Expressing Load Allocations with Direct Linkage to Implementation Tools

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Wisconsin Department of Natural Resources

TMDL = WLA + LA + MOS

Where:

WLA = Wasteload Allocation (Permitted Point Sources)

LA = Load Allocation (Nonpoint Sources)

MOS = Margin of Safety

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TMDLs Individualize the WLA

Waste Load Allocation

- WWTPs / POTWs
- Industries
- MS4s
- Non-Metallic Mines
- Construction Sites
- CAFOs

Load Allocation

Traditionally

One Lump

Number

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A Single LA Lumps
The Good, The Bad , And The Ugly

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Challenges with Single Load Allocation

- Implementation of the LA is often critical to watershed restoration.
- Lumped LA provides no guidance on where to target efforts or what those efforts should be.
- Watershed modeling does not provide a defined target for implementation.

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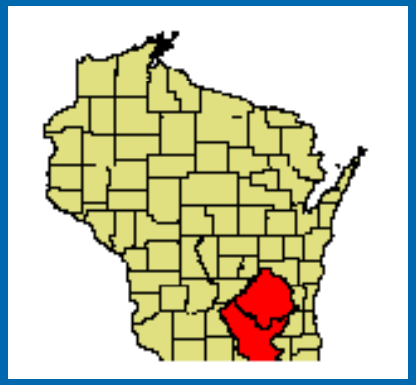
SO WHAT???

Excuse: We have limited control over non-permitted discharges.

