

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







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")



Finding Offsets

Quantifying Offsets with SNAP+

Converting Offset to Credits

Questions

Trading and Adaptive Management Process

 Decide if Adaptive Management/Trading is right for the point source & their partners Step • Work with partners to develop the Adaptive Management/Trading plan Step 2 Submit Plan to WDNR Permit will be reissued/modified to include Adaptive Management/Trading Step 3 requirements (requirements differ between AM and trading) • Comply with permit requirements and implement Adaptive Management/ Trading plan (requirements and timing differ between AM and trading) Step

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



PRESTO Online

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

<u>http://dnr.wi.gov/</u>, 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 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.



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: <u>http://dnr.wi.gov/topic/tmdls/</u>
- 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 <u>DOES NOT</u> 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



Agricultural Prioritization

NC

SP

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









Overall erosion "score"





Where are the animals?







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.







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

SNAP-Plus

Wisconsin's Nutrient Management Planning Software

Home

Downloads

Version 1.132

User Manual

Database Tools

News & Help

Installation Details

Recent Program Changes

Training Opportunities

Answers (FAQ)

Known Problems

Helpful Links Contact & Links

Contact Information NRCS 590 Standard UWEX publication A2809 WI Phosphorus Index

RUSLE2 Info

Soil and Restriction Maps

SNAP-Plus is produced by the



SNAP-Plus is supported by:



NRCS Natural Resources Conservation Service



Important News

August 5, 2013 SnapPlus Version 2.0 is available at http://snapplus.wisc.edu.

SnapPlus 2.0 has been released on August 5, 2013 at **snapplus.wisc.edu**. We encourage SnapPlus users to use the new version as it has many improvements including the new A2809 nutrient recommendations. The new version will convert existing version 1 farm databases for use in SnapPlus 2.0 without modifying it. Existing SnapPlus version 1.132 farm databases will continue to work in version 1, but with the old A2809 recommendations.

SnapPlus 2.0 is now available

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 THE DURING ST

Stream

P Delivery Factors

Field

• 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 × K × L × S × C × P

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

 $\mathbf{a}_{i} = \mathbf{r}_{i} \mathbf{k}_{i} \mathbf{I}_{i} \mathbf{S} \mathbf{c}_{i} \mathbf{p}_{i}$

- r_i = erosivity factor
- $k_i = soil erodibility factor$
- $I_i = slope length$
- 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.

<u>Source:</u> 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



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	Ο
Soybean	0.7	0.6	2.7	0.3	1
Winter wheat	0.2	0.2	2.2	0.2	0





	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

8

7

6

5

4

3

2

1

0

Runoff P loss (lb/acre/yr)



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

Soil test P = 70 ppm Manawa silty clay loam soil, 2% slope

Rotation: 3 years corn silage and 3 years alfalfa

Tillage Influence

Manure Timing and Method Influence

8

6

5

4

3

2

1

Runoff P loss (lb/acre/yr)
SnapPlus Example Pl 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 Pl 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

