

An aerial photograph of a farm complex situated in a rural landscape. The farm features several large, white and red barns, multiple tall, cylindrical grain silos, and a circular water tank. The surrounding fields are a mix of green and golden-brown, with a prominent, large, wavy 'S' shaped field in the foreground. The entire scene is captured from a high angle, showing the intricate patterns of the agricultural land.

Implementing and Verifying Offsets for Trading and Adaptive Management

Proposed Phosphorus Legislation

- AB 680/SB 547 were recently passed by state senate and assembly to extend the timeline of adaptive management, allow adaptive management for TSS, and create a statewide variance process for phosphorus
- This webinar will solely address the water quality trading and adaptive management options
- If a statewide phosphorus variance option is established, this option will be discussed in other webinars/correspondence
- Questions on proposed legislation may be submitted to:

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Deputy Water Division Administrator

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(608) 267-7651

Training Opportunities

Webinar 1. Overview

Webinar 2. Finding and Quantifying Credits

Webinar 3. Developing a Plan

Webinar 4. Implementing and Verifying Offsets

<http://dnr.wi.gov/topic/SurfaceWater/atlas.html>



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”)

Comparing Adaptive Management & Trading

	Adaptive Management	Trading
Pollutants Covered	TP (and possibly TSS)	All pollutants except BCCs
End Goals	Attaining the water quality criteria	Compliance with WQBEL (offset load)
Calculated Reductions	No trade ratios	Trade ratios apply
Timing	Implemented throughout the permit term	Generating credits as they can be used
In-Stream Monitoring	Required	Not required
Level of Documentation Needed	General watershed information	Field-by-field documentation

See Webinars 1 & 2 for additional information.

Responsibility

- Compliance Option for WPDES permit holder (i.e. 'Point Sources')



Overall Process

Trading/Adaptive Management selected as preferred compliance option (NOI/Request Form)

Trading/Adaptive Management plan developed

WDNR approves plan and reissues/modifies WPDES permit

Implementation & verification requirements built-in to WPDES permit

Timing

Permit Year	Step in Compliance Schedule
0	<i>Permit Reissued</i>
1	Operational Evaluation Report
2	Compliance alternatives, source reductions, and improvements status
3	Preliminary compliance alternatives plan
4	Final compliance alternatives plan
5	Progress report on plans & specifications
6	<i>Additional time to generate credits or comply with AM interim limits, as determined necessary by WDNR.</i>
7	
8	
9	

Submit NOI/
Preliminary
Request Form

Submit Plan &
Checklist

PERMIT REISSUED

What will a trading WPDES permit look like?

- Monitoring requirements and limitations
- Statement of authorization
- Method for demonstrating compliance
- Annual reporting requirements
- Compliance schedule (if needed)
- Other

See Implementing Water Quality Trading in WPDES Permits

Monitoring Requirements and Limitations

- For point to point trades, table will be adjusted for both credit generator and user
- For point to nonpoint trades:

Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Phosphorus, Total	-	lbs/day	3/week	Calculated	
WQT TP Credits	-	lbs/day	3/week	Calculated	
WQT TP Computed Compliance	Monthly Average	lbs/day	3/week	Calculated	See TMDL limit table

Month	Monthly Average Limit (lbs/day)	Month	Monthly Average Limit (lbs/day)
January	2.26	July	2.46
February	2.57	August	2.45
March	2.36	September	2.45
April	2.49	October	2.32
May	2.41	November	2.35
June	2.55	December	2.26

Statement of Authorization

- Allows WQT to be used with identified limits
- Refers to a specific trading plan number
- Specifies number of credits that can be used in a calendar year
- Only authorizes credits established in the plan & approved by DNR to be used
- May specify a time-period (for TMDL scenarios)

Example:

The permittee may use WQT to demonstrate compliance with monthly average WQBELs specified in the Table 1.1.1.1. Credits equal to 950 pounds per calendar year for TP are available until June 30, 2020 as specified in Water Quality Trading Plan WQT-2013-00003.

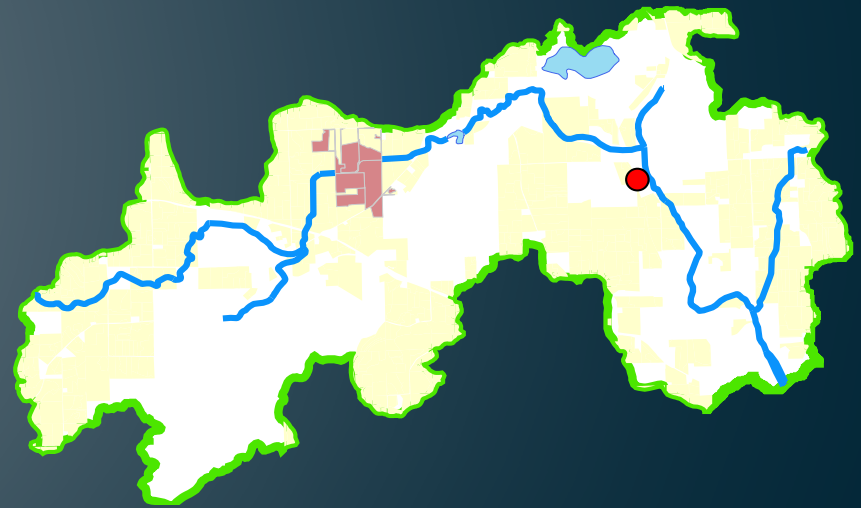
Demonstrating Compliance

- Monthly Calculation
- Reported on monthly eDMR
 - Number of credits used is reported in “WQT TP Credit” column
 - Adjusted effluent loading reported in “WQT TP Computed Compliance” column
- When to Use Credits
 - Credits generated from point sources must be used within same time period as they were generated
 - Credits must be used in same month if limits are expressed monthly
 - Credits generated each year by nonpoint source can be used throughout the year

Over(-)/Under(+) adj. IIM req:	120	60	95	20	30	30	150	90	120	0	0	340	0	0	340
Annual Total PI:	8			6			12			4			3		
Particulate PI:	6.8			5.1			11.1			3.9			2.6		
Soluble PI:	1.0			0.6			0.9			0.6			0.6		

Example 1- *Point to Nonpoint Trade*

- Point source 1 is located in Rock River TMDL
- Monthly Limitations apply
- Credits needed for select months
- Point source 1 works with County LCD to install buffer strips to generate credits



Example 1 - *Point to Nonpoint Trade*

- TMDL-derived limitation is 0.88 lbs/day (0.17 mg/L), for January (0.88 lbs per day / 0.63 MGD / 8.34)
- January effluent quality is 3.62 lbs/day (0.69 mg/L)
- Point source 1 needs 84.9 lbs of credit for January ((3.62 lbs/day – 0.88 lbs/day)*31 days)

Month	Difference Between Final TP Limit and Effluent Loading	
	(lbs/day)	(lbs/month)
January	2.74	84.9

TMDL Scenario:

Total Monthly Effluent Loading — (Applicable TP Limit * # days/month)

Non-TMDL Scenario:

Monthly Effluent Concentration (mg/L) — Applicable TP Limit (mg/L)

Example 1- Point to Nonpoint Trade

Total TP Load Reduction (lbs/yr)	Total Credits (lbs/yr)	Total Credits Needed (lbs/mo)
		~85



*TP Load Reduction = (Current Condition — Improved Condition) * Acres*

Pre-Buffer Condition:

Over(+)/Under(-) adj UW rec:	-120	60	95	20	30	30	150	90	120	0	0	-340	0	0	-340
Annual Total PI:	8			6			12			4			3		
Particulate PI:	6.8			5.1			11.1			3.9			2.6		
Soluble PI:	1.0			0.6			0.9			0.6			0.6		



Post-Buffer Condition:

Annual Total PI:	2			2			5			3			2		
Particulate PI:	1.1			1.0			3.7			2.5			1.6		
Soluble PI:	1.0			0.6			0.8			0.5			0.5		



*TP Load Reduction = (8 — 2) * 40 acres = 240 lbs/yr*

Example 1- *Point to Nonpoint Trade*

Total TP Load Reduction (lbs/yr)	Total Credits (lbs/yr)	Total Credits Needed (lbs/mo)
240		~85



Trade Ratio= (Delivery + Downstream + Equivalency + Uncertainty - Habitat Adjustment) : 1



Trade Ratio= (Uncertainty - Habitat Adjustment) : 1



Total TP Load Reduction generated from buffer strips, no-till, and cover crops:

Trade Ratio= (2) : 1



Trade Credit= $240/2 = 120$ lbs/yr

Example 1- *Point to Nonpoint Trade*

Total TP Load Reduction (lbs/yr)	Total Credits (lbs/yr)	Total Credits Needed (lbs/mo)
240	120	~85

- January eDMR report
 - “WQT TP Credit” = 85 Credits Used
 - “WQT TP Computed Compliance” = 0.88 lbs/day
 - 85 lbs per mo / 31 days = 2.74 lbs/day
 - 3.62 lbs/day – 2.74 lbs/day = 0.88 lbs/day
- Remaining credit = 35 lbs/yr



Tips for PS:NPS trades

1. Create a “margin of safety”
2. Create a back up plan if practices fail
3. Ease of verification
 - Landowner certification
 - Field visits
 - Pictures
 - Other?

