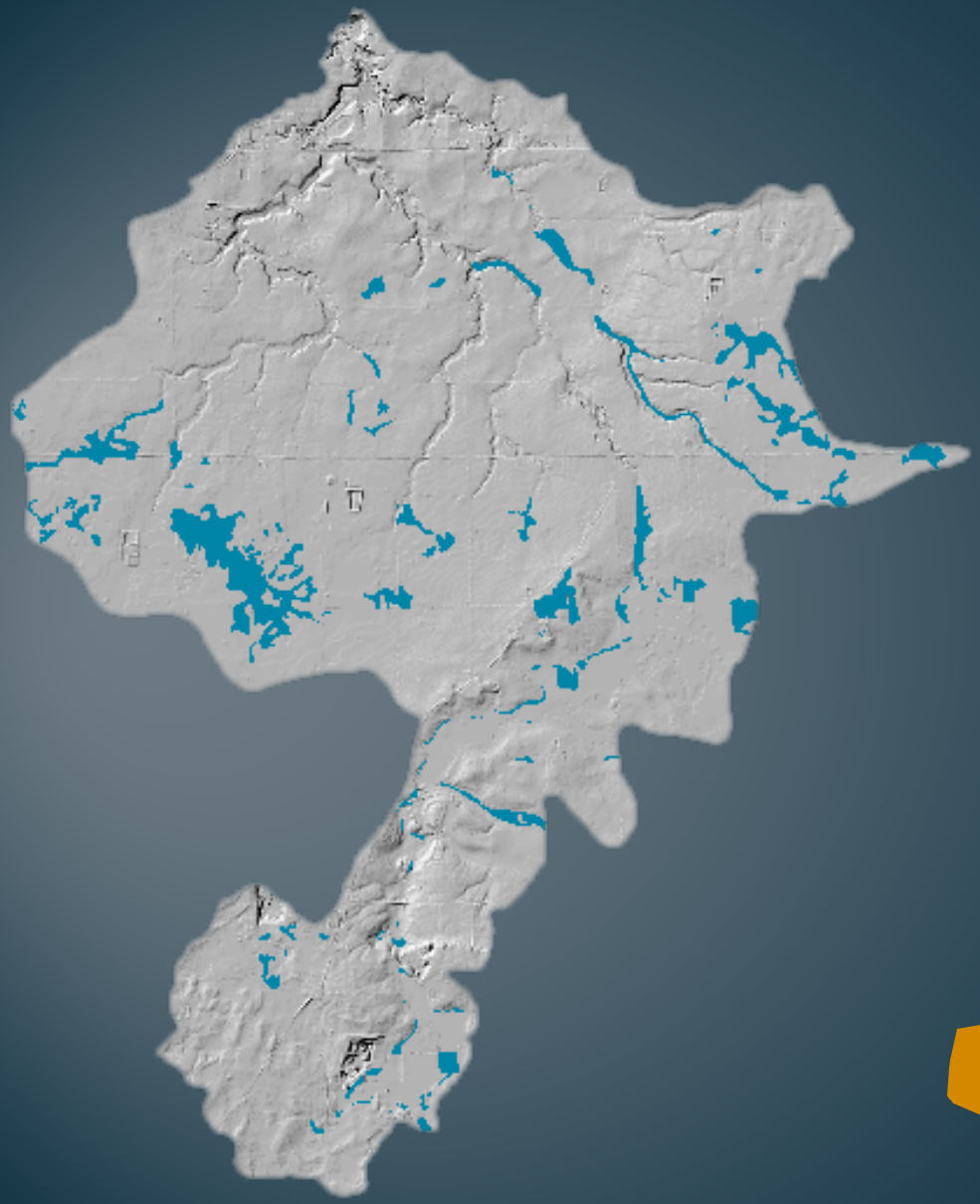


Where are farmers already working to curb erosion?

Grassed Waterway

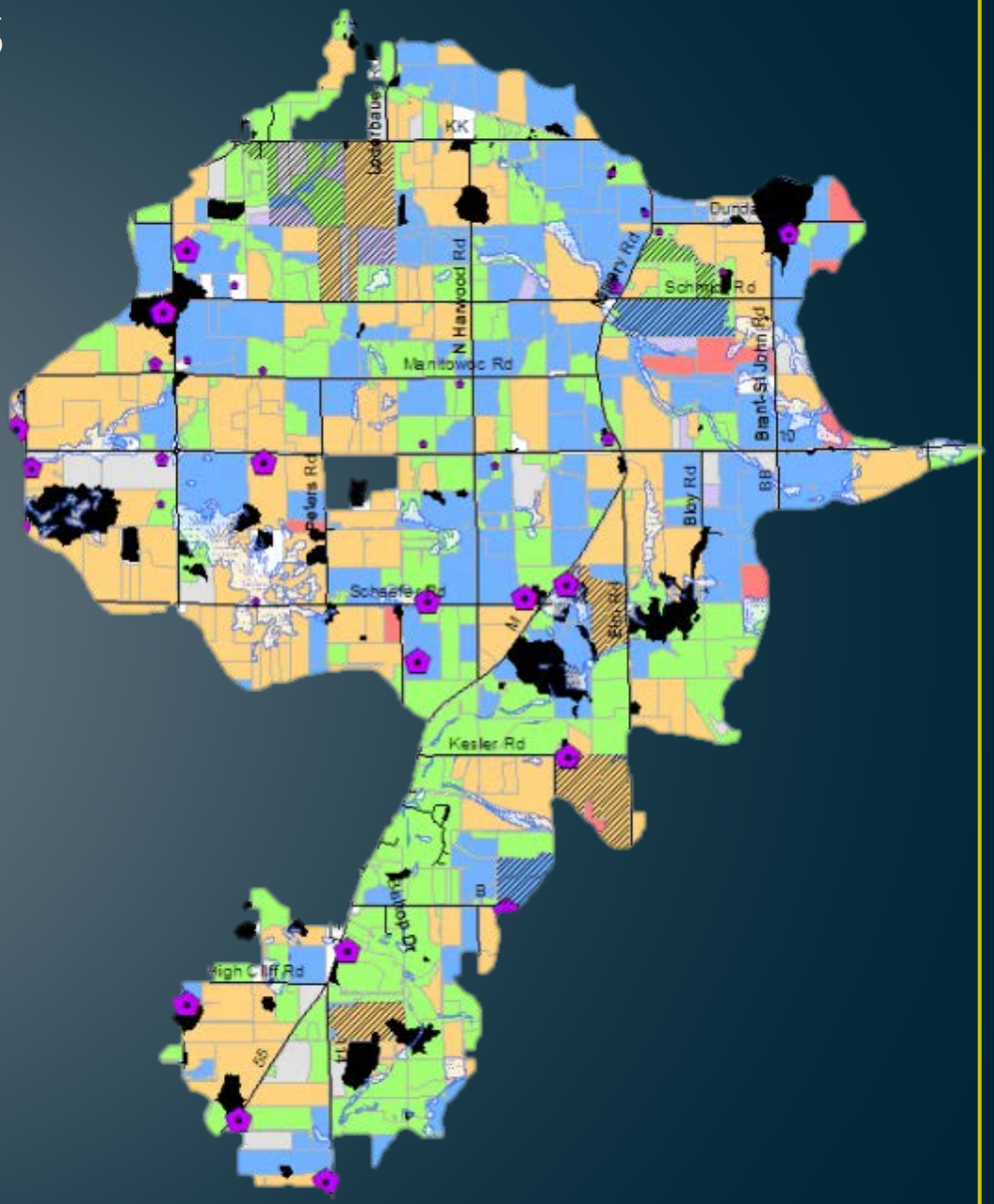
Contour cropping

Where can we restore wetlands?



Potentially restorable wetlands

Putting the Pieces Together



LEGEND

- High Erosion Score
- Non-contributing areas
- Pot. Restorable Wetlands

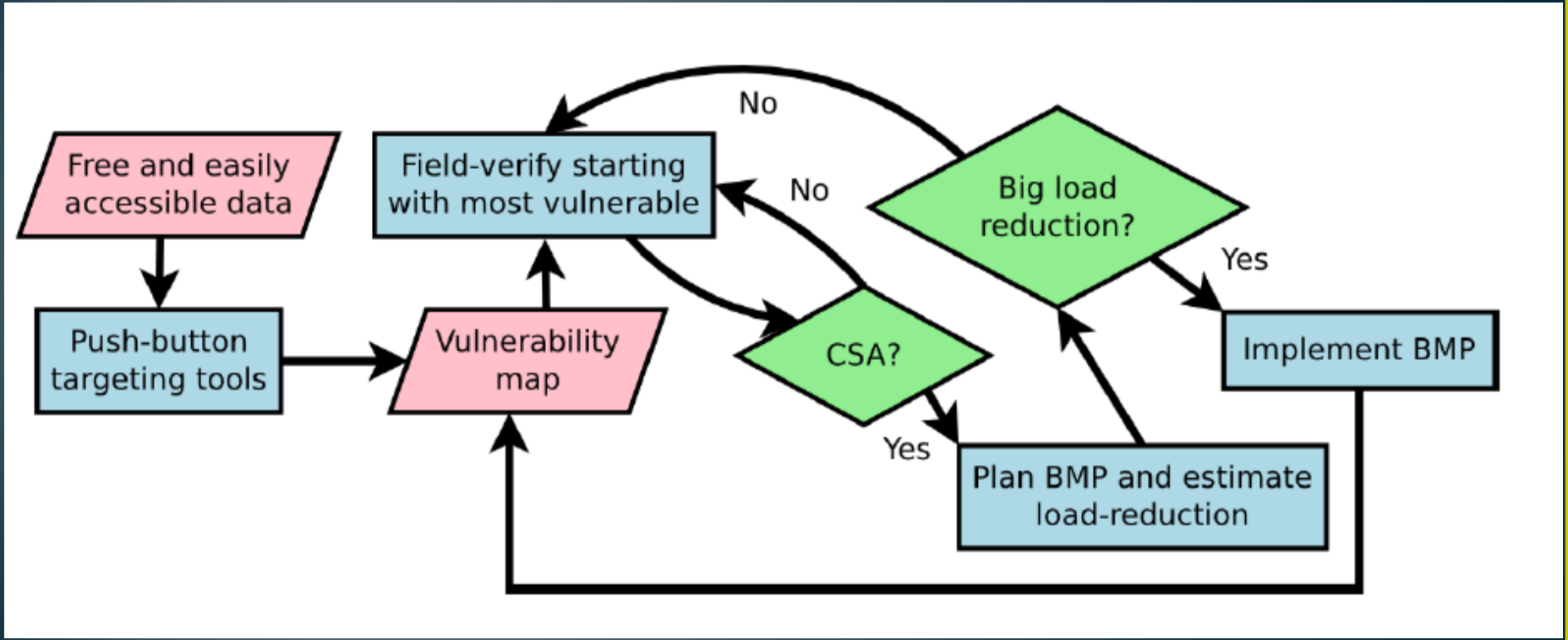
Distance from animal lot to stream

- 0 – 100 ft.
- 100 - 200
- 200 - 300
- > 300

Crop Rotation

- Continuous Corn
- Cash Grain
- Dairy
- Pasture/Hay/Grassland
- Not enough data

Decision framework for identifying Critical Source Areas (CSAs) of non-point source nutrient pollution and prioritizing best management practices (BMPs) on agricultural fields.