- 0 × A SnapPlus 2.0 built on 2013-11-15 - testing2013-11-15 0 File View Tools Help Field: 09 Sub-Farm: Show all fields. Farm name: testing2013-11-15.snapDb Group: Show all fields. Location: C:\SnapPlus2\MySnapPlusData 144 + + →) Farm Fields Soil Tests Nutrients Cropping Daily Log Reports Ρ κ Year Soil Test pН OM County Acres Pred. Soil Symbol Rest Group Texture Fast Facts 2012-10-30 6.8 3.8 65 110 Buffalo 40.0 Chaseburg CaC Т Silt Loam yes Calculate all years Add/Delete Years Rotation Wizard [>] [<] Dominant critical soil details: Crop Year (Fall to Fall): 2017 2013 2014 2015 2016 Name: Chaseburg Soybeans 15-20 inch ro Alfalfa Corn grain Alfalfa Seeding Spring Alfalfa Alfalfa Crop: • Symbol: CaC Slope: 8.0 151-170 1.0-2.5 4.6-5.5 Yield Goal: ÷ 6-65 Ŧ 4.6-5.5 4.6-5.5 -Texture: Silt Loam Spring Chisel, no disk Tillage: Spring Chisel, no disk Spring Chisel, no disk None None None Rotation Settings Soil Test Date: 2012-10-30 2012-10-30 2012-10-30 2012-10-30 2012-10-30 2012-• • . Years 7 -Start 2013 🚔 Lime Rec: 0 0 0 0 NA Contouring Filter Area Irrigated 0.05/MRTN Irrigated Irrigated Irrigated Irrigated 📃 Irri Irrigation / MRTN info: None None Designed, Season notes: On contour field edge K20 (lbs/acre) Designed, Strip crop in field 190 0 75 0 0 0 0 145 0 0 340 0 0 340 0 UW Recommendation: 115 0 0 60 95 90 180 0 180 0 Prior years' extra: ---10 ---Summary 2013 to 2019 190 0 75 0 0 20 0 0 135 0 0 340 0 0 340 0 Adjusted UW recommendation: Ava soil loss 3.4 t/ac/yr 0 0 0 0 0 -0 1st & 2nd year legume credit: -_ _ _ --_ _ -Field "T" 5 t/ac/yr 0 0 0 0 0 0 0 0 0 0 0 0 2nd & 3rd year manure credit: ----70 60 170 20 30 50 150 90 255 0 0 0 0 0 0 0 Avg P Index 6 SCI 0.3 This year's manure: 0 This year's fertilizer: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 P205 K20 0 Total credits & applications: 70 60 170 20 30 50 150 90 255 0 0 0 0 0 0 Removal 390 1K lb/ac 400 0.5 20 4 6 0 00 400 240 240 Over(+)/Under(-) adj UW rec. 20 lb/ac Balance -195 -670 6 12 3 8 4 Annual Total PI: Soil test P is greater than 50 6.8 5.1 11.1 3.9 2.6 Particulate PI: ppm: P2O5 balance should be 1.0 0.6 0.9 0.6 0.6 Soluble PI: less than zero lb/acre.

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

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This year's manure: This year's fertilizer: Total credits & applications: Over(+)/U <mark>nder(-) adj UW rec</mark>	70 0 70 120	60 0 60	170 0 170 05	20 0 20 20	30 0 30 30	50 0 50 30	150 0 150 150	90 0 90	255 0 255 120		0 0 0 0	0 0 0 0	0 0 0 340	0 0 0 0	0 0 0 0	0 0 0 340	0 0 0	Avg P Index 2 SCI 0.5 P2O5 K2O Removal 390 1K Ib/ac Balance -195 -670 Ib/ac
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Field 2: Corn-Soy Rotation Spring Tillage

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Crop:	Corn grain		-	Soybear	ns 15-20 ir	ch ro' 👻	Corn gra		-	Soybea	ns 15-20	inch ro' 👻	Corn gra		-	Soybe:	Name: Chaseburg
Yield Goal:	151-170		-	56-65		-	151-170)	-	56-65		-	151-170)	-	56-65	Symbol: CaC Slope: 8.0 Texture: Silt Loam
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Prior years' extra: Adjusted UW recommendation:	- 190	0	0 45	- 0	60 0	125 0	140	90	90	-	180 0	300 0	- 140	210 0	265 0	-	Summary 2013 to 2019
1st & 2nd year legume credit:	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	Avg soil loss 6.4 t/ac/yr
2nd & 3rd year manure credit:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Field "T" 5 t/ac/yr
This year's manure:	70	60	170	20	30	50	150	90	255	20	30	50	70	60	170	20	Avg P Index 11 SCI 0.1
This year's fertilizer:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	P2O5 K2O
Total credits & applications:	70		170	20	30	50	150	90	255	20	30	50	70	60	170	20	Removal 390 435 lb/ac
Over(+)/U <mark>nder() adj UW ree:</mark>	120	60	425	20	30	50	10	00	255	20	30	50	70	60	170	20	Balance -30 480 lb/ac
Annual Total PI:		9			6			15			8			18			Soil test P is greater than 50
Particulate PI:		7.5			5.2			14.0			6.4		<u> </u>	16.6			ppm; P2O5 balance should be
Soluble PI:		1.1		<u> </u>	0.6			0.9			1.1		<u> </u>	1.2		<u> </u>	less than zero Ib/acre.
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Field 2-A: Corn-Soy, No Till, On Contour