Rock River TMDL for Phosphorus

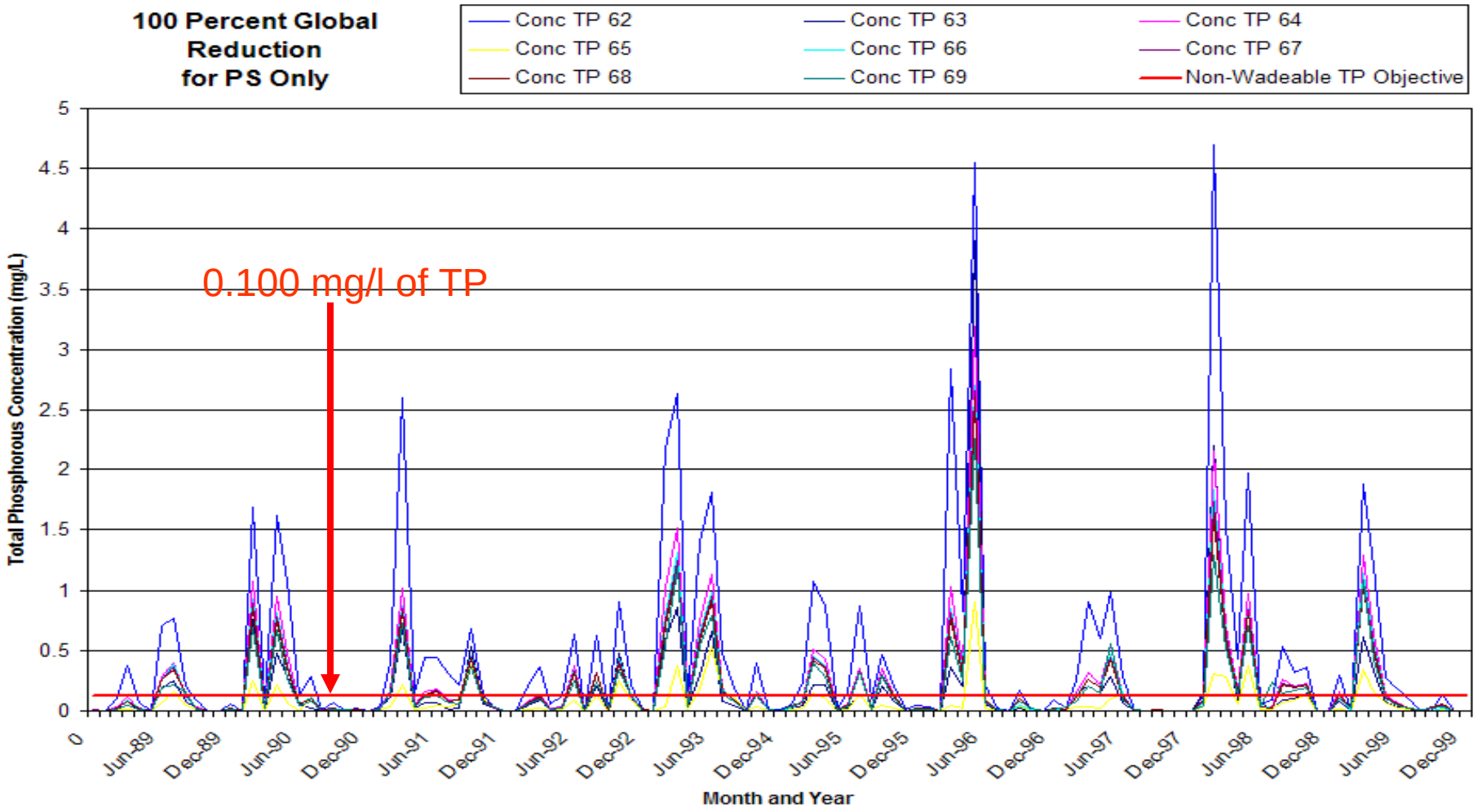


3,600 Square Miles

62% Agricultural

- 72 WWTP and Permitted Industries with Individual Permits
- 52 Permitted Municipalities (MS4s)
- 300 General Industrial Permits
- CAFOs
- Construction Permits

Rock River TMDL WLA = 0



Evaluation Period 1989 to 1999

Solution: A Better Defined Load Allocation