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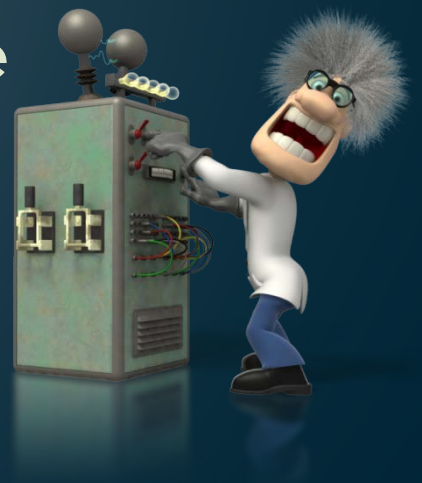
Quantifying Reductions

- Credits Generated by a Nonpoint Source

  Modeling vs. Monitoring
  - SNAP-Plus and RUSLE2 for agricultural field practices
  - New Barnyard Tools
  - SLAMM and P-8 for urban practices

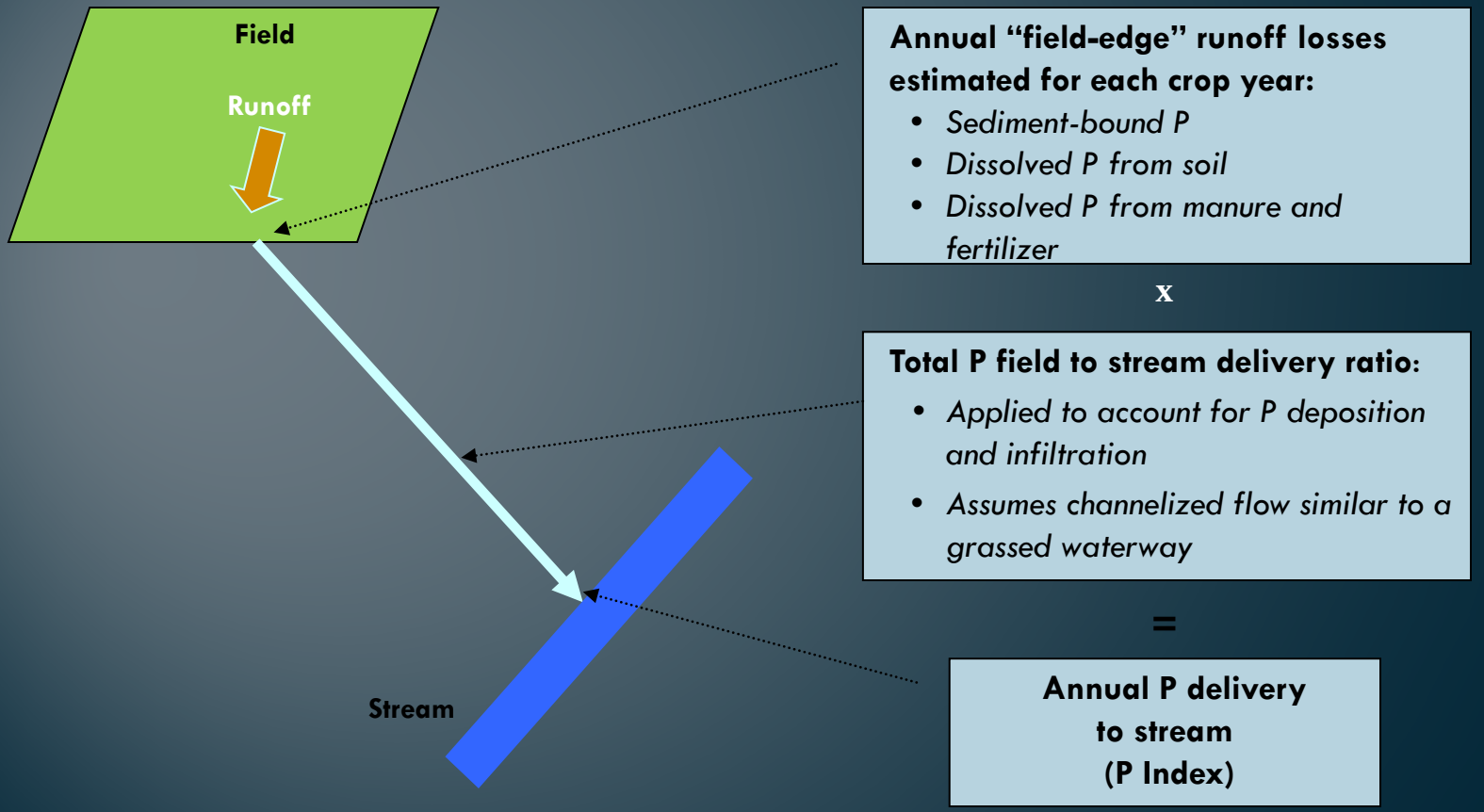
- Credits Generated by a Point Source
  - Effluent monitoring

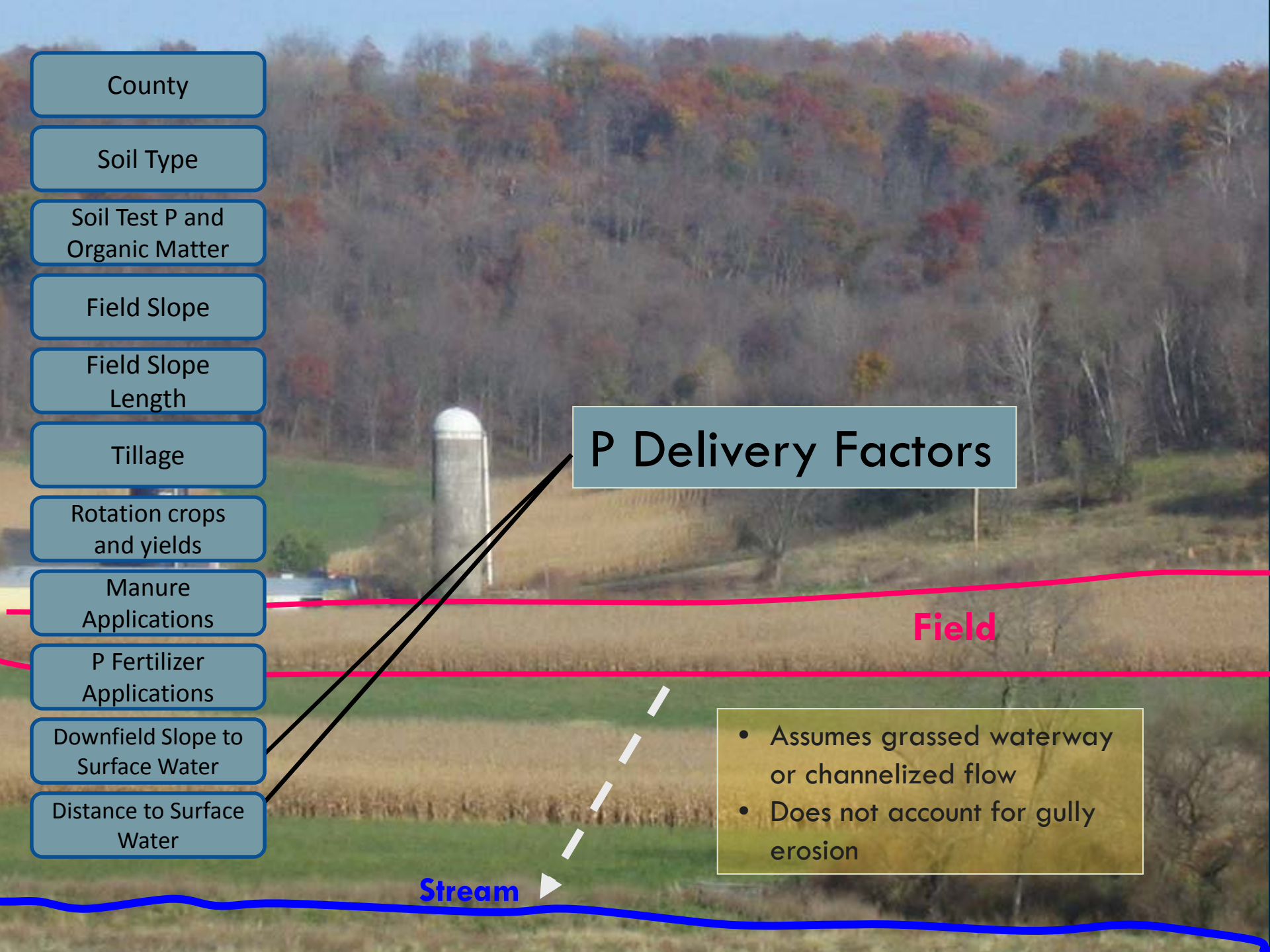


Quantifying Credits

Wisconsin P Index

- P Index estimates P delivery to nearest surface water body
- Accounts for sources and transport based on long-term average weather




County
Soil Type
Soil Test P and Organic Matter
Field Slope
Field Slope Length
Tillage
Rotation crops and yields
Manure Applications
P Fertilizer Applications
Downfield Slope to Surface Water
Distance to Surface Water
P Delivery Factors
Field
Stream
• Assumes grassed waterway or channelized flow
• Does not account for gully erosion

Sources of Phosphorus

- Soil P
- Manure P on surface
- Fertilizer P on surface

P and Soil Transport

- Eroding sediment

  - *RUSLE2 erosion*

- Rainfall runoff

  - *Runoff curve numbers*

- Snowmelt runoff

  - *Method based on surface depressional storage and long-term average runoff for agricultural watersheds*