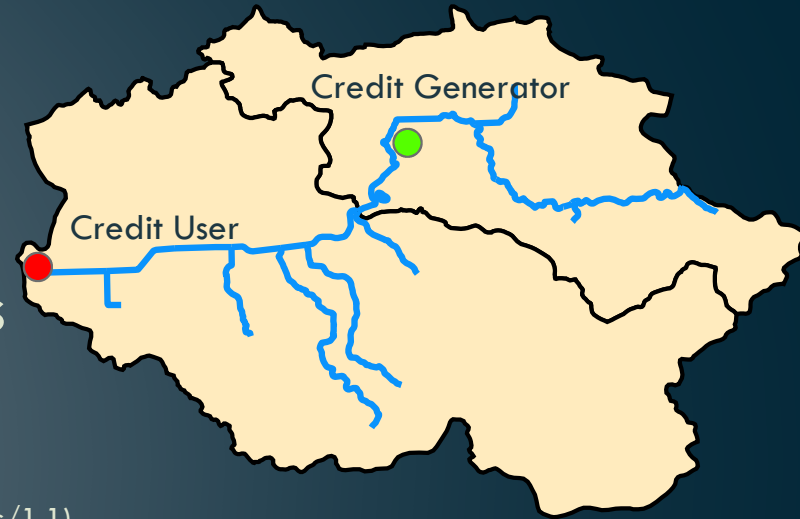


Example: Barnyard Improvements

See Webinar 3 for additional detail.

Example 2- Point to Point Trade

- Point source 1 needs 20 lbs of credit for March
- Point source 2 can provide 28 lbs of reduction
- Total credit available = 25 lbs (25lbs/1.1)
 - Trade Ratio = (Delivery + ~~Downstream~~ + ~~Equivalency~~ + Uncertainty - ~~Habitat Adjustment~~): 1
 - Trade Ratio = $(0 + 1) : 1 \rightarrow 1 : 1 \rightarrow 1.1 : 1$
- Revised limit for point source 1 = 104 lbs (79 lbs/mo + 25 lbs/mo)
- Revised limit for point source 2 = 86 lbs (114 lbs/day - 28 lbs/day)



Tips for PS:PS Trades

- Point source credit generator must accept lower WQBEL in WPDES permit
- Not permanent
 - Can be changed upon permit reissuance/modification
- Verification handled through eDMRs
- Permits likely synchronized or given a separate permit(s)

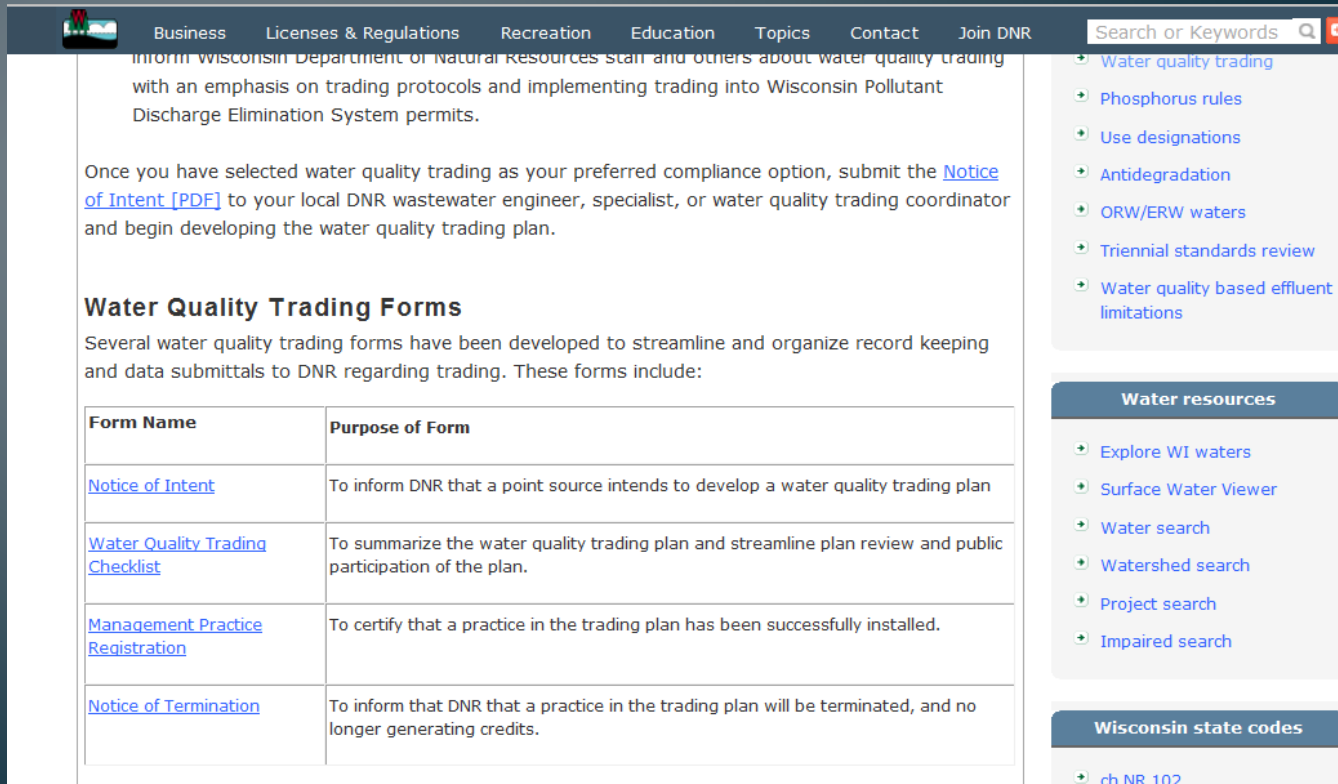


Annual Reporting Requirements

- Requires reporting by January 31st each year of the WPDES permit
 - Number of credits (lbs/month) used each month of the previous year
 - Source of each month's credits by identifying the approved water quality trading plan that details the source
 - A summary of the annual inspection of each nonpoint source management practice that generated credits
 - Identification of noncompliance or failure to implement

Documentation

- Dnr.wi.gov, keyword “water quality trading”



The screenshot shows the Wisconsin Department of Natural Resources (DNR) website. The navigation bar includes links for Business, Licenses & Regulations, Recreation, Education, Topics, Contact, and Join DNR. A search bar is located on the right. The main content area is titled "Water Quality Trading" and includes a paragraph about informing the DNR and others about trading protocols. Below this, there is a section titled "Water Quality Trading Forms" which lists several forms: Notice of Intent, Water Quality Trading Checklist, Management Practice Registration, and Notice of Termination. A table provides details for each form, including its name and purpose. On the right side, there is a sidebar with a search bar and a list of water resources, including Water quality trading, Phosphorus rules, Use designations, Antidegradation, ORW/ERW waters, Triennial standards review, and Water quality based effluent limitations. Below this, there is a section titled "Water resources" with links to Explore WI waters, Surface Water Viewer, Water search, Watershed search, Project search, and Impaired search. At the bottom, there is a section titled "Wisconsin state codes" with a link to ch NR 102.

Business Licenses & Regulations Recreation Education Topics Contact Join DNR Search or Keywords

Inform Wisconsin Department of Natural Resources staff and others about water quality trading with an emphasis on trading protocols and implementing trading into Wisconsin Pollutant Discharge Elimination System permits.

Once you have selected water quality trading as your preferred compliance option, submit the [Notice of Intent \[PDF\]](#) to your local DNR wastewater engineer, specialist, or water quality trading coordinator and begin developing the water quality trading plan.

Water Quality Trading Forms

Several water quality trading forms have been developed to streamline and organize record keeping and data submittals to DNR regarding trading. These forms include:

Form Name	Purpose of Form
Notice of Intent	To inform DNR that a point source intends to develop a water quality trading plan
Water Quality Trading Checklist	To summarize the water quality trading plan and streamline plan review and public participation of the plan.
Management Practice Registration	To certify that a practice in the trading plan has been successfully installed.
Notice of Termination	To inform that DNR that a practice in the trading plan will be terminated, and no longer generating credits.

Water quality trading
Phosphorus rules
Use designations
Antidegradation
ORW/ERW waters
Triennial standards review
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

Management Practice Registration

- Submit with WQT plan or during compliance schedule
 - Type of credit generated (PS: NPS)
 - Trade agreement number
 - Practice used to generate credits
 - Anticipated load reduction
 - Trade ratio
 - Method of quantification
 - Location (land parcel ID)

Trade Registration Information (Use a separate form for each trade agreement)					
Type	Trade Agreement Number	Practices Used to Generate Credits	Anticipated Load Reduction	Trade Ratio	Method of Quantification
<input type="radio"/> Urban NPS <input checked="" type="radio"/> Agricultural NPS <input type="radio"/> Other	00001	Buffer Strip	160	2:1	SNAP+
County <input type="checkbox"/>	Closest Receiving Water Name <input type="checkbox"/> Happy Creek		Land Parcel ID(s) XXXXXXXXXXXXXXXX	Parameter(s) being traded TP	
The preparer certifies all of the following:					

Notice of Termination

- Submit ASAP, no later than annual report
- Submit with management practice registration form, if practice being replaced

Credit Generator Information	
Credit generator type (select all that apply):	<input type="checkbox"/> Permitted Discharge (non-MS4/CAFO) <input type="checkbox"/> Urban nonpoint source discharge <input type="checkbox"/> Permitted MS4 <input checked="" type="checkbox"/> Agricultural nonpoint source discharge <input type="checkbox"/> Permitted CAFO <input type="checkbox"/> Other - Specify:
Trade Agreement number(s) to be terminated including affected land parcel ID(s): 00001	
Amount of trading credit being terminated 160	Effective date of termination 05/30/2014
Reason for termination Practice no longer required, higher effluent quality achieved	
Is this agreement being updated or replaced? <input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Unsure	
Will this termination result in non-compliance with the effective limit or other permit requirements? <input type="radio"/> Yes; Name: _____ <input checked="" type="radio"/> No <input type="radio"/> Unsure	

Other permit requirements

- Reopener clause
 - Failure to implement
 - Failure to comply
 - New information becomes available that would change WDNR approval
- Annual inspection requirements
 - Number of credits used each month
 - Summary of inspections
- Certification statements
- Minimum control level (TBEL or P99)

Public Notification

- If significant changes to WQT plan occur, WQT plan update will be public noticed as part of a permit modification
- Permit language may not necessarily change as part of the permit modification
- <http://dnr.wi.gov/topic/wastewater/PublicNotices.html>

What will an AM WPDES permit look like?