- Break-out by watershed or sub-watershed
- Break-out by land use
  - Agricultural fields and pastures
  - Non-permitted urban areas
  - Woodland, natural areas, and background
- Link the load allocation to an implementation mechanism or field scale tool.

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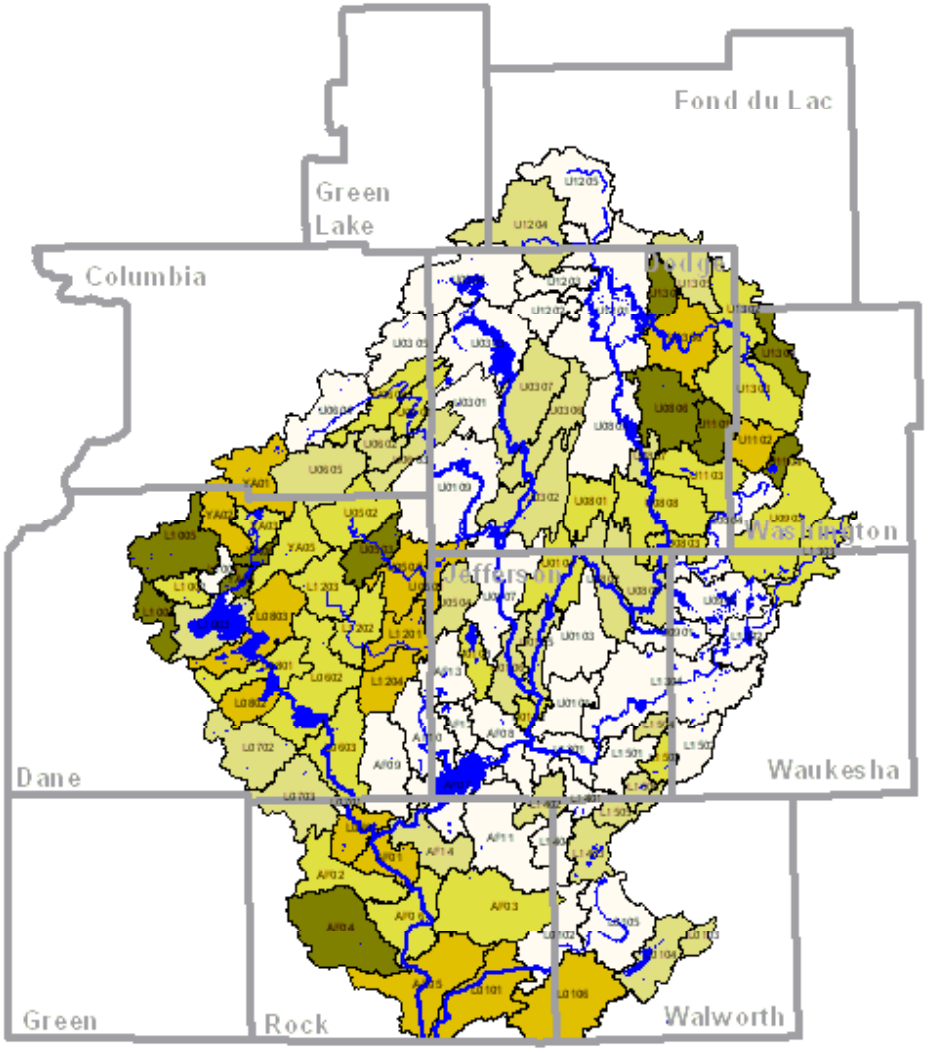
Rock River Watershed Loadings