RUSLE2

Average annual rill and interrill erosion on a slope in T/acre/year

Erosion = R x K x L x S x C x P

RUSLE2: Basic equation for average annual soil loss (a) on each *ith* day is:

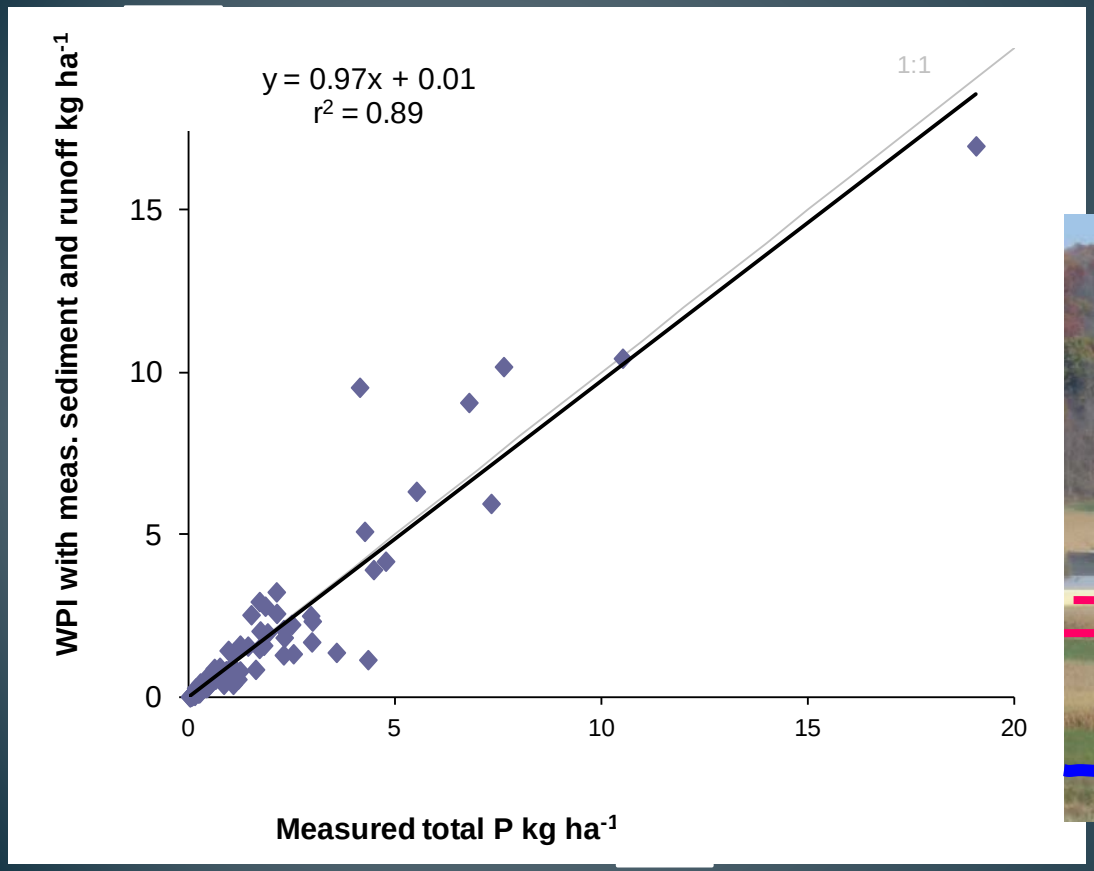
$$a_i = r_i k_i l_i S c_i p_i$$

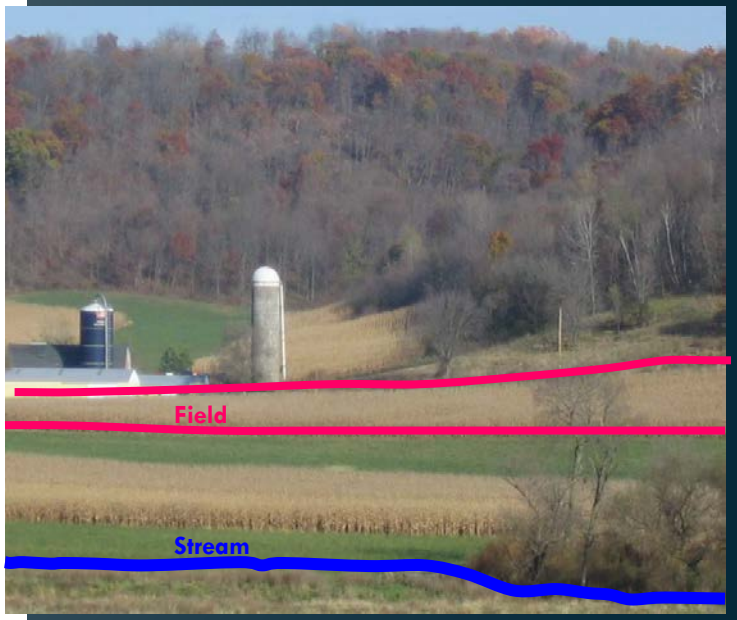
r_i = erosivity factor
k_i = soil erodibility factor
l_i = slope length
S = slope steepness
c_i = cover management factor
p_i = supporting practices factors

P Index's Particulate P loss is tightly correlated with soil loss as modeled by USDA's RUSLE2.

Testing "Source" Components of P Index Equations

Revised WI P Index compared to measured runoff losses for 86 site years using measured sediment and runoff volume in the equations

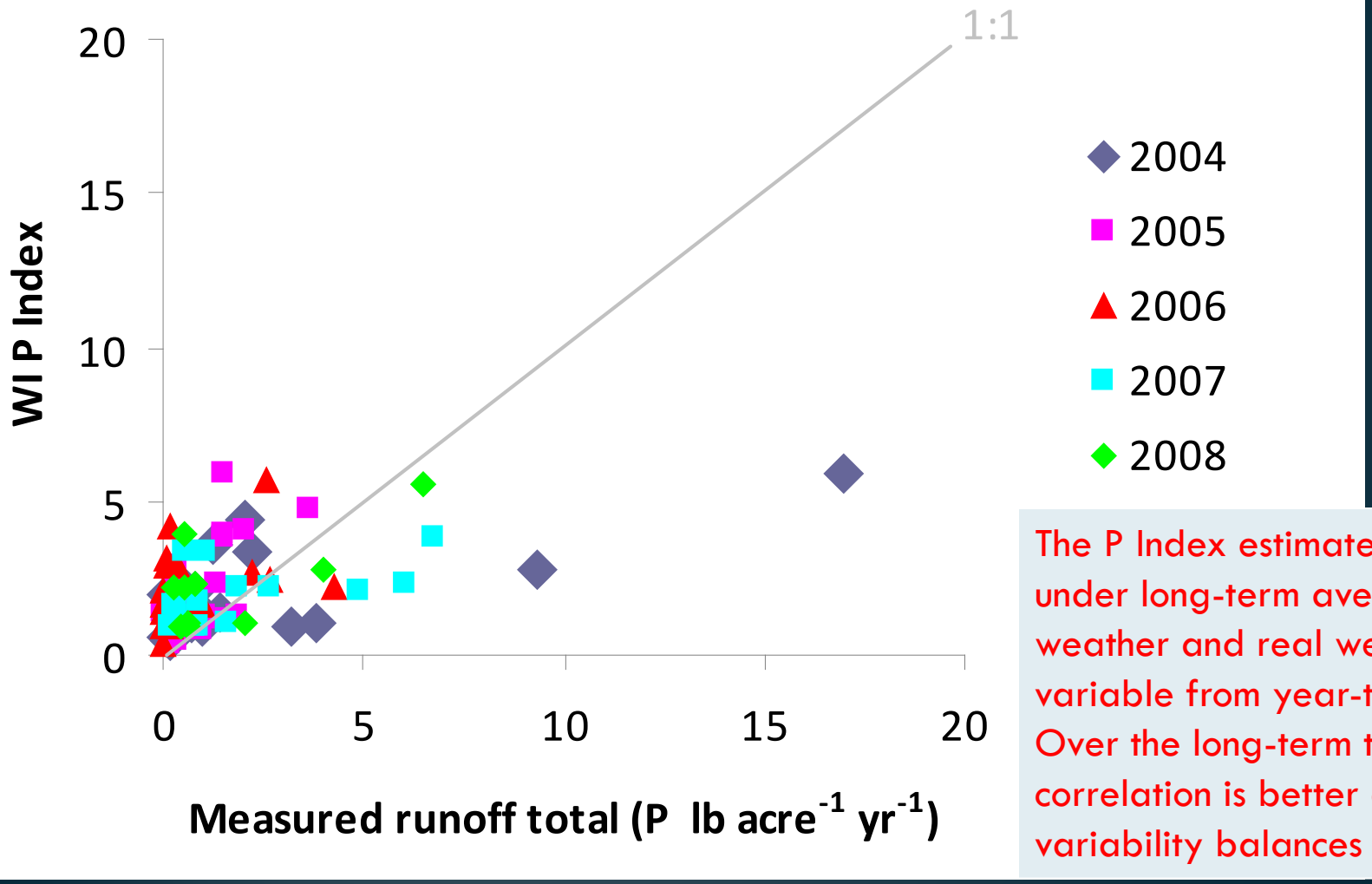




- P Index is working relatively well to rank fields by total P loss if the methods used to estimate average annual runoff and sediment loss are accurate.

Source: Good, L.W., P. Vadas, J.C. Panuska, C.A. Bonilla, W.E. Jokela, 2012. Testing the Wisconsin Phosphorus Index with Year-Round Field-Scale Runoff Monitoring. Journal of Environmental Quality. 41:1730-1740.

Measured Annual Runoff P and WI P Index
Monitoring conducted in 2003-2008



The P Index estimates P loss under long-term average weather and real weather is variable from year-to-year. Over the long-term the correlation is better as the variability balances out.