- Effluent monitoring requirements and limitations
- In-stream monitoring requirements
- Statement of authorization
- Annual reporting requirements
- Other

Interim Limits

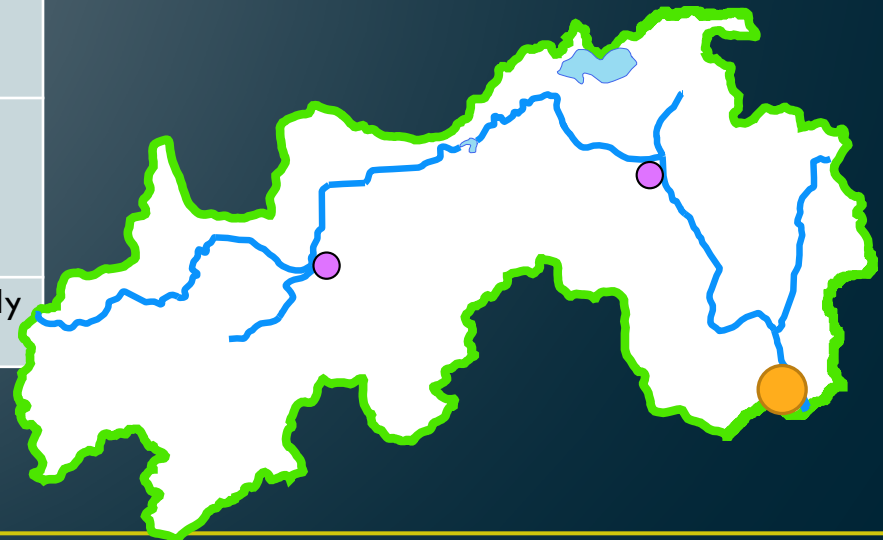
- AM interim limits
- Sampling frequency and type

Monitoring Requirements and Effluent Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate	—	MGD	Daily	Continuous	
Phosphorus, Total	Month Avg.	1.0 mg/L	3/Week	24-hr Flow Prop. Comp.	
Phosphorus, Total	Six-month Avg.	0.6 mg/L	3/Week	Calculated	Limit effective April 1, 2017 (see Schedule of Compliance 2.1). Apply 6-month average limit to periods of May through October and November through April.
Phosphorus, Total	—	lbs/day	3/Week	Calculated	

Sampling Points

- Effluent monitoring location
- In-stream monitoring location
 - Furthest downstream point in the action area will be included in WPDES permit
 - Other sample locations may be voluntary or included in WPDES permit

Parameter	Limit and Units	Sample Frequency	Sample Type
Flow, River	cfs	Concurrently with TP samples	Measure
Phosphorus, Total	mg/L	Every other Monday May through October	Grab
Phosphorus, Total	lbs/month	Monthly	Total Monthly



Statement of Authorization

- Allows AM to be used
- Refers to a specific AM plan number
- Specifies minimum P reduction that must be achieved

Example:

The permittee shall design and implement the actions identified in AM Plan No.1234-2014 in accordance with the goals and measures identified in the approved plan.

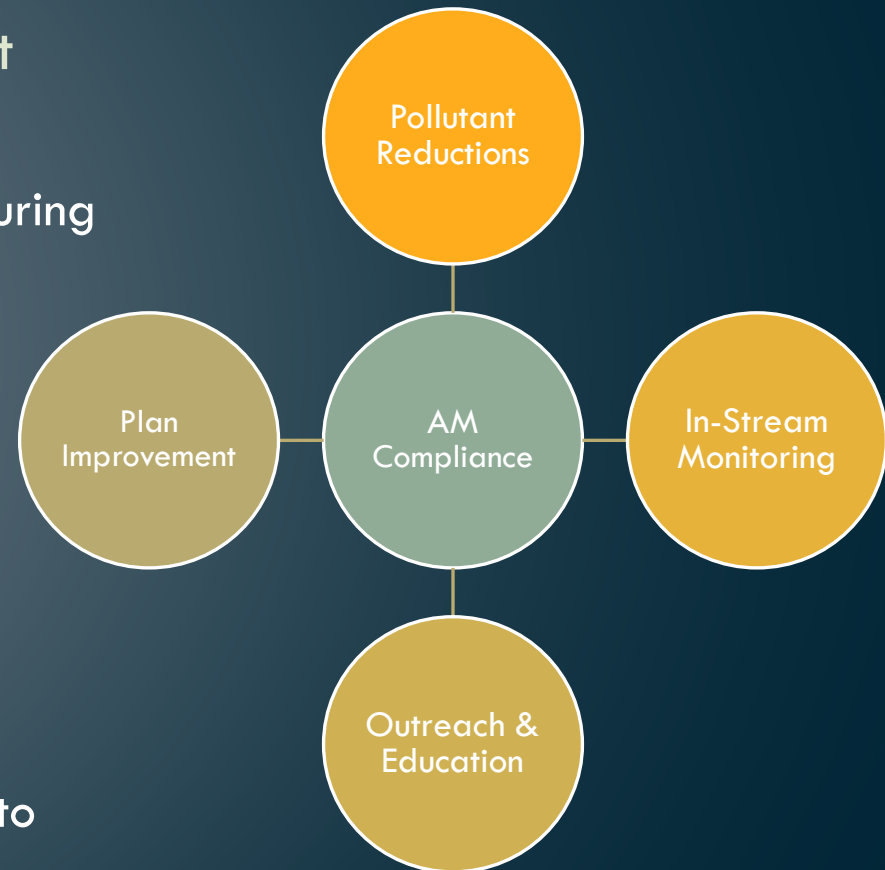
If total phosphorus loadings within the Happy Creek action area, as identified in AM Plan No.1234-2014, are not reduced by at least 775 pounds per year by March 31, 2021, the watershed adaptive management option may not be available to the permittee when this permit is reissued in 2021.

Minimum P Reduction Example

- Current P load (stream load + effluent load)
 - $(Q_s * C_s * 8.34 * 365) + (Q_e * C_e * 8.34 * 365)$
 - $(3.5 \text{ MGD} * 0.131 \text{ mg/L} * 8.34 * 365) + (0.5 \text{ MGD} * 0.4 \text{ mg/L} * 8.34 * 365)$
 - Current P load = $\sim 2000 \text{ lbs/yr}$
- Allowable P load
 - $(Q_s + Q_e) * WQC * 8.34 * 365$
 - $(3.5 \text{ MGD} + 0.5 \text{ MGD}) * 0.075 \text{ mg/L} * 8.34 * 365$
 - Allowable load = $\sim 915 \text{ lbs/yr}$
- Compare the difference
 - Needed Reduction = $\sim 1,100 \text{ lbs/yr}$
 - PS contribution = 40%
- Minimum P reduction at end of permit term 1 = 440 lbs/yr ($1100 * 40\%$)
- Minimum P reduction at end of permit term 2 = 660 lbs/yr ($1100 - 440$)

Annual Reporting Requirements

- Requires reporting by January 31st each year of the WPDES permit
 - Identify actions from plan completed during the previous calendar
 - Identify actions in progress;
 - Evaluate collected monitoring data
 - Progress towards achieving the goals
 - Outreach and education
 - Offset practice verification
 - 20%/year recommendation
 - Identify any corrections or adjustments to the plan that are needed
 - Other?