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Watershed Scale Lumping
The Good, The Bad , And The Ugly

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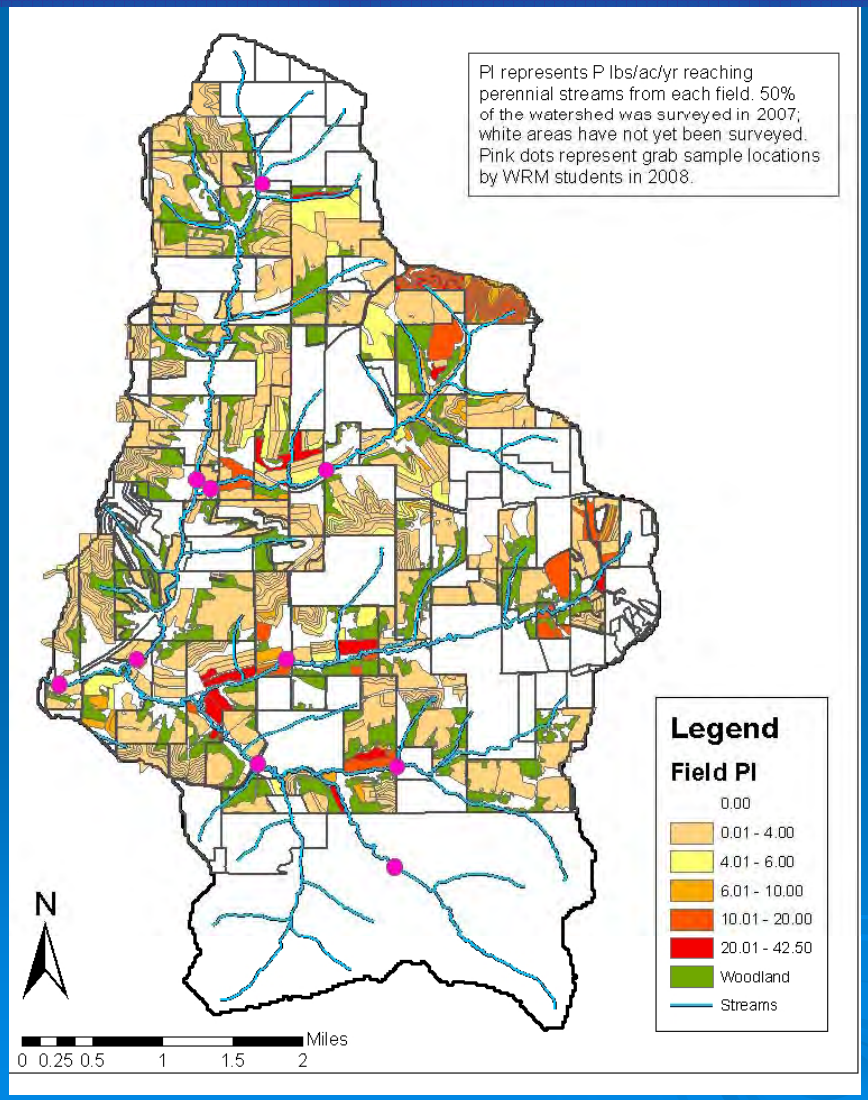
Watershed Modeling Results