Transport Factors and P Index for Continuous Tilled Crops

Tillage: Fall chisel, twisted shovel, spring disking, field cultivation

	Erosion (T/a/yr)	Part. P Index	Total Runoff (in)	Soluble P Index	Total P Index
Corn silage	5.7	5.4	2.9	0.2	6
Corn grain	1.4	1.3	1.5	0.1	1
Soybean	4.6	4.5	2.6	0.2	5
Winter wheat	0.5	0.5	1.1	0.1	1

Transport Factors and P Index for Continuous No-till Crops

Tillage: No-till

	Erosion (T/a/yr)	Part. P Index	Runoff (in)	Sol. P Index	Total P Index
Corn silage	1.7	1.6	3.9	0.4	2
Corn grain	0.1	0.1	1.9	0.2	0
Soybean	0.7	0.6	2.7	0.3	1
Winter wheat	0.2	0.2	2.2	0.2	0

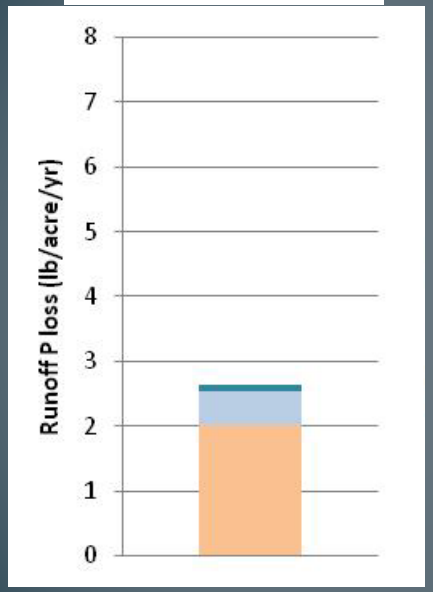
Particulate and Soluble P Index with Manure Applications

	Soil Loss (T/a/yr)	Part. P Index	Sol. P Index
15,000 gallons/acre slurry, fall, surface applied, no-till	0.9	1.4	1.1
15,000 gallons/acre slurry, fall, incorporated with chisel plow	4.5	5.6	0.5

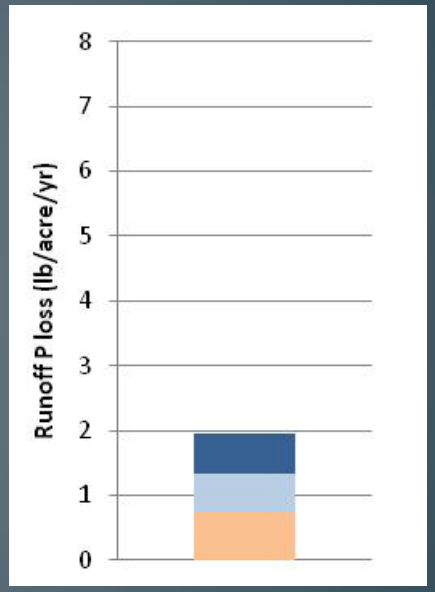
- Higher dissolved P losses with no-till
- Higher particulate P losses with incorporation by tillage

P Index Varies with Management: NE Wisconsin Example

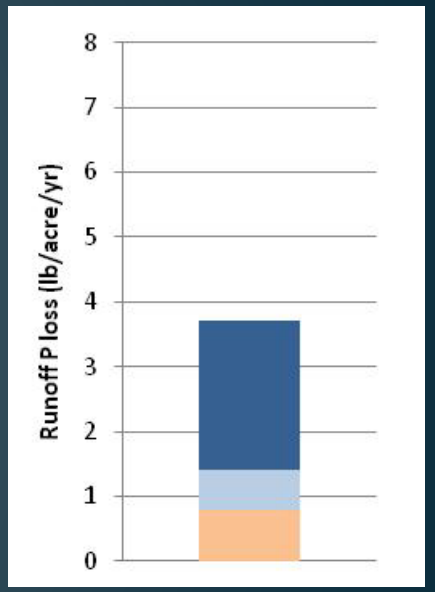
Rotation: 3 years corn silage and 3 years alfalfa
Soil test P = 70 ppm
Manawa silty clay loam soil, 2% slope



Fall chisel, fall apply
10,000 gal/acre
dairy manure
1.3 T/a/yr erosion



No till, fall apply
10,000 gal/acre
dairy manure
0.5 T/a/yr erosion



No till, winter apply
7,000 gal/acre
dairy manure
0.5 T/a/yr erosion

Tillage Influence | **Manure Timing and Method Influence**

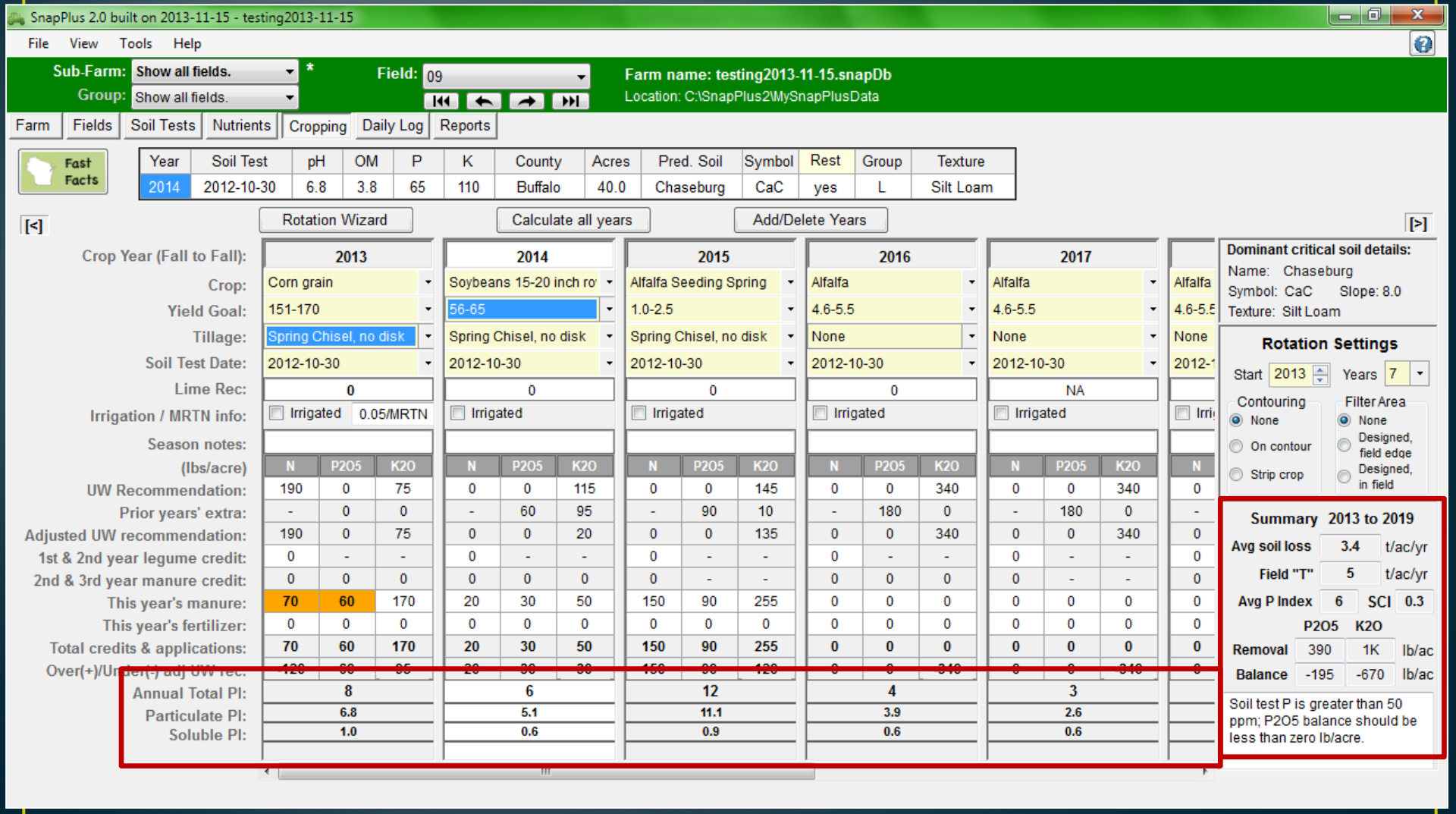
SnapPlus Example PI Runs

- Constants
  - Soil type (CaC – 8% slope)
  - Soil test values (P= 65ppm)
  - Field Characteristics
    - Size (40acres)
    - Distance and slope to water 2-6%)
  - Crop Management
    - 7 yr rotation
    - Yield goals
    - Manure applications
      - Corn: 10,000 gal/acre, slurry, fall applied, unincorporated
      - Soybeans: 10 T/acre, semi-solid, fall applied, incorporated