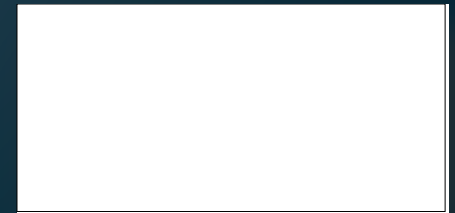
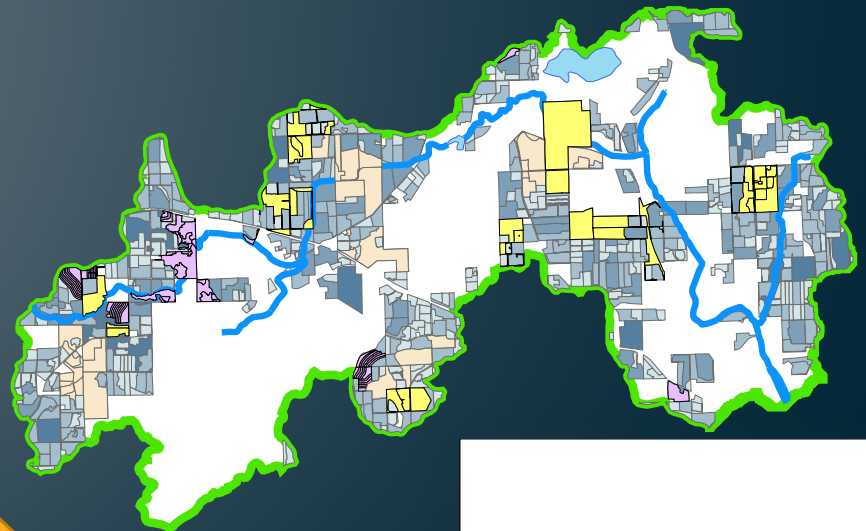


Example Pollutant Reduction Goal

Year 2 Goal= 20% nutrient management planning/year; 300 lb reduction



*Companion Crop Installed
on 150 ac.*



Other

- Reopener Clause
- Provisions for Terminating AM
 - Why?
 - Failure to Implement
 - New information becomes available making AM infeasible
 - What happens?
 - Receive originally calculated effluent limits
 - May use WQT or other compliance option
 - Compliance schedule may be available

Tips for Adaptive Management

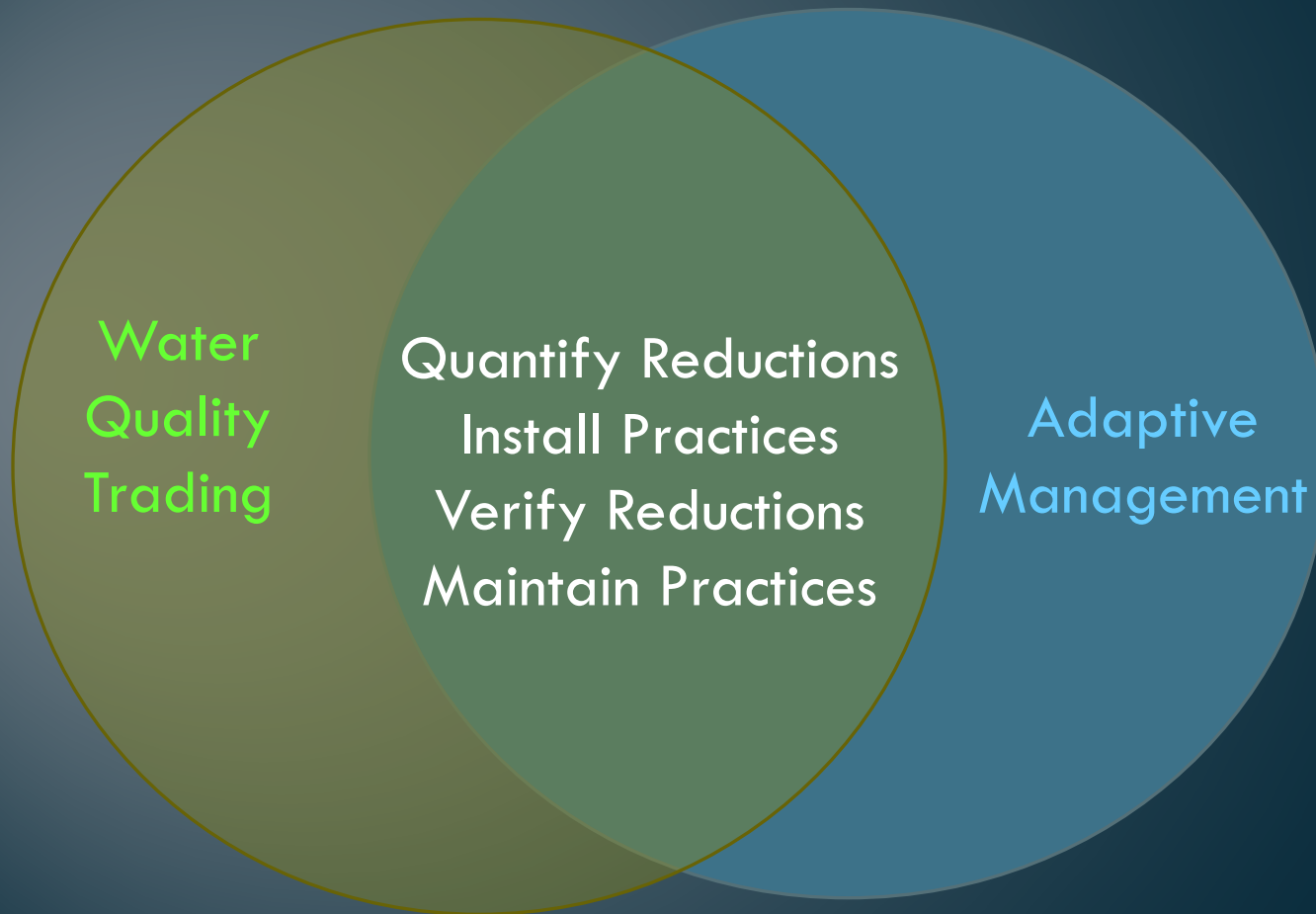
- Plan for full project life
 - Adjustments can be made over time
- Create reasonable assurances for plan success
 - Go above the minimum in-stream monitoring requirements specified in WPDES permit
 - Apply trade ratio, at least to minimum P reduction
 - Apply credit threshold, at least to minimum P reduction
- Ensure reductions would “count” under trading
 - Utilize agreements and management practice registration forms

Overview

- Implementation and Inventories
- Quantifying Reductions
- How to Apply Trade ratios
- Verification
- TMDL Example



Steps for Evaluating Adaptive Management and Water Quality Trading are Not Mutually Exclusive



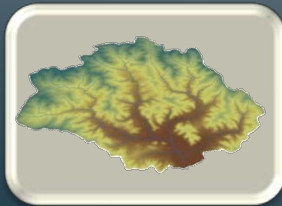
Finding Potential Reductions / Credits

- Determine your eligibility for the programs and what works best for your situation.
- 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).

Evaluate NPS contributions

- Use sound scientific data and rationale
- Determine eligibility for AM and evaluate potential for nonpoint reductions based on percentages.
- PRESTO
 - Calculates basin specific average annual phosphorus loads from point and nonpoint sources

Watershed
Delineation



Effluent
Aggregation



Pollutant
Runoff

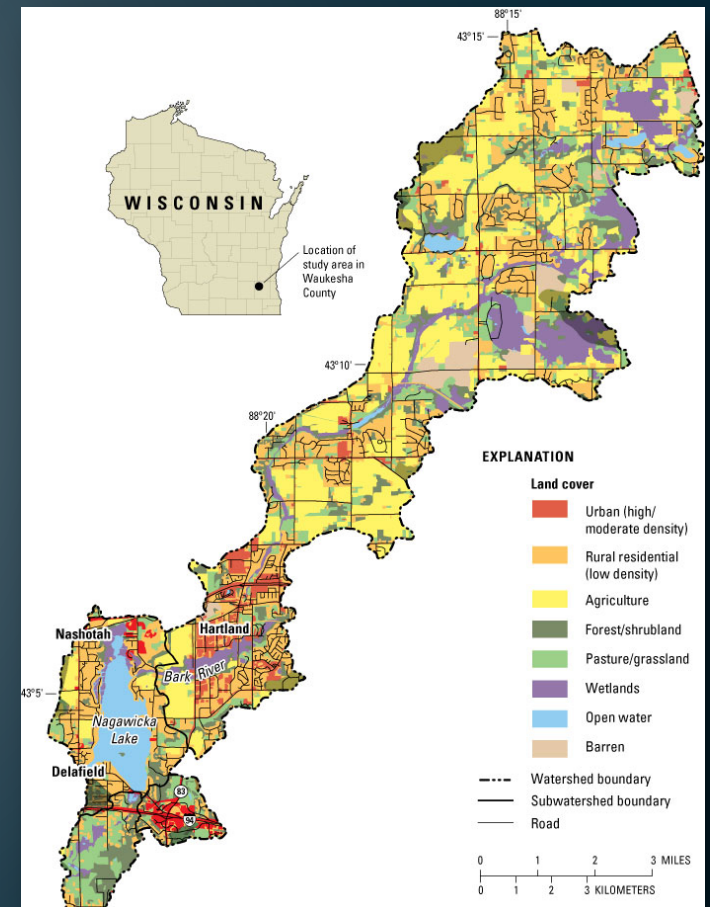


Evaluate Nonpoint Reductions

- Conduct a watershed assessment to identify source areas.
- Estimate load reductions for installation of practices.
- Look for complementary practices and target beneficial areas such as wellhead protection areas.