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	Yield G	Goal:	151-170		-	56-65		-	151-170 •		56-65 🗸		151-170		•	56-65	Texture: Silt Loam		
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	ar legume cr		0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	Avg soil loss 0.3 t/ac/yr
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	its & applicati	ions:	70	60	170	20	30	50 50	70	60 60	170	20	30	50 50	70	60 60	170	20	Removal 390 435 lb/ac
Over(+)/Un			1/11	1	178		1			2			1			2			Balance -60 395 lb/ac
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	Soluble PI: 0.7												toos anan zoro hordoro.						

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

oPlus 2.0 b	ouilt on 2013-	11-15 - tes	ting2013-	11-15																- 0 ×
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Fast	Year	Soil Tes	st pl	H ON	Л Р	К	County	Acres	s Pre	ed. Soil	Symbol	Rest	Group	Texture	,					
Facts	2018	2012-10-	30 6.	.8 3.8	8 65	110	Buffalo	40.0	Cha	aseburg	CaC	yes	L	Silt Loar	m					
		[Rotat	ion Wiza	ırd		Calculat	e all year	s	ſ	Add/De	lete Yea	rs							[>]
Сгор	Year (Fall	to Fall):		2013			2014			2015			2016			2017			Dominant critical	
· ·		Crop:	Corn gra	ain	•	Soybea	ns to small	grain -	Corn gra	ain	-	Soybea	ans to sma	all grain 👻	Corn gr	ain	-	Soybe:	Name: Chasebu Symbol: CaC	rg Slope: 8.0
	Yiel	d Goal:	151-170)	•	56-65		-	151-170	0	-	56-65		-	151-170)	•	56-65	Texture: Silt Loam	
		Tillage:	Spring C	Chisel, no	disk 🚽	Spring	Chisel, no d	lisk, c 🝷	Spring (Chisel, no	disk 🝷	Spring	Chisel, no	odisk, d 🔻	Spring	Chisel, no	disk 👻	Spring	Rotation S	ettings
	Soil Te	st Date:	2012-10	-30		2012-1)-30	•	2012-10)-30	•	2012-1	0-30	-	2012-10	0-30	•	2012-1	Start 2013 🚔	Years 7 -
	Lin	ne Rec:		0			0			0			0			NA			Contouring	Filter Area
Irrig	gation / MR	TN info:	🔲 Irriga	ated 0.0)5/MRTN	Irrig	ated		🔲 Irriga	ated 0.	05/MRTN	🔲 Irrig	jated		Irrig	ated 0.	05/MRTN	🔲 Irri		None
		n notes:					1			1									On contour	Designed, field edge
		os/acre)	N 190	P2O5	K20	0	P2O5	K20 85	N 140	P2O5	K20 45		P2O5	K20 85	N 140	P205	K20 45	N 0	Strip crop	Designed, in field
	Recommen Prior years		190	0	45	0	60	125	140	90	45 90		150	215	140	180	180			
	recommen		190	0	45	0	0	0	140	0	0	0	0	0	140	0	0	0	Summary 20	
	ear legume		0	-	-	0	-	-	0	-	-	0	-	-	0	-	-	0	Avg soil loss	3.2 t/ac/yr
1 & 3rd ye	ear manure	credit:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Field "T"	5 t/ac/yr
Т	his year's n	nanure:	70	60	170	20	30	50	70	60	170	20	30	50	70	60	170	20	Avg P Index 6	SCI 0.3
Th	nis year's fe	rtilizer:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	P2O5	K2O
	lits & applie	cations:	70	60	170	20	30	50	70	60	170	20	30	50	70	60	170	20	Removal 390	435 lb/ac
ver(+)/U		JW reei	120	60	125	20	30	50	70	60	170	20	30	50	70	60	170	20	Balance -60	395 lb/ac
	Annual T			5		-	3	/		9			3			9			Soil test P is great	er than 50
		late PI:	<u> </u>	4.6		-	2.5	/	<u> </u>	8.1 0.9		<u> </u>	2.7		<u> </u>	8.2 0.9			ppm; P2O5 baland	e should be
	Soli	uble PI:		0.0		-	0.0			0.0			0.0			0.3			less than zero Ib/a	cre.
			•															•	,	