- What does a LA of 1,000 lbs. of phosphorus mean at the watershed scale?
- How do I translate that LA to an agricultural production area or operation?
- How is compliance determined?

Wisconsin Statewide P-Index Standard

- Existing standards (590):
  - PI = 6 statewide calculated over the accounting period.
  - No direct application of nutrients or soils to surface water; including manure deposition.
- New requirements promulgated in January:
  - PI may not exceed an annual cap of 10.
  - Adjustment to lower PI values if specified in TMDLs.

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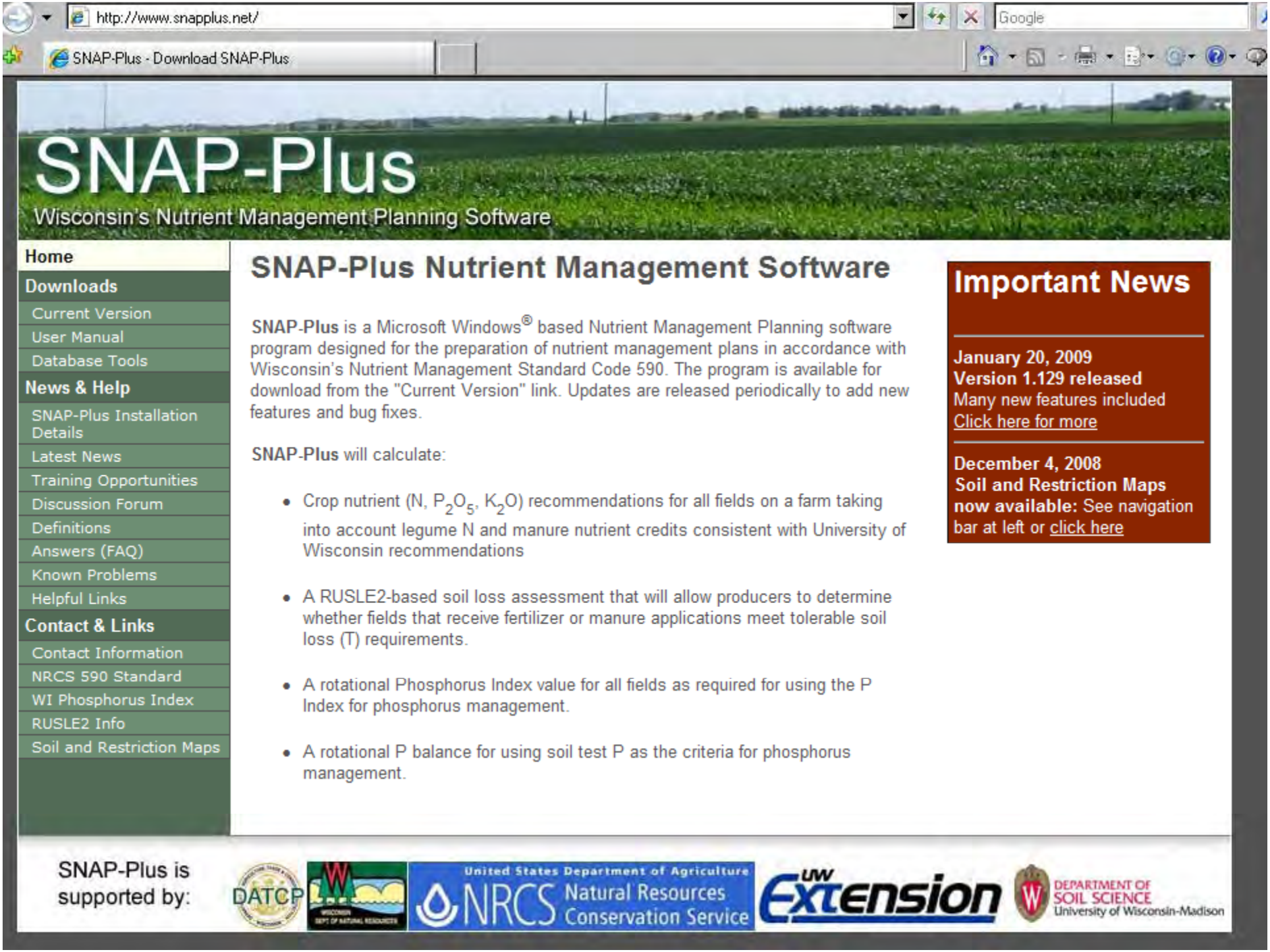
http://www.snapplus.net/
Google
SNAP-Plus - Download SNAP-Plus
SNAP-Plus
Wisconsin's Nutrient Management Planning Software
Home
Downloads
Current Version
User Manual
Database Tools
News & Help
SNAP-Plus Installation Details
Latest News
Training Opportunities
Discussion Forum
Definitions
Answers (FAQ)
Known Problems
Helpful Links
Contact & Links
Contact Information
NRCS 590 Standard
WI Phosphorus Index
RUSLE2 Info
Soil and Restriction Maps
SNAP-Plus Nutrient Management Software
SNAP-Plus is a Microsoft Windows® based Nutrient Management Planning software program designed for the preparation of nutrient management plans in accordance with Wisconsin's Nutrient Management Standard Code 590. The program is available for download from the "Current Version" link. Updates are released periodically to add new features and bug fixes.
SNAP-Plus will calculate:
Crop nutrient (N, P2O5, K2O) recommendations for all fields on a farm taking into account legume N and manure nutrient credits consistent with University of Wisconsin recommendations
A RUSLE2-based soil loss assessment that will allow producers to determine whether fields that receive fertilizer or manure applications meet tolerable soil loss (T) requirements.
A rotational Phosphorus Index value for all fields as required for using the P Index for phosphorus management.
A rotational P balance for using soil test P as the criteria for phosphorus management.
Important News
January 20, 2009
Version 1.129 released
Many new features included
Click here for more
December 4, 2008
Soil and Restriction Maps now available: See navigation bar at left or click here
SNAP-Plus is supported by:
DATCP
United States Department of Agriculture
NRCS Natural Resources Conservation Service
UW Extension
DEPARTMENT OF SOIL SCIENCE
University of Wisconsin-Madison

Manageable Solution

- Express LA at a subwatershed scale or other manageable size.
- Equate the LA to Phosphorus Index, Tolerable Soil Loss Target, or other field scale parameter.

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Actual Watershed P Index Values

Rotation Average P Index (lb P/acre/year)