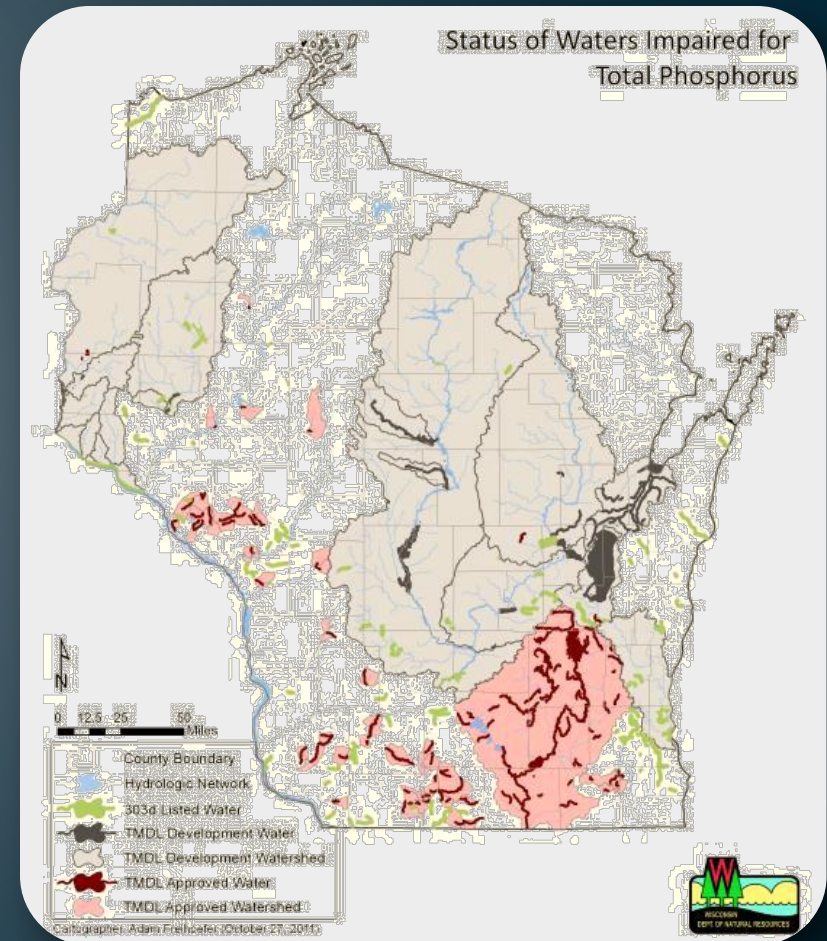
Evaluate Geographic Setting

- 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.



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:

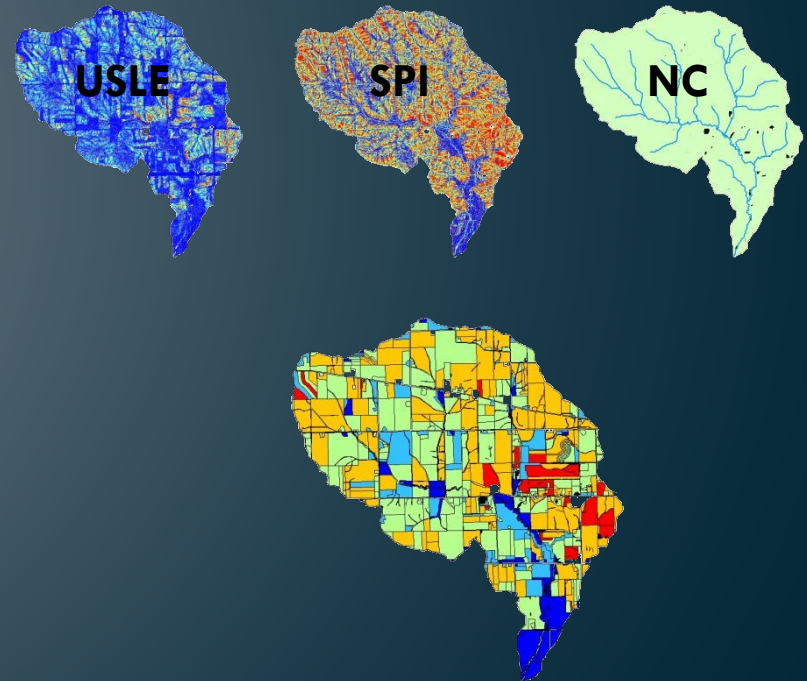
Aaron Ruesch and Theresa Nelson, P.E.

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.

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



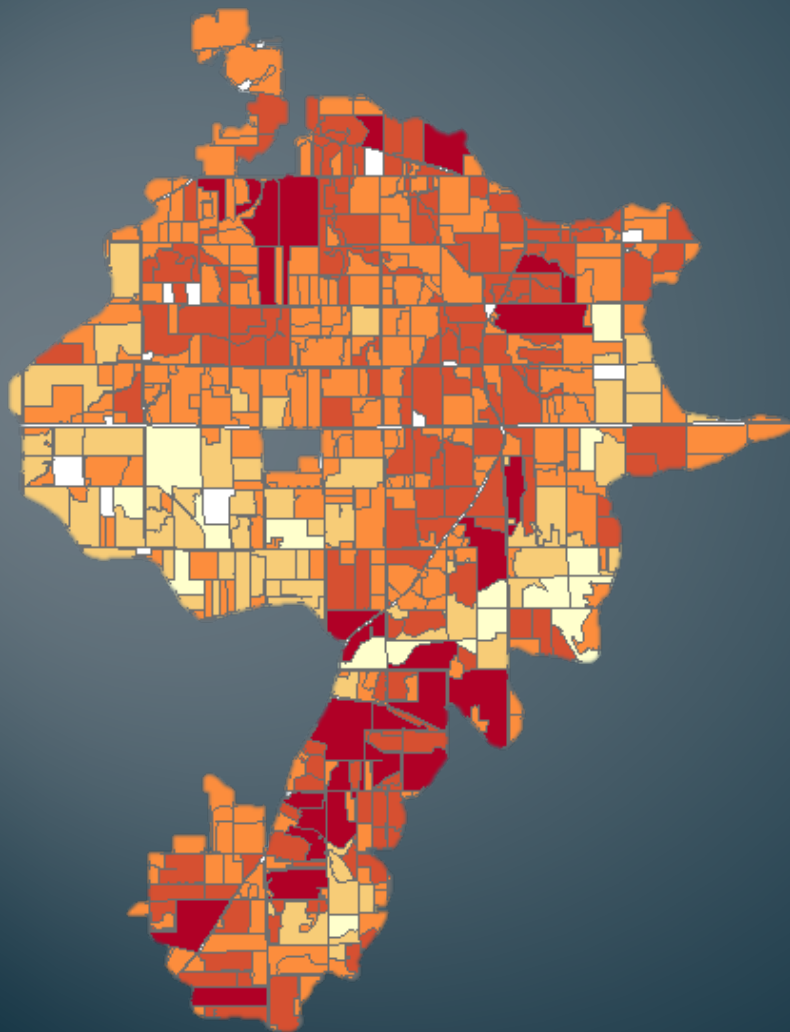


Source: NRCS

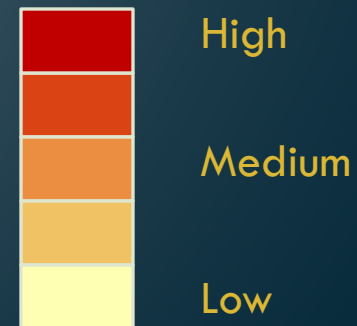




Overall erosion “score”






Erosion “Score”







Putting the Pieces Together






LEGEND

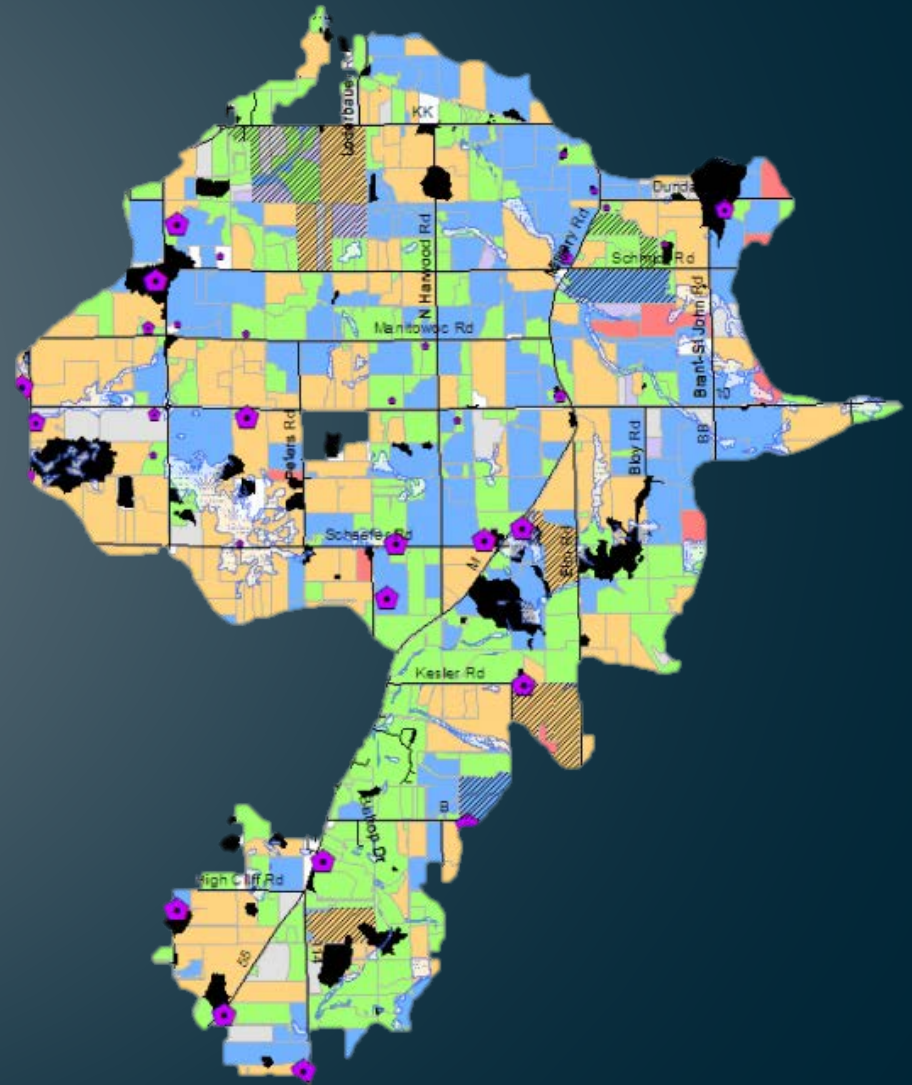
-  High Erosion Score
-  Non-contributing areas
-  Pot. Restorable Wetlands