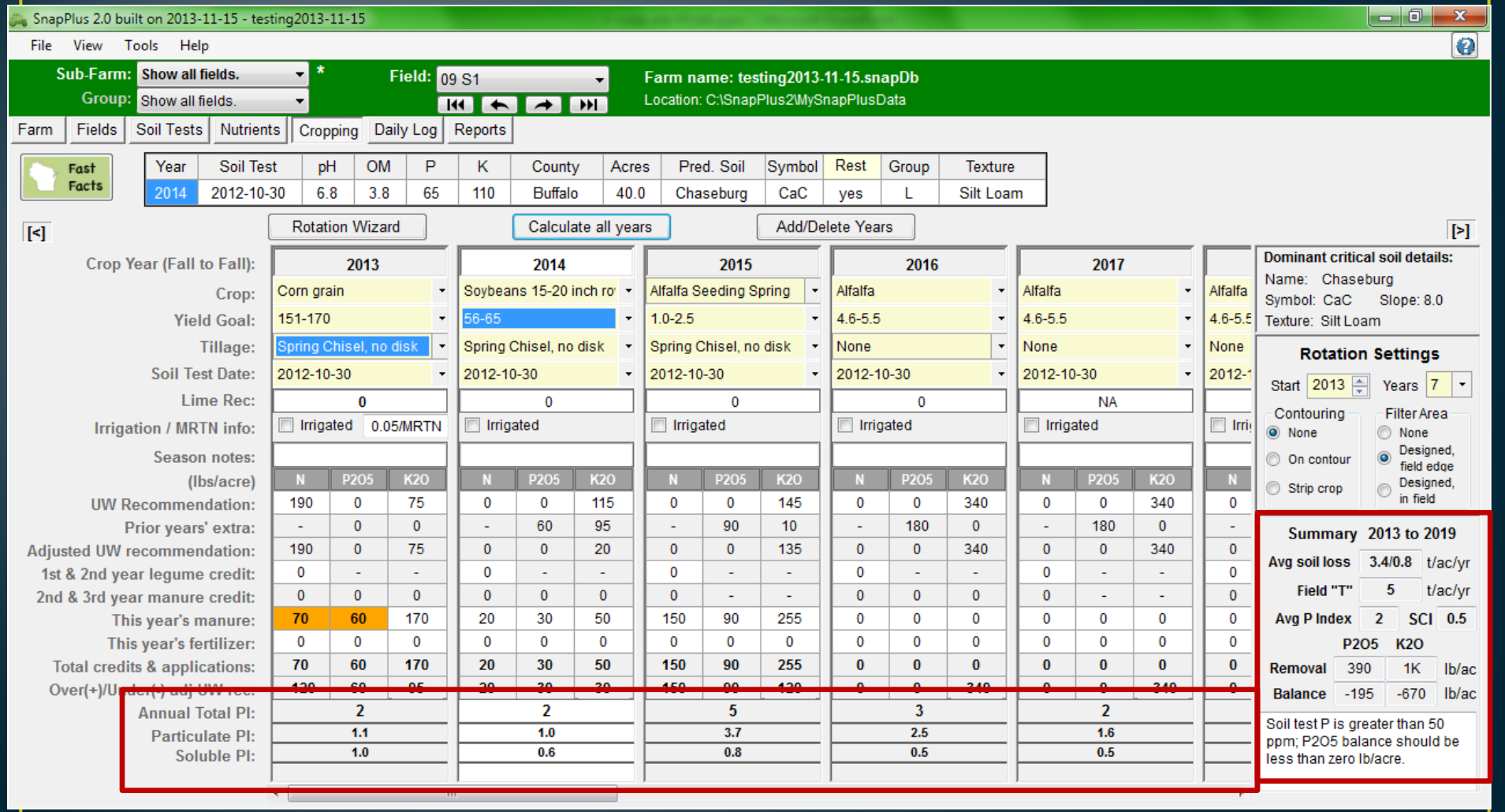
SnapPlus Example PI Runs

- Changing Factors
  - Tillage (on/off contour, tillage type)
  - With or without cover crops
  - Rotations
  - Buffers
- Snap Features
  - ~230 crop types
  - 11 tillage types
  - Annual and rotational average PI values
  - Soluble and Particulate PI values

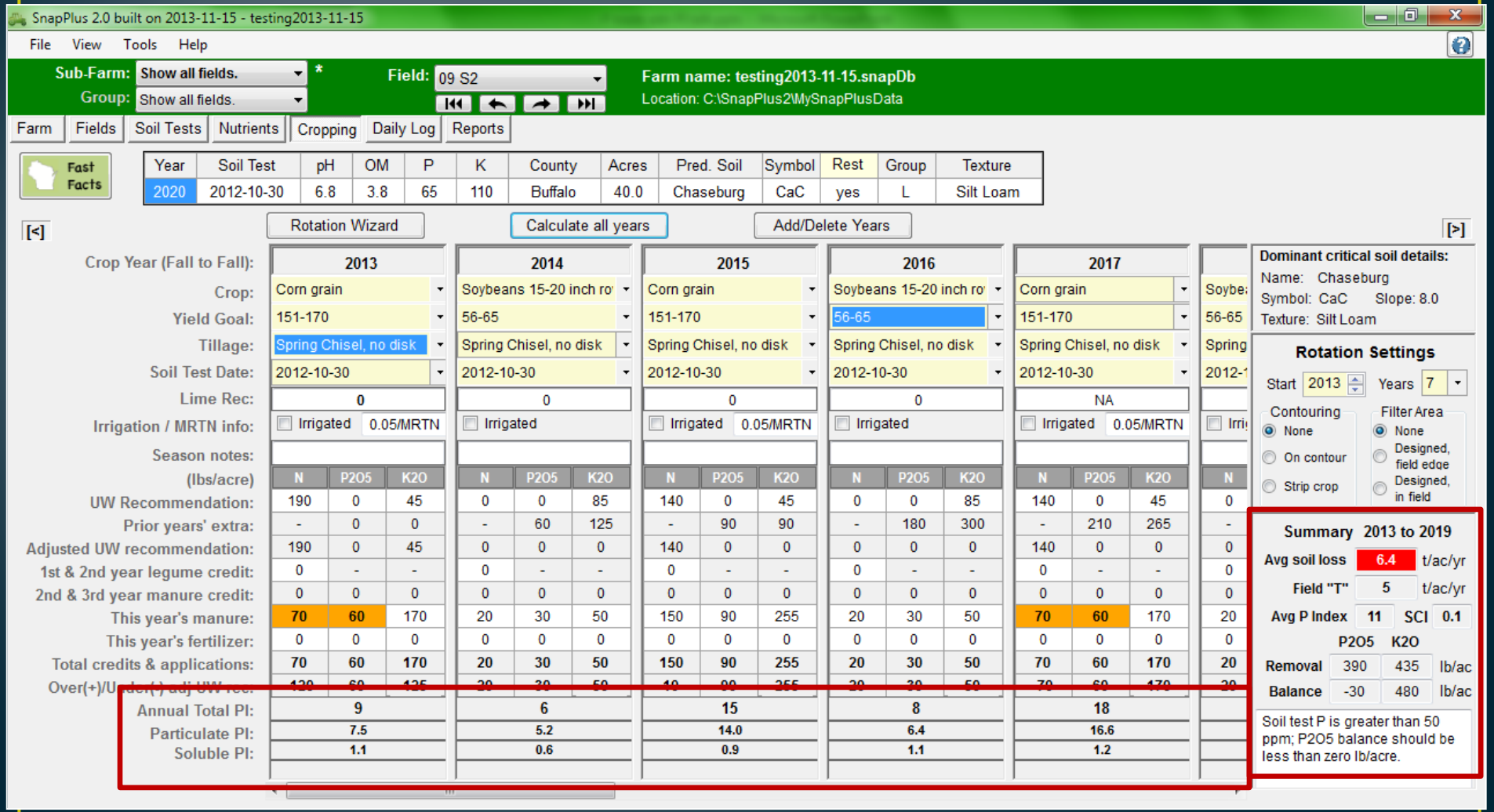
Field 1: Corn-Soy-Alfalfa Rotation



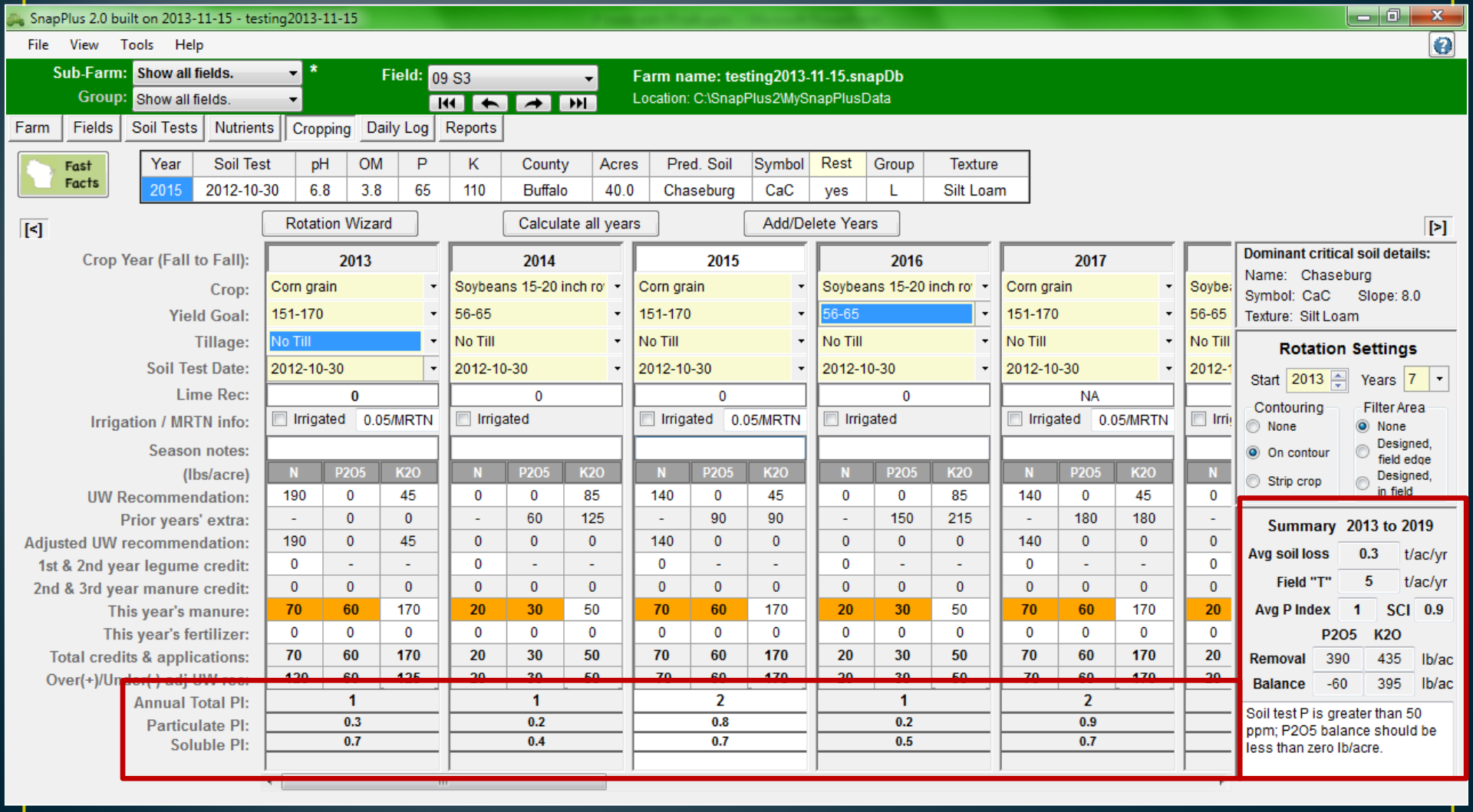
Field 1A:
Corn-Soy Rotation with edge of field buffer