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

🝇 SnapPlus 2.0 built on 2013-11-15 - tes	ting2013-11-	15																	
File View Tools Help																			0
Sub-Farm: Show all fields.	- *	Field	d: 09	S5		•	Farm na	ame: tes	ting2013-	11-15.sn	apDb								
Group: Show all fields.	•				-	•••	Location	: C:\Snapl	Plus2\MySi	napPlusC	Data								
Farm Fields Soil Tests Nutrient	s Croppin	g Daily L	og F	Reports															
Fast Year Soil Tes	t pH	OM	P	ĸ	County	/ Acre	e Dro	d. Soil	Symbol	Rest	Group	Textur							
Facts 2013 2013-12-	- P		65	110	Buffalo			aseburg	CaC	yes	I	Silt Loa							
	1		<u>ן גט</u>	110				iseburg	I			One Lua							
[<]	Rotation	Wizard	<u> </u>		Calcula	ite all yea	rs		Add/De	lete Yea	rs								[4]
Crop Year (Fall to Fall):	2	2013			2014			2015			2016			2017			2018		Dominant critical soil details:
Crop:	Corn grain		-	Soybear	ns to sma	II grair 👻	Corn gr	ain	-	Soybea	ins to sma	all grain 👻	Corr	n grain	•	Soybea	ans to sm	all gra	a Name: Chaseburg Symbol: CaC Slope: 8.0
Yield Goal:	151-170		-	56-65		-	151-170)	-	56-65		-	151	170	-	56-65			Texture: Silt Loam
Tillage:	No Till		-	No Till, o	cover crop	no till 👻	No Till		-	No Till,	cover cro	o no till 👻	No T	111	-	No Till,	cover cro	p no t	ti Rotation Settings
Soil Test Date:	2013-12-03		•	2013-12	-03	•	2013-12	2-03	-	2013-1	2-03	•	201	3-12-03	-	2013-1	2-03		Start 2013 🐥 Years 7 🔹
Lime Rec:		NA			0			0			0			0			NA		- Contouring - Filter Area
Irrigation / MRTN info:	Irrigated	0.05/MR	RTN	📃 Irriga	ated		🔲 Irrig	ated 0.0	05/MRTN	🔲 Irrig	ated			rrigated 0.	05/MRTN	🔳 Irrig	jated		None None
Season notes:																			On contour On contour
(Ibs/acre)		205 K2		N	P205	K20	N	P205	K20	N	P205	K20	N	P205	K20	N	P205	K	Designed,
UW Recommendation:		0 45		0	0	85	140	0	45	0	0	85	14		45	0	0	8	in field
Prior years' extra:		0 0		-	60	125	-	90	90	<u> </u>	150	215		180	180		240	3	Summary 2013 to 2019
Adjusted UW recommendation:	190 0	0 45		0	0	0	140	0	0	0	0	0	14		0	0	0	+	Avg soil loss 1.3/0.2 t/ac/yr
1st & 2nd year legume credit: 2nd & 3rd year manure credit:		0 0		0	-	-		- 0	-		-	-			- 0	0	-		Field "T" 5 t/ac/yr
This year's manure:	-	60 17		20	30	50	70	60	170	20	30	50	7	-	170	20	30		Avg P Index 1 SCI 0.9
This year's fertilizer:		0 0	- 1	0	0	0	0	0	0	0	0	0	0		0	0	0	+	P205 K20
Total credits & applications:	70	60 17	0	20	30	50	70	60	170	20	30	50	7) 60	170	20	30		Removal 390 435 lb/ac
Over(+)/Under(-) adj 0W rec.	-120	80 12	5	20	- 00	50	-70	00	170	20	- 30	50	- 7	00	170	20	- 30		Balance -60 395 lb/ac
Annual Total PI:		1			1			1			1			2			1		Soil test P is greater than 50
Particulate PI:		0.4			0.3			0.6			0.4			0.7			0.4		ppm; P2O5 balance should be
Soluble PI:		0.9			0.8		<u> </u>	0.8		<u> </u>	0.9			0.9			0.9	_	less than zero Ib/acre.
	•											_							