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



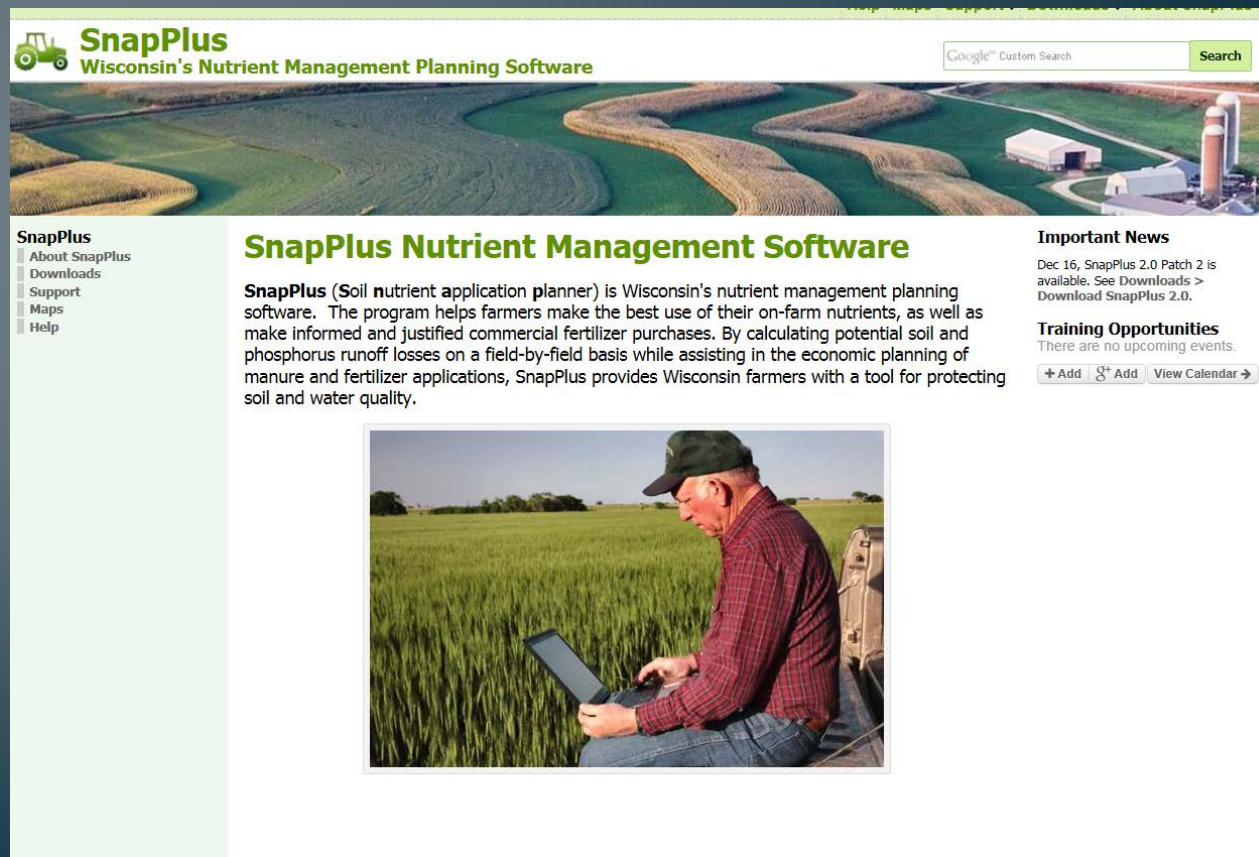
Quantifying Reductions

- Credits Generated by a Nonpoint Source
 - SNAP-Plus and RUSLE2 for agricultural field practices
 - New Barnyard Tools
 - SLAMM and P-8 for urban practices



Quantifying Reductions

- Models and tools developed to date are estimations of load reductions on an average annual basis.



The screenshot shows the SnapPlus website, which is Wisconsin's Nutrient Management Planning Software. The header features the SnapPlus logo and a Google Custom Search bar. The main banner image shows a farm with a large pond and silos. The left sidebar contains a navigation menu with links to About SnapPlus, Downloads, Support, Maps, and Help. The main content area has the title "SnapPlus Nutrient Management Software" and a paragraph describing the software's purpose: to help farmers make the best use of their on-farm nutrients, calculate potential soil and phosphorus runoff losses, and assist in the economic planning of manure and fertilizer applications. Below the text is a photo of a farmer in a red plaid shirt and green cap, sitting in a field and using a laptop. The right sidebar contains sections for "Important News" (dated Dec 16, 2016) and "Training Opportunities" (stating there are no upcoming events).

SnapPlus
Wisconsin's Nutrient Management Planning Software

Google Custom Search Search

SnapPlus
About SnapPlus
Downloads
Support
Maps
Help

SnapPlus Nutrient Management Software

SnapPlus (Soil nutrient application planner) is Wisconsin's nutrient management planning software. The program helps farmers make the best use of their on-farm nutrients, as well as make informed and justified commercial fertilizer purchases. By calculating potential soil and phosphorus runoff losses on a field-by-field basis while assisting in the economic planning of manure and fertilizer applications, SnapPlus provides Wisconsin farmers with a tool for protecting soil and water quality.

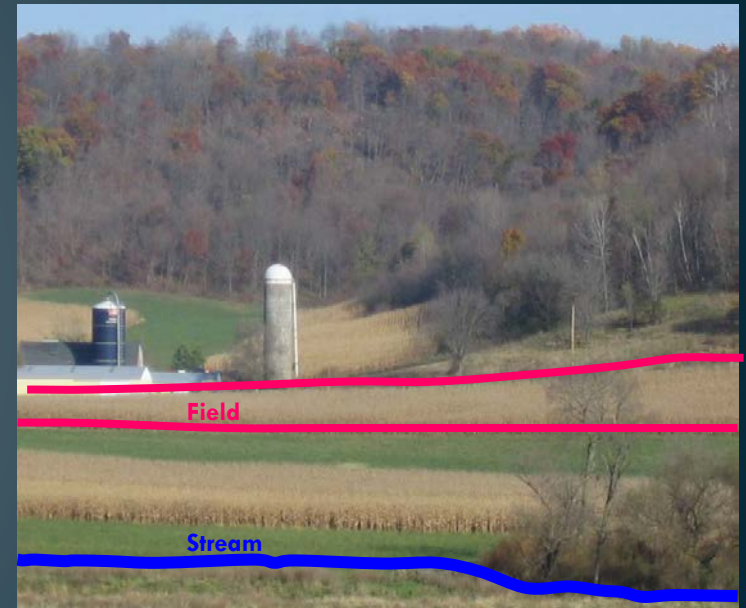
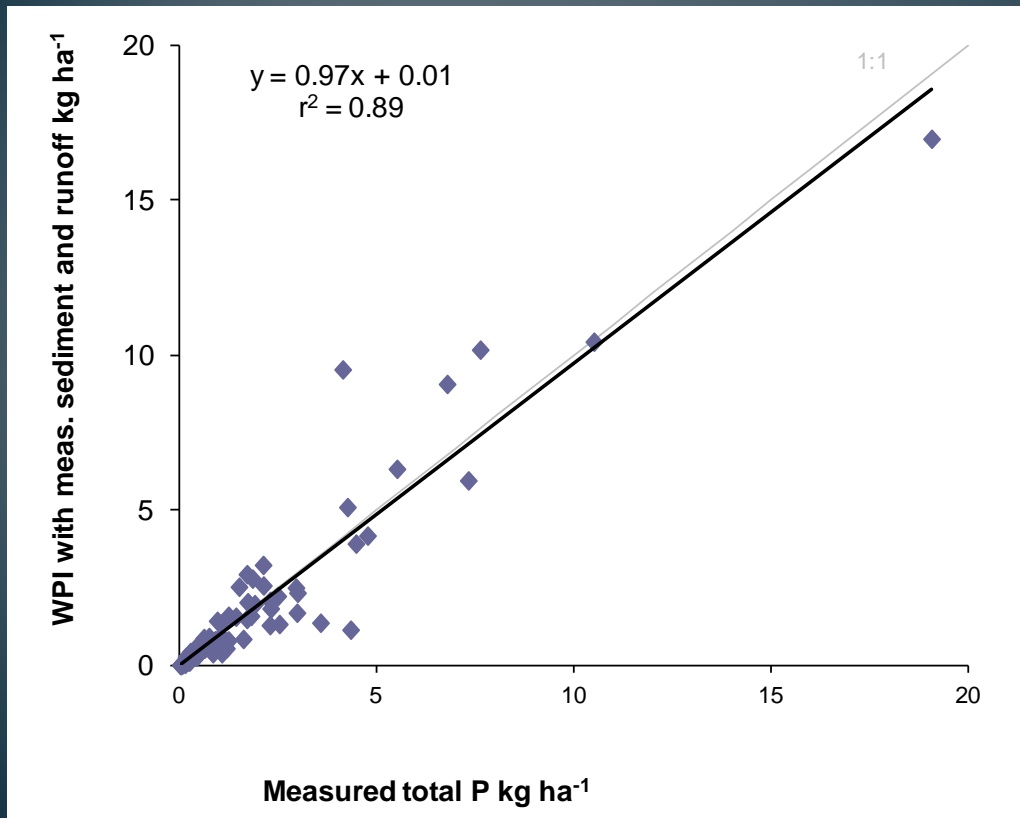
Important News
Dec 16, SnapPlus 2.0 Patch 2 is available. See Downloads > Download SnapPlus 2.0.