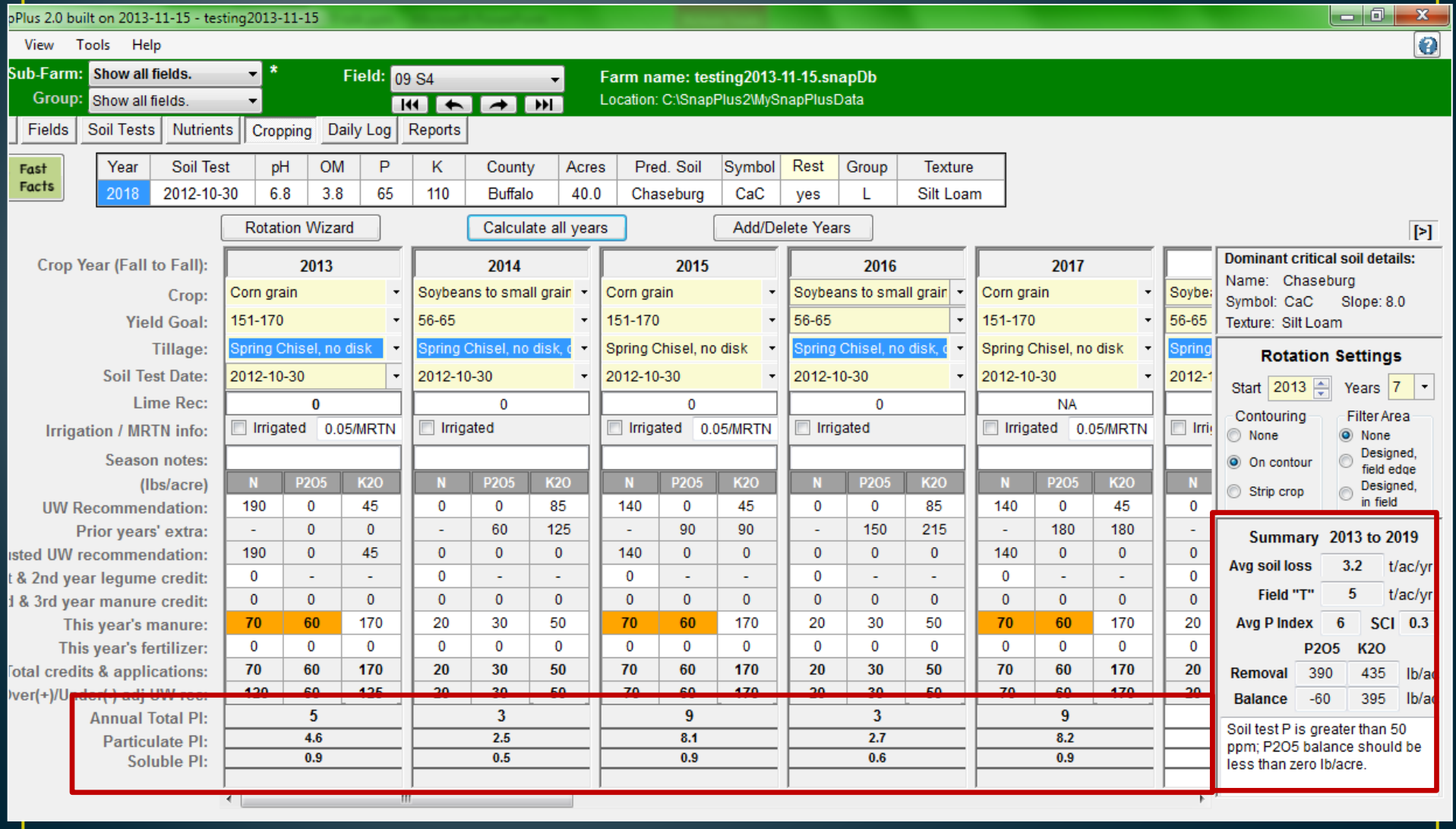
Field 2:
Corn-Soy Rotation Spring Tillage



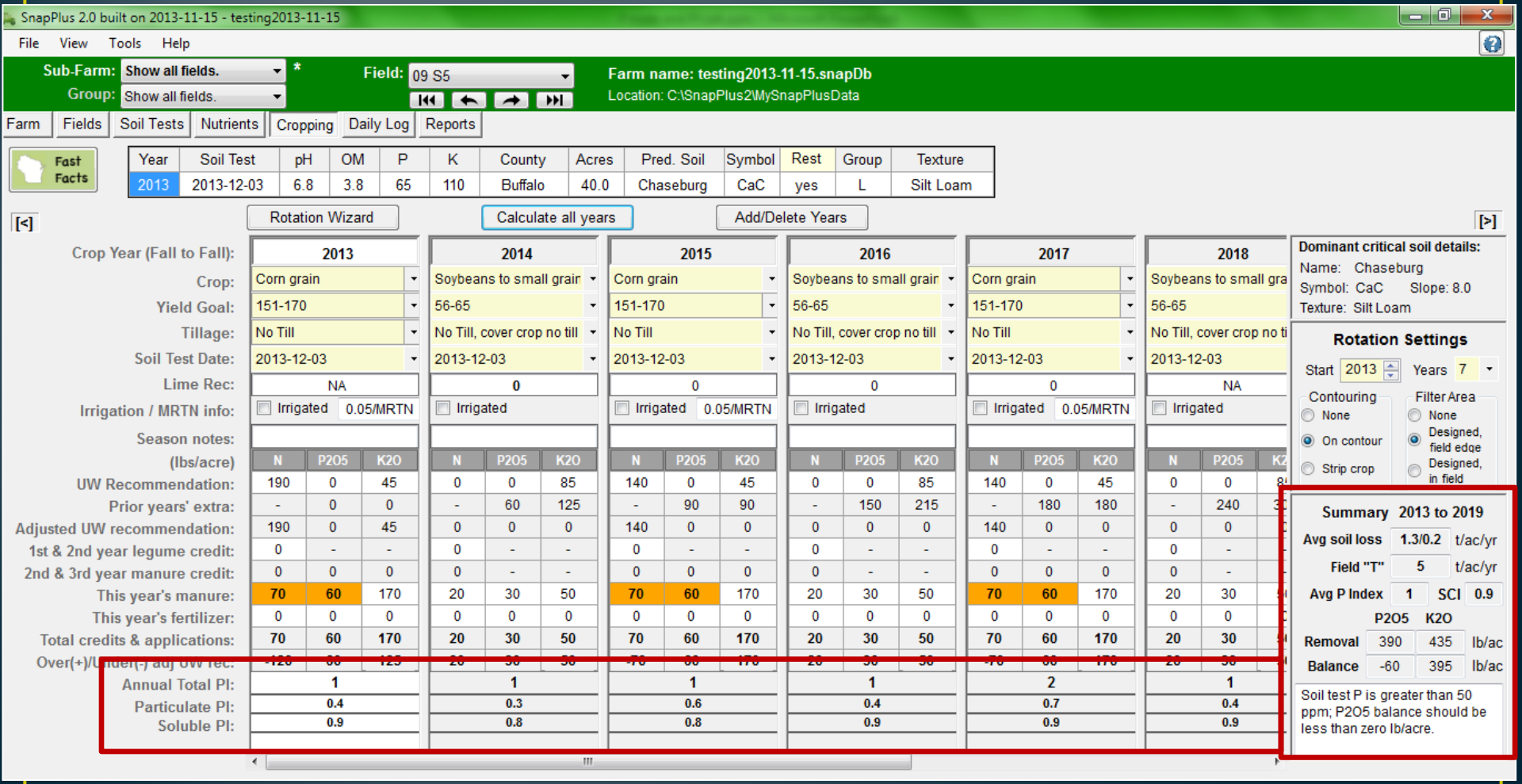
Field 2-A:
Corn-Soy, No Till, On Contour



Field 2-A2:
Corn-Soy w/cover crop, on contour



Field 2-A3: Corn grain-Soy w/cover, No Till, On Contour, Edge of Field Buffer



SnapPlus Example PI Summary

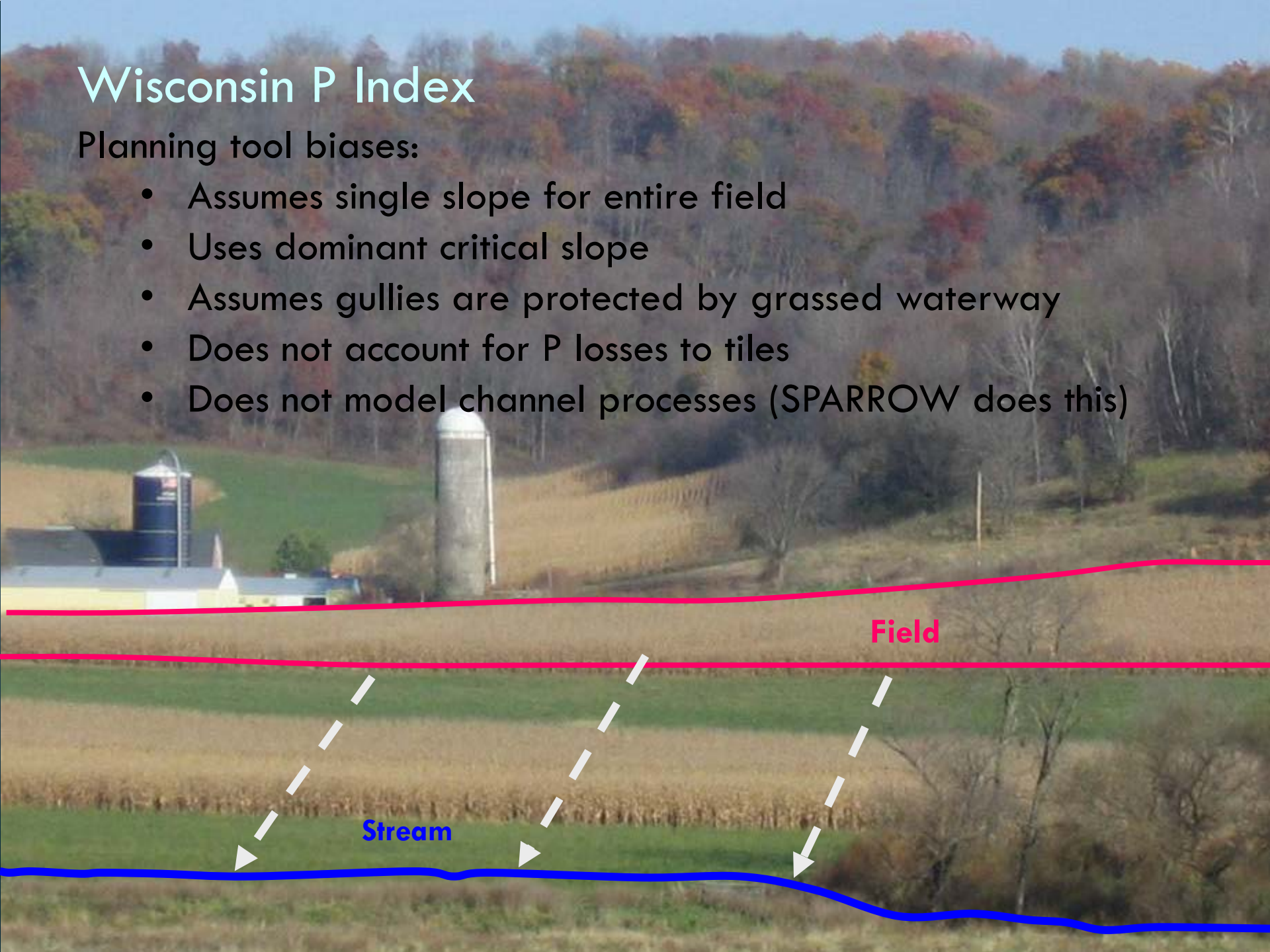
(expressed in lbs/acres)