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	РІ Yr 7	Rot. Ave	Soil Loss
] (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)

Field

BAR STATISTICS

Resources / SnapPlus Support

- P Index Website: http://wpindex.soils.wisc.edu/
- SnapPlus Website: http://www.snapplus.net/
- Contact Information:
 - Sara Walling, DATCP, <u>sara.walling@wi.gov</u>, 608-224-4501
 - Laura Ward Good, UW Madison Soil Science Dept, <u>lwgood@wisc.edu</u>, 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 <u>NPSs Located in a</u> <u>TMDL Watershed</u>

- 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

PracticesNRCS 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):

• 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				
<u>Whole Field Management:</u> Requires an approved nutrient management plan, filter strips/buffer	1	NRCS 590, 393, 332, 412, 345		Requires an approved NRCS 590 nutrient management plan (NMP) that meets both the soil test-P and PI requirements.
strips, grassed waterways, conservation or no till, and cover		329, 340 and 330	SNAP-Plus or equivalent model results compared to	Requires a draw down strategy for nutrient concentrations that are above University of Wisconsin-Extension soil fertility recommendations.
crops. Additional practices as deemed by NRCS or County Conservationist			baseline	No application of manure, biosolids, or industrial wastes on snow covered or frozen ground or on fields with high groundwater or tile drainage.
may be required to protect against mobilization and delivery of pollutants.				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: Tillage Options Mulch Till No Till Riparian Filter Strip (edge of field) Grassed Waterway Cover Crop Other practices simulated in SNAP- Plus	2 (3) 2 (3) 2 (3) 2 (3) See Notes 2 (3) 2 (3)	NRCS 590 NRCS 345 NRCS 329 NRCS 393 NRCS 412 NRCS 340	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.
Production Area Practices Diversion Roof Runoff Structure Vegetated Treatment System Constructed Wetland	2 2 4 4	NRCS 362 NRCS 558 NRCS 635 NRCS 656	University of Wisconsin Barnyard Tool APLE or equivalent modeling method	
Sediment Control Basin	2	NRCS 350	RUSLE2	For agricultural runoff control.
Streambank Stabilization and Shoreline <u>Protection</u> Without aquatic habitat restoration With aquatic habitat restoration	3 2	NRCS 580 NRCS 382 NRCS 580 NRCS 395	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.

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.

l		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Rotation Average
l	Field 1 Dairy Rotation (Ib/ac/yr)	8	6	12	4	3	2	5	6
l	Field 1-A1 Dairy + Buffer (lb/ac/yr)	2	2	5	3	2	1	1	2
ľ	Load Reduction (lb/ac/ yr)	6	4	7	1	1	1	4	3.4
	Field located	l in a 1	ſMDL w	/atersh	ed with	n Credi	t Threst	nold o	f 3
	Interim Load Reduction (lb/ac/yr)	5	3	7	1	0	0	2	2.6

Long-term Load

Reduction (lb/ac/yr)

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
	. -	<u> </u>	•	•	0 5			0.5
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 (Ib/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")