Average: 4
Min: 0.1
Max: 45

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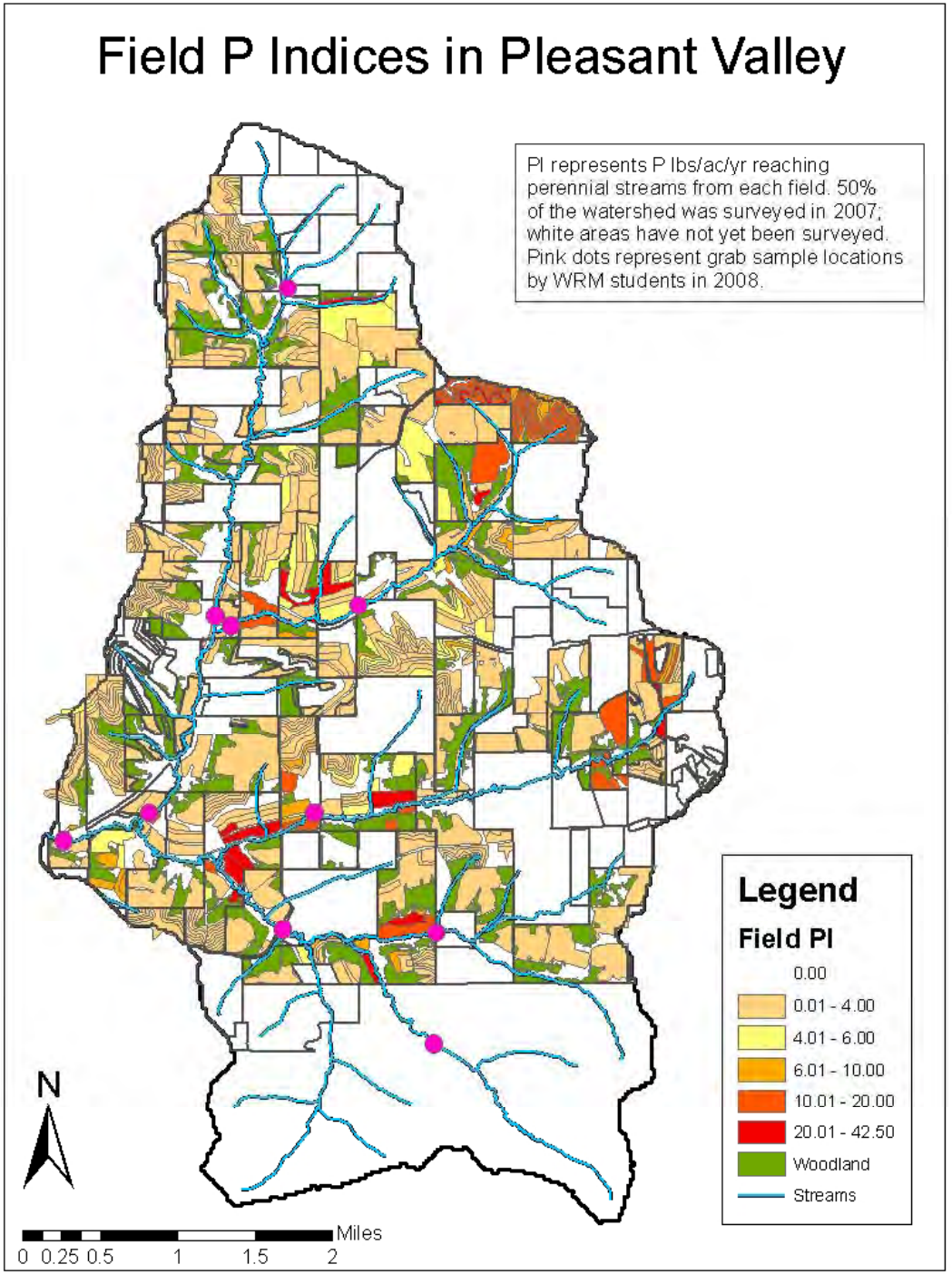
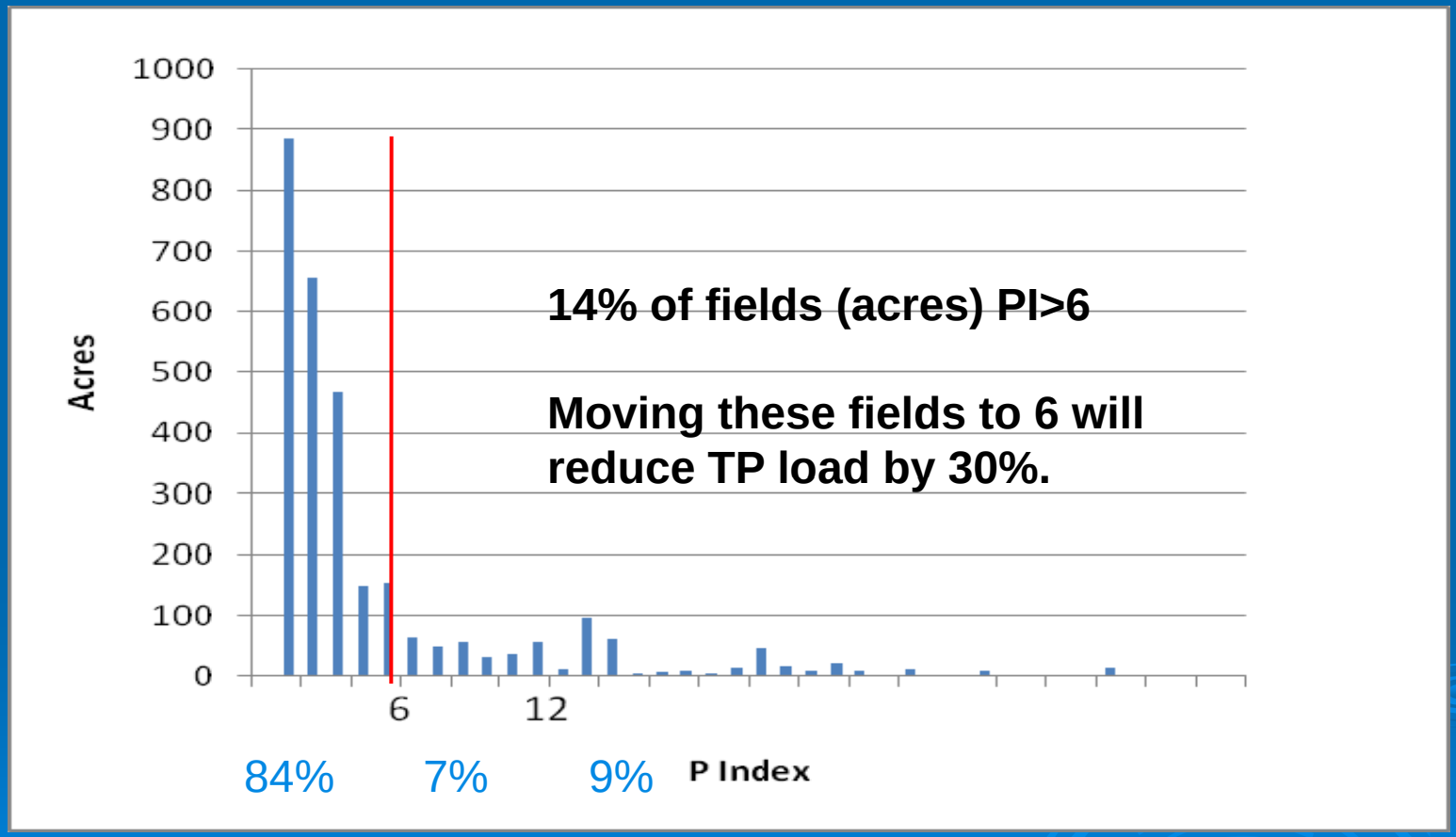