Field	PI Yr 1	PI Yr 2	PI Yr 3	PI Yr 4	PI Yr 5	PI Yr 6	PI Yr 7	Rot. Ave	Soil Loss
1 (Dairy Rotation, no BMPs)	8	6	12	4	3	2	5	6	3.4
1-A1 (Dairy + Buffer)	2	2	5	3	2	1	1	2	3.4/0.8
2 (Corn-Soy, No BMPs)	6	3	10	4	12	3	12	7	3.9
2-A1 (Corn-Soy, no till)	1	1	2	1	2	1	2	1	0.3
2-A2 (Corn-Soy w/cover)	5	3	9	3	9	3	9	6	3.2
2-A3 (Whole Field)	1	1	1	1	2	1	1	1	1.3/0.2

Wisconsin P Index

Planning tool biases:

- Assumes single slope for entire field
- Uses dominant critical slope
- Assumes gullies are protected by grassed waterway
- Does not account for P losses to tiles
- Does not model channel processes (SPARROW does this)



Resources / SnapPlus Support

- P Index Website: http://wpindex.soils.wisc.edu/
- SnapPlus Website: http://www.snapplus.net/
- Contact Information:
  - Sara Walling, DATCP, sara.walling@wi.gov, 608-224-4501
  - Laura Ward Good, UW Madison Soil Science Dept, lwgood@wisc.edu, 608-262-9894

Annual Phosphorus Loss Estimator (APLE) for Barnyards

Under development by Peter Vadas, USDA-ARS

Estimates sediment and P in runoff per acre per year using:

- Surface type (dirt or paved)
- Soil test P
- Number of animals – manure generated,
- Average annual rainfall (uses to estimate runoff)

Converting Reductions Into Credits

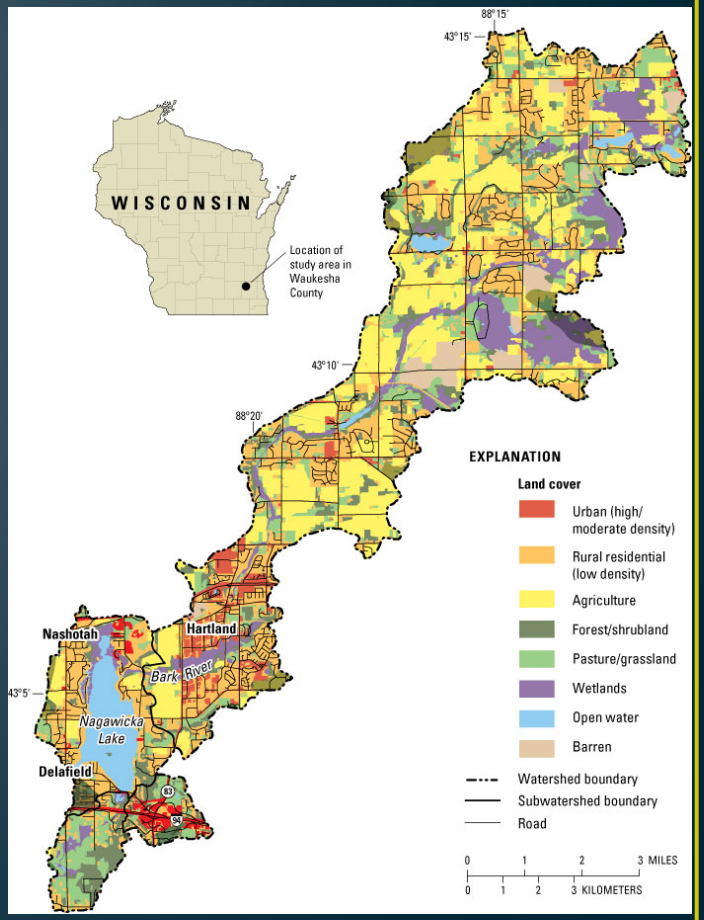
- **What is a credit?**

  A credit is a unit of pollutant reduction usually measured in pounds equivalent. Credits can be generated by a point source over-controlling its discharge or by a nonpoint source installing best management practices (BMPs) beyond the credit threshold.

DNR negotiated concept of interim credits.

Evaluate Geographic Setting

- Size of watershed and location of point sources relative to potential credits.
- Relative location of point of standards application.
- Assess need for downstream trading or delivery factors due to lakes or impoundments – how will this impact trade ratios or attainment of water quality standards.



Trade Ratios

- Trade ratios are used to ensure the amount of reduction resulting from the trade has the same effect as the reduction that would be required without the trade. Further requires an improvement in water quality.

- Trade ratio components include:
    1. Location
    2. Delivery
    3. Uncertainty
    4. Equivalency
    5. Retirement

Applicable Sections of Guidance Document

2.7 Pollutant Reduction Credit Threshold

Credit threshold is the pollutant load below which reductions must be made to generate pollutant reduction credits.

- PS CG – Most restrictive effluent limit (permitted MS4, 20% TSS reduction)
- NPS CG – Current pollutant load or LA when TMDL approved

2.8 Interim and Long-term Pollutant Reduction Credits for NPSs Located in a TMDL Watershed

- TMDL Credit Threshold
  - Apply % Reduction from TMDL to the baseline condition in TMDL.
    - Baseline NR 151 (PI= 6)
    - Barnyards and Stream bank Stabilization

Applicable Sections of Guidance Document

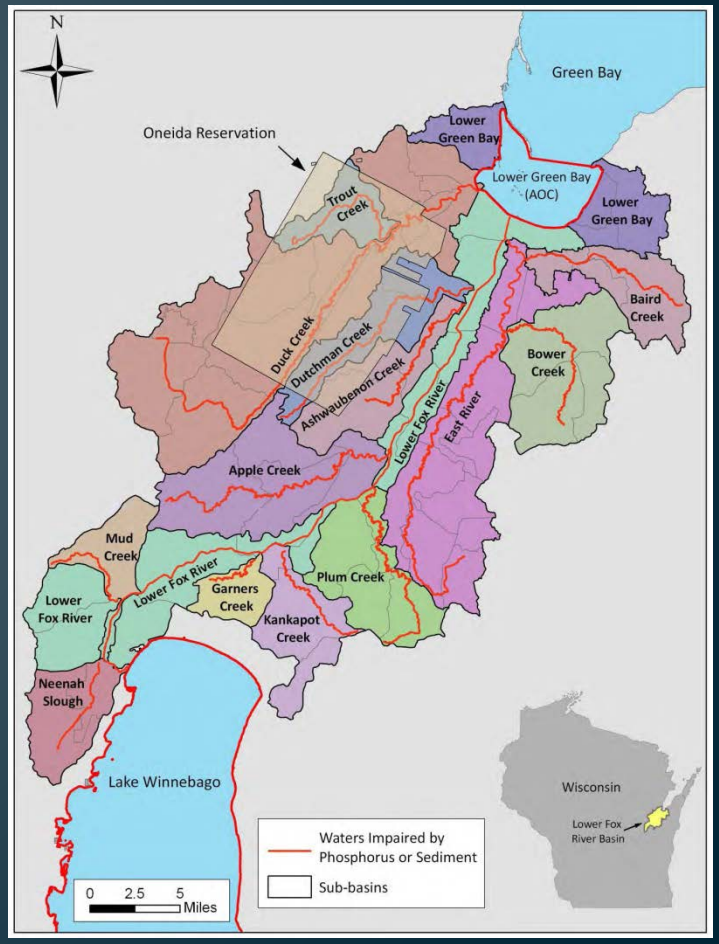
2.9 Technical Standards for Management Practices

- NRCS or WDNR

2.10 Location and Geographic Extent of Water Quality Trades

TMDL WQBELs – Credits generated within drainage area of impaired segment

Non-TMDL WQBELs – Credits generated upstream of point of standards application (POSA)



Applicable Sections of Guidance Document

2.11 Trade Ratios

- (Delivery + Downstream + Equivalency + Uncertainty - Habitat Adjustment):1
  - Minimum Trade Ratios equal 1.1:1 for PS CG, 1.2:1 for NPS CG

2.12 Timing of Pollutant Reduction Credit Generation

- PS CG - Must comply with trade agreement permit limit
- NPS CG - BMP in place and effective

2.13 Timing of Pollutant Reduction Credit Use

- PS CG - Credits must be generated during compliance period
- NPS CG - Anytime during calendar year

2.14 Quantifying Pollutant Load Reductions

- PS CG - Effluent monitoring
- NPS CG - Method specified by guidance

Trade Ratio

- ***Final Trade Ratio = Delivery + Equivalency + Uncertainty – Habitat Adjustment***

  For trades involving nonpoint sources the trade ratio cannot be lower than 1.2:1 (1.2 pounds of nonpoint for every pound of point source pollutant). For trades located upstream in the same HUC-12 the equation generally simplifies to:

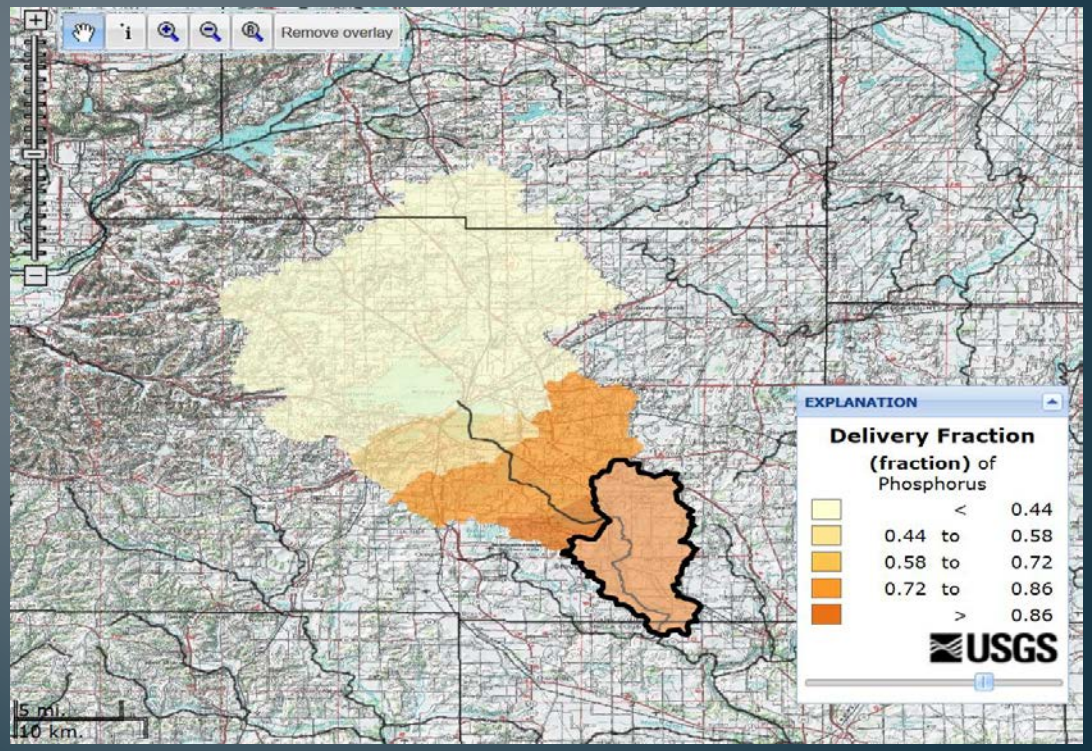
- ***Final Trade Ratio = Uncertainty : 1 (add 0.2 if necessary)***

Trade Ratio

- Equivalency (form of pollutant)
  - Not necessary with phosphorus
  - Not yet specified for N and TSS (sediment)
- Delivery (distance between generator and user)
  - TMDL – Same factors used in TMDL or USGS SPARROW
  - Non-TMDL – USGS SPARROW model for P, N and sediment
  - **Not needed if trading within same HUC-12**

Delivery - SPARROW Output Example

Delivery Factor = (1/SPARROW delivery fraction) - 1



Trade Ratio

Downstream Trade Ratio Factor: Allow downstream trading in same HUC-12 but minimize risk of exceedances of water quality criteria.

Percent Difference between Buyer's Load and Total Load at Point of Discharge	Downstream Trade Ratio Factor
< 25%	**0.1**
25 - 50%	**0.2**
50 - 75%	**0.4**
75% >	**0.8**

Uncertainty Factor

Point Source Credit Generator Uncertainty Factor: The uncertainty factor for the trade is set equal to 1 when the credit generator performs effluent monitoring in accordance with the terms of its WPDES discharge permit.

Due to the nature of stormwater discharges, nonpoint source uncertainty factors are more appropriate for a permitted MS4.

Uncertainty Factor

Nonpoint Source Credit Generator Uncertainty Factor: For the purpose of this uncertainty factor, MS4s and other permitted storm water sources are considered nonpoint because the pollutant source is diffuse and dependent on climatic factors.

Generally, the nonpoint source uncertainty factor accounts for the effectiveness of management practices employed over various flow or precipitation regimes and the ease of verification that the management practice is in place and operating effectively.

Trade Ratio – Uncertainty

Table 4. Management practices with recommended credit generation and use information.

Management Practice	Uncertainty Factor[1]	Applicable Technical Standard	Method for Calculating Pollutant Load Reductions	Notes
Agricultural Practices				
Whole Field Management: Requires an approved nutrient management plan, filter strips/buffer strips, grassed waterways, conservation or no till, and cover crops. Additional practices as deemed by NRCS or County Conservationist may be required to protect against mobilization and delivery of pollutants.	1	NRCS 590, 393, 332, 412, 345 329, 340 and 330	SNAP-Plus or equivalent model results compared to baseline	Requires an approved NRCS 590 nutrient management plan (NMP) that meets both the soil test-P and PI requirements. Requires a draw down strategy for nutrient concentrations that are above University of Wisconsin-Extension soil fertility recommendations. No application of manure, biosolids, or industrial wastes on snow covered or frozen ground or on fields with high groundwater or tile drainage. A crop or livestock producer engaged in a trade agreement must have all fields under an approved NMP, not just fields engaged in the trade.
Companion Crops (perennial vegetation)	1	NRCS 340	SNAP-Plus or equivalent model results compared to baseline Model as perennial cover	Companion crops must be established to provide continuous protection to soil surface and placed in support of Nutrient Management and supporting practices outlined below.
Conservation Easement	1	NRCS 327	SNAP-Plus or equivalent model results compared to baseline	Land in perennial vegetation.

Trade Ratio – Uncertainty

Table 4. Management practices with recommended credit generation and use information.

Management Practice	Uncertainty Factor[1]	Applicable Technical Standard	Method for Calculating Pollutant Load Reductions	Notes
Nutrient Management and supporting practices:	2 (3)	NRCS 590	SNAP-Plus or equivalent model results compared to baseline	An approved NMP is required with any of the listed supporting practices. All supporting practices receive the same uncertainty factor as the NMP. An uncertainty factor of 2, instead of (3), may be used when documentation can be provided through historic cropping records or soil testing that nutrient levels are stable or dropping, an indication of adherence to the NMP. An uncertainty factor of (3) is required if fields are not brought into compliance with NR 151.02 and NR 151.04, Wis. Adm. Code. No application of manure, biosolids or industrial wastes allowed on snow-covered or frozen ground or on fields with high groundwater or tile drainage. A crop or livestock producer engaged in a trade agreement must have all fields under an approved NMP, not just fields engaged in the trade. Use of **grassed waterways** on fields in support of nutrient management and other supporting practices lowers the uncertainty factor to 1.5.
Tillage Options				
Mulch Till	2 (3)	NRCS 345		
No Till	2 (3)	NRCS 329		
Riparian Filter Strip (edge of field)	2 (3)	NRCS 393		
Grassed Waterway	See Notes	NRCS 412		
Cover Crop	2 (3)	NRCS 340		
Other practices simulated in SNAP-Plus	2 (3)			
Production Area Practices			University of Wisconsin Barnyard Tool APLE or equivalent modeling method	
Diversion	2	NRCS 362		
Roof Runoff Structure	2	NRCS 558		
Vegetated Treatment System	4	NRCS 635		
Constructed Wetland	4	NRCS 656		
Sediment Control Basin	2	NRCS 350	RUSLE2	For agricultural runoff control.
Streambank Stabilization and Shoreline Protection			Contact WDNR to discuss project and develop a method to quantify impact of stabilization. Appropriate methods include NRCS regression calculation.	For livestock producers, streambank stabilization must be accompanied by riparian fencing or other controls to prevent destruction of streambanks.
Without aquatic habitat restoration	3	NRCS 580 NRCS 382		
With aquatic habitat restoration	2	NRCS 580 NRCS 395		

Example 1: Located in TMDL

- 40 acre field
- Dairy Rotation with a buffer added (2:1 Uncertainty Trade Ratio)
- Credit Threshold: Annual PI = 3 (TMDL call for a 50% reduction from NR 151 standards)
- Not located downstream and no delivery factor needed

Application of Trade Ratios (Example 1)

- Summary of PI for installation of buffer strip on a dairy rotation

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Rotation Average
Field 1 Dairy Rotation (lb/ac/yr)	8	6	12	4	3	2	5	6
Field 1-A1 Dairy + Buffer (lb/ac/yr)	2	2	5	3	2	1	1	2
Load Reduction (lb/ac/yr)	6	4	7	1	1	1	4	3.4

- Field located in a TMDL watershed with Credit Threshold of 3

Interim Load Reduction (lb/ac/yr)	5	3	7	1	0	0	**2**	2.6
Long-term Load Reduction (lb/ac/yr)	1	1	0	0	1	**1**	2	1

Application of Trade Ratios (Example 1)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Rotation Average
Interim Load Reduction (lb/ac/yr)	5	3	7	1	0	0	2	2.6
Long-term Load Reduction (lb/ac/yr)	1	1	0	0	1	1	2	1

- Installation of buffer strip Trade Ratio 2:1

Interim Credits (lb/ac/yr)	2.5	1.5	3.5	0.5	0	0	2	1.3
Long-term Credits (lb/ac/yr)	0.5	0.5	0	0	0.5	1	1	0.5

- 40 acre field

Total Interim Credits (lb/yr)	100	60	140	20	0	0	80	57.2
Total Long-term Credit (lb/yr)	20	20	0	0	20	40	40	20.0

Example 2: Located outside of TMDL

- 40 acre field
- Corn – Soybean Rotation with whole field management (1:1 uncertainty Trade ratio)
- Credit Threshold Not Applicable
- Located downstream but no delivery factor needed. Presto analysis shows point source averages 42% of total load.

Application of Trade Ratios (Example 2)

- Summary of PI for whole field management

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Rotation Average
Field 1 Corn Soybean (lb/ac/yr)	6	3	10	4	12	3	12	7
Field 1-A1 Whole Field (lb/ac/yr)	1	1	1	1	2	1	1	1
Load Reduction (lb/ac/yr)	5	2	9	3	10	2	11	6

- Field not located in a TMDL, no credit threshold

Interim Load Reduction (lb/ac/yr)	0	0	0	0	0	0	0	0
Long-term Load Reduction (lb/ac/yr)	5	2	9	3	10	2	11	6

Application of Trade Ratios (Example 2)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Rotation Average
Interim Load Reduction (lb/ac/yr)	0	0	0	0	0	0	0	0
Long-term Load Reduction (lb/ac/yr)	5	2	9	3	10	2	11	6

- Trade Ratio: whole field manament (1:1) plus downstream (0.2) results in trade ratio of 1:1.2

Long-term Credits (lb/ac/yr)	4.1	1.7	7.5	2.5	8.3	1.6	9.2	5.0

- 40 acre field

Total Long-term Credit (lb/yr)	164	68	300	100	332	64	368	200

Keys: Finding and Quantifying Credits

- Determine your eligibility for the programs.
- Evaluate information contained in TMDLs.
- Use DNR screening tools to evaluate potential opportunities (work with county LCDs, crop consultants, and watershed groups).
- Perform field scale analysis to quantify reductions (work with county LCD and crop consultants).
- Apply applicable trade ratios.

Questions:

Guidance for Implementing Water Quality Trading in WPDES Permits

A Water Quality Trading How To Manual

http://dnr.wi.gov/topic/SurfaceWater/WaterQualityTrading.html

(topic keyword: "water quality trading")

Adaptive Management Technical Handbook

http://dnr.wi.gov/topic/SurfaceWater/AdaptiveManagement.html

(topic keyword: "adaptive management")