Training Opportunities
There are no upcoming events.

+ Add + Add View Calendar

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.

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



Trade Ratio

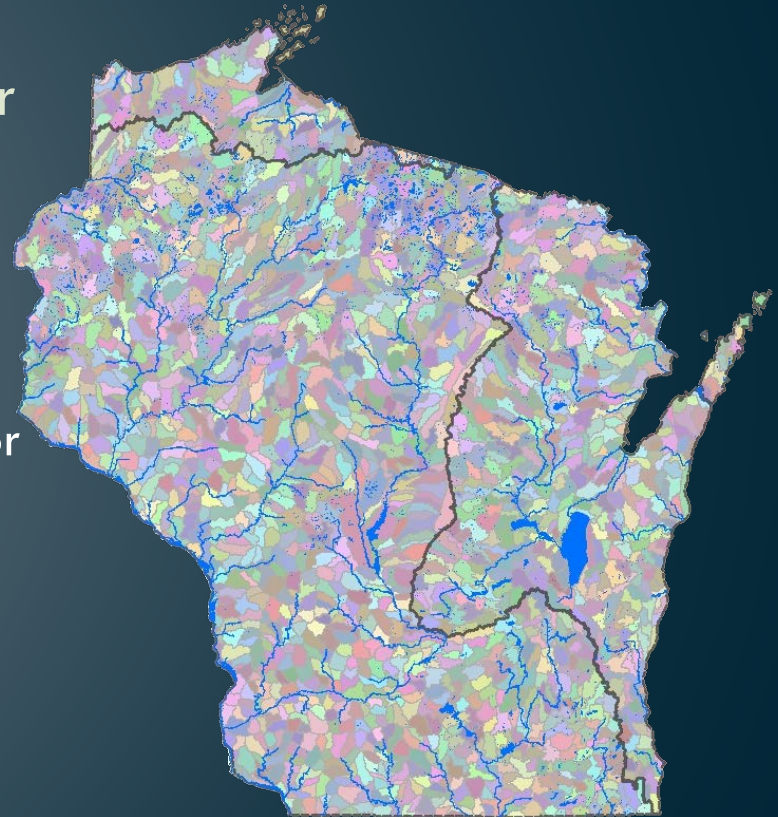
- *Final Trade Ratio = Delivery + Equivalency + Uncertainty – Habitat Adjustment*

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:

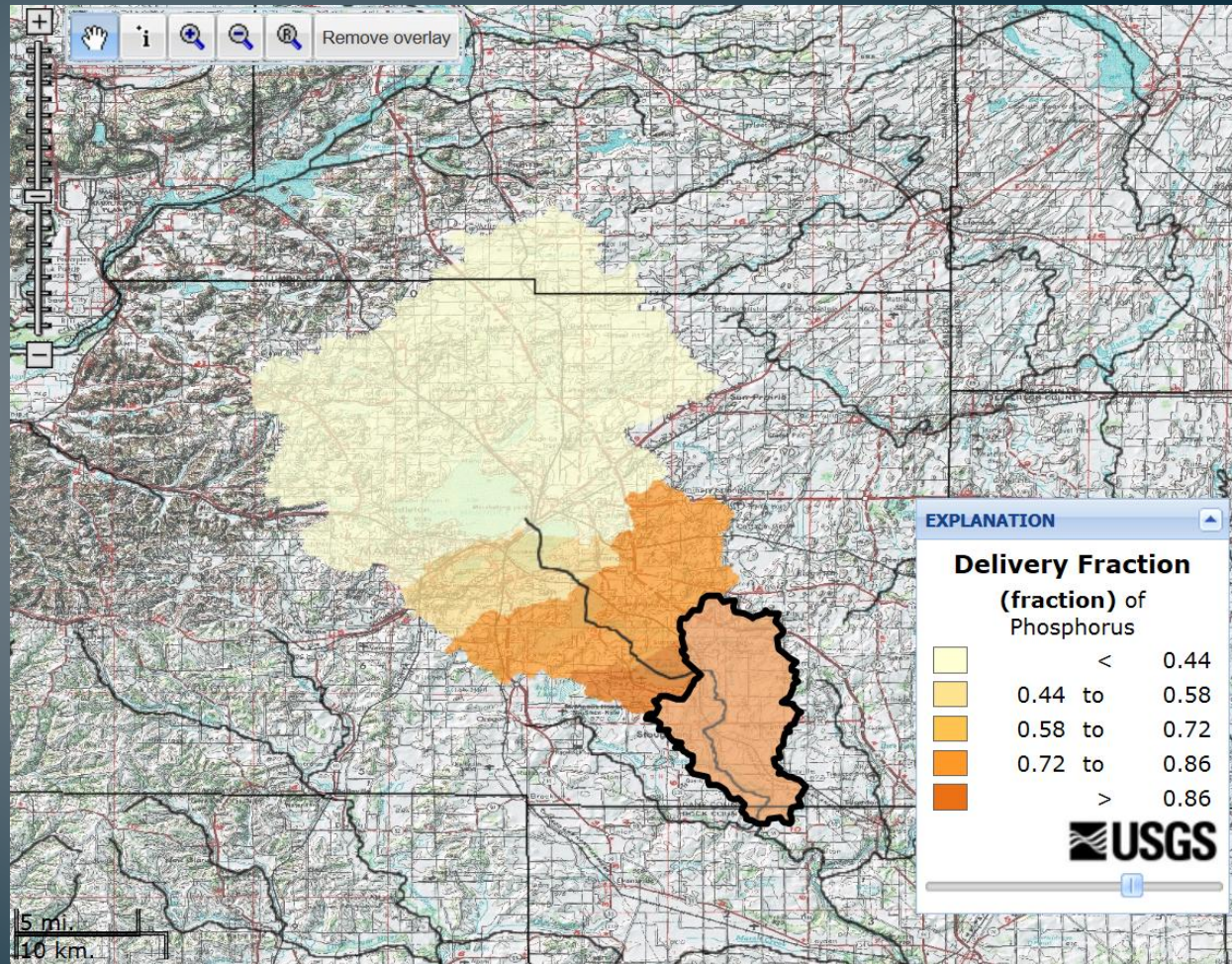
- *Final Trade Ratio = Uncertainty : 1 (add 0.2 if necessary)*

Trade Ratio

- 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 and **Not needed if trading within same HUC-12**
 - A HUC or **hydrologic unit code** is a sequence of numbers or letters created by the USGS that identify the drainage area of a hydrological feature like a river or a lake. A HUC-12 is about 40 square miles in size.



Delivery: SPARROW Output Example



$$\text{Delivery Factor} = (1/\text{SPARROW delivery fraction}) - 1$$

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

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 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
<u>Nutrient Management and supporting practices:</u>	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.
Tillage Options				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.
Mulch Till	2 (3)	NRCS 345		
No Till	2 (3)	NRCS 329		
Riparian Filter Strip (edge of field)	2 (3)	NRCS 393		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.
Grassed Waterway	See Notes	NRCS 412		No application of manure, biosolids or industrial wastes allowed on snow-covered or frozen ground or on fields with high groundwater or tile drainage.
Cover Crop	2 (3)	NRCS 340		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.
Other practices simulated in SNAP-Plus	2 (3)			Use of grassed waterways on fields in support of nutrient management and other supporting practices lowers the uncertainty factor to 1.5.
<u>Production Area Practices</u>			University of Wisconsin Barnyard Tool APLE or equivalent modeling method	
Diversification	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.
<u>Streambank Stabilization and Shoreline Protection</u>			Contact WDNR to discuss project and develop a method to quantify impact of stabilization. Appropriate methods include NRCS regression calculation.	
Without aquatic habitat restoration	3	NRCS 580 NRCS 382		For livestock producers, streambank stabilization must be accompanied by riparian fencing or other controls to prevent destruction of streambanks.
With aquatic habitat restoration	2	NRCS 580 NRCS 395		

Verification

- For Water Quality Trading
 - Monthly certification as part of DMR that practices are installed, maintained, and functioning.
 - Annual verification of practices – permittee is the responsible party but can contract with county LCD, consultant, or other able group.
- For Adaptive Management
 - Verify 20% of practices per year so that over permit term 100% verification occurs.
- NRCS technical standards can be used to help evaluate practices – see maintenance and installation requirements.

Credit Threshold for TMDLs

$$\text{TMDL} = \text{WLA (point source)} + \text{LA (nonpoint source)} + \text{MOS}$$

Allocations for TMDL:

$$2000 \text{ lbs/yr} = 800 \text{ lbs/yr} + 1100 \text{ lbs/yr} + 100 \text{ lbs/yr}$$

(fixed) (fixed)

Existing Conditions:

Point source is at 1000 lbs/yr and wants to trade to meet requirements

Trading in TMDL (the math still needs to work):

$$2000 \text{ lbs/yr} = 1000 \text{ lbs/yr} + 900 \text{ lbs/yr} + 100 \text{ lbs/yr}$$

Trading Example 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 of PI = 6)
- 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

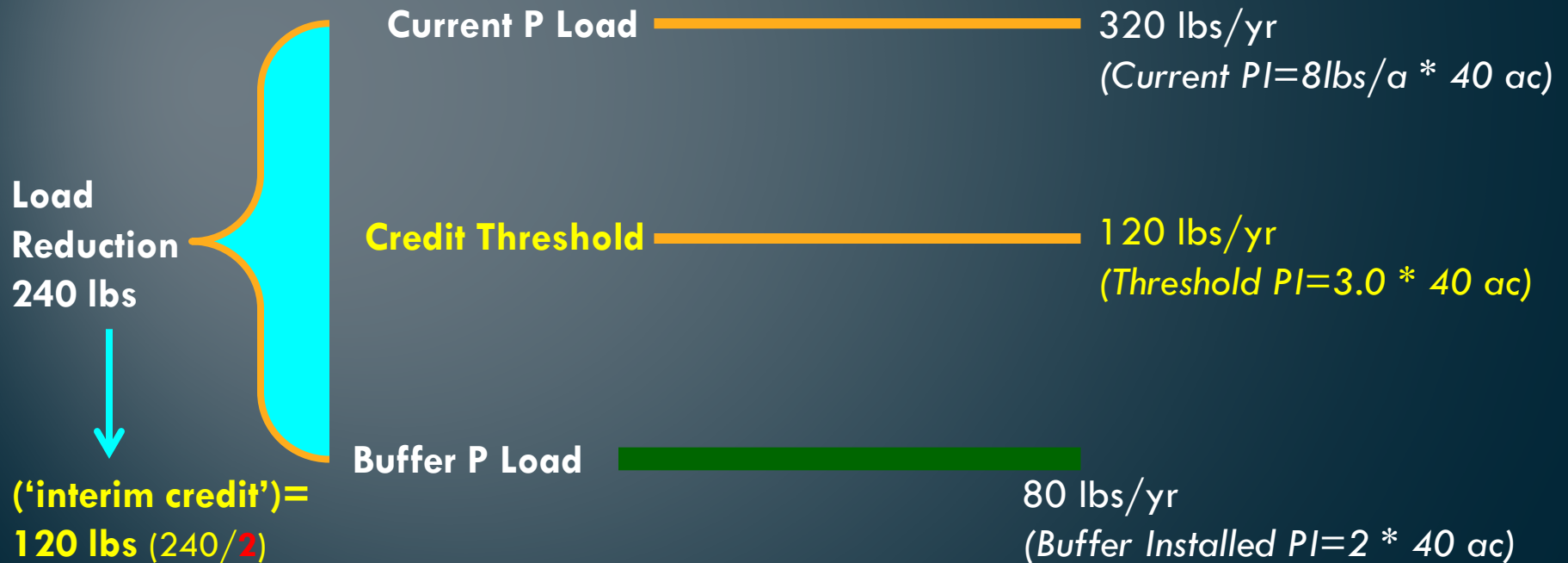
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Field 1 Dairy Rotation (lb/ac/yr)	8	6	12	4	3	2	5
Field 1-A1 Dairy + Buffer (lb/ac/yr)	2	2	5	3	2	1	1
Load Reduction (lb/ac/yr)	6	4	7	1	1	1	4

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

Interim Load Reduction (lb/ac/yr)	5 (8-3)	3	7	1	0	0	0
Long-term Load Reduction (lb/ac/yr)	1 (3-2)	1	0	0	1	1	2
Total Load Reduction	6	4	7	1	1	1	2

TMDL Scenario Year 1 Credits

- Buffer strip installed on a 40 acre field within same TMDL reach
- TMDL load reduction target is 50%
- Credit threshold is 3.0 lbs/ac/yr ($6 * (1 - 50\%)$)
- **Trade ratio is 2:1**



Note: Calculation must be made for each year in crop rotation.

Application of Trade Ratios (Example 1)

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

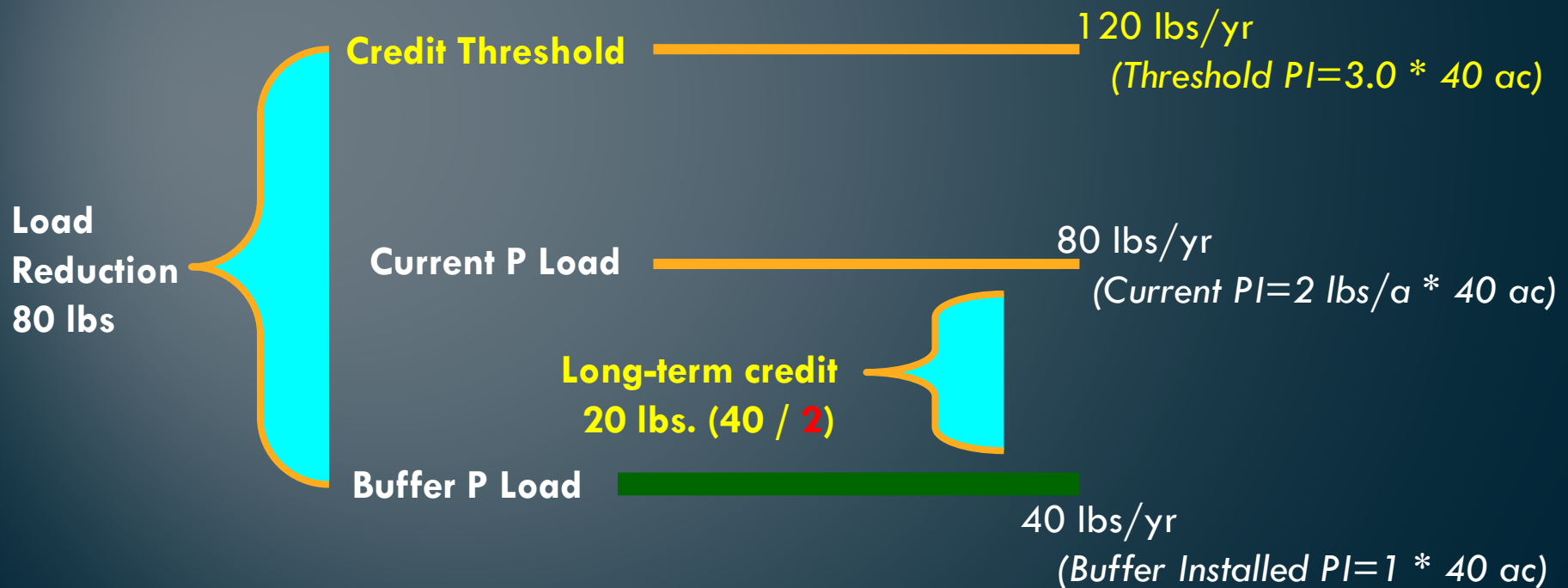
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Field 1 Dairy Rotation (lb/ac/yr)	8	6	12	4	3	2	5
Field 1-A1 Dairy + Buffer (lb/ac/yr)	2	2	5	3	2	1	1
Load Reduction (lb/ac/yr)	6	4	7	1	1	1	4

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

Interim Load Reduction (lb/ac/yr)	5 (8-3)	3	7	1	0	0 (Done)	0
Long-term Load Reduction (lb/ac/yr)	1 (3-2)	1	0	0	1	1 (2-1)	2
Total Load Reduction	6	4	7	1	1	1	2

TMDL Scenario Year 6 Credits

- Buffer strip installed on a 40 acre field within same TMDL reach
- TMDL load reduction target is 50%
- **Trade ratio is 2:1**



Note: Calculation must be made for each year in crop rotation.

NPS Implementation Handbook

- Existing guidance is geared toward point source audiences
- DNR is developing separate guidance for implementation entities
 - County LCDs
 - Third party groups
- Utilizing a stakeholder advisory group to provide input
 - WLWCA
 - County LCDs
 - Clean Wisconsin
 - The Nature Conservancy
 - UWEX
 - NRCS



AM & WQT Contacts

Location	Contact Information	DNR Office/Email
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	Karen Nenahlo	Karen.Nenahlo@Wisconsin.gov
Eastern District	Vacant	Contact Statewide coordinators
Western District	Mike Vollrath	Michael.Vollrath@Wisconsin.gov

<http://dnr.wi.gov>

keywords: “adaptive management”, “water quality trading”

Questions:

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”)