Reducing the Agricultural P-Load

- Research shows a disproportionate amount of the load can be attributed to a small fraction of the fields.
- Targeting these fields critical for reduction of nonpoint pollution loads.

P Index Distribution in SW Wisconsin Watershed



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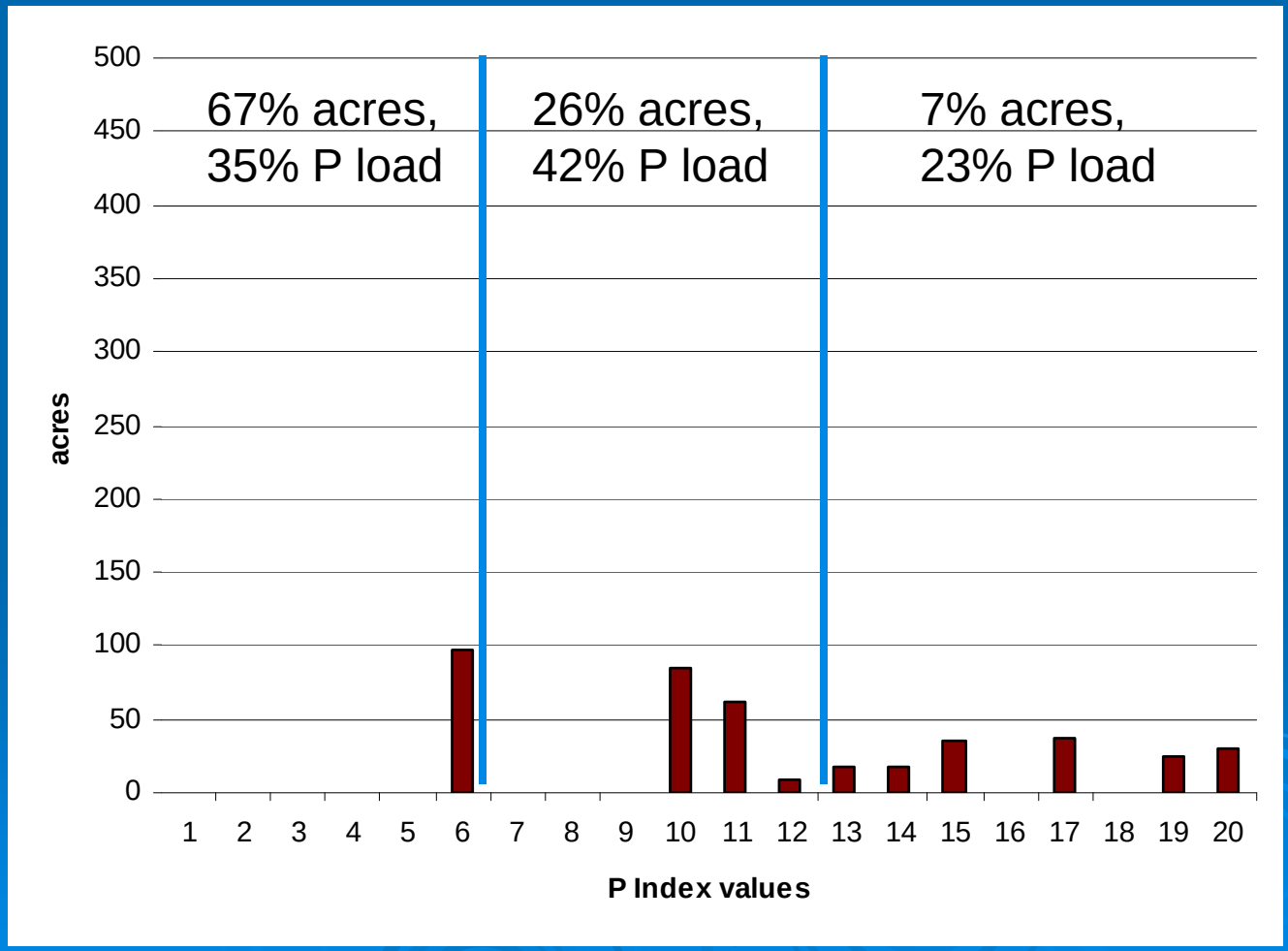
Annual P Index Distribution from Mead Lake Watershed (Draft TMDL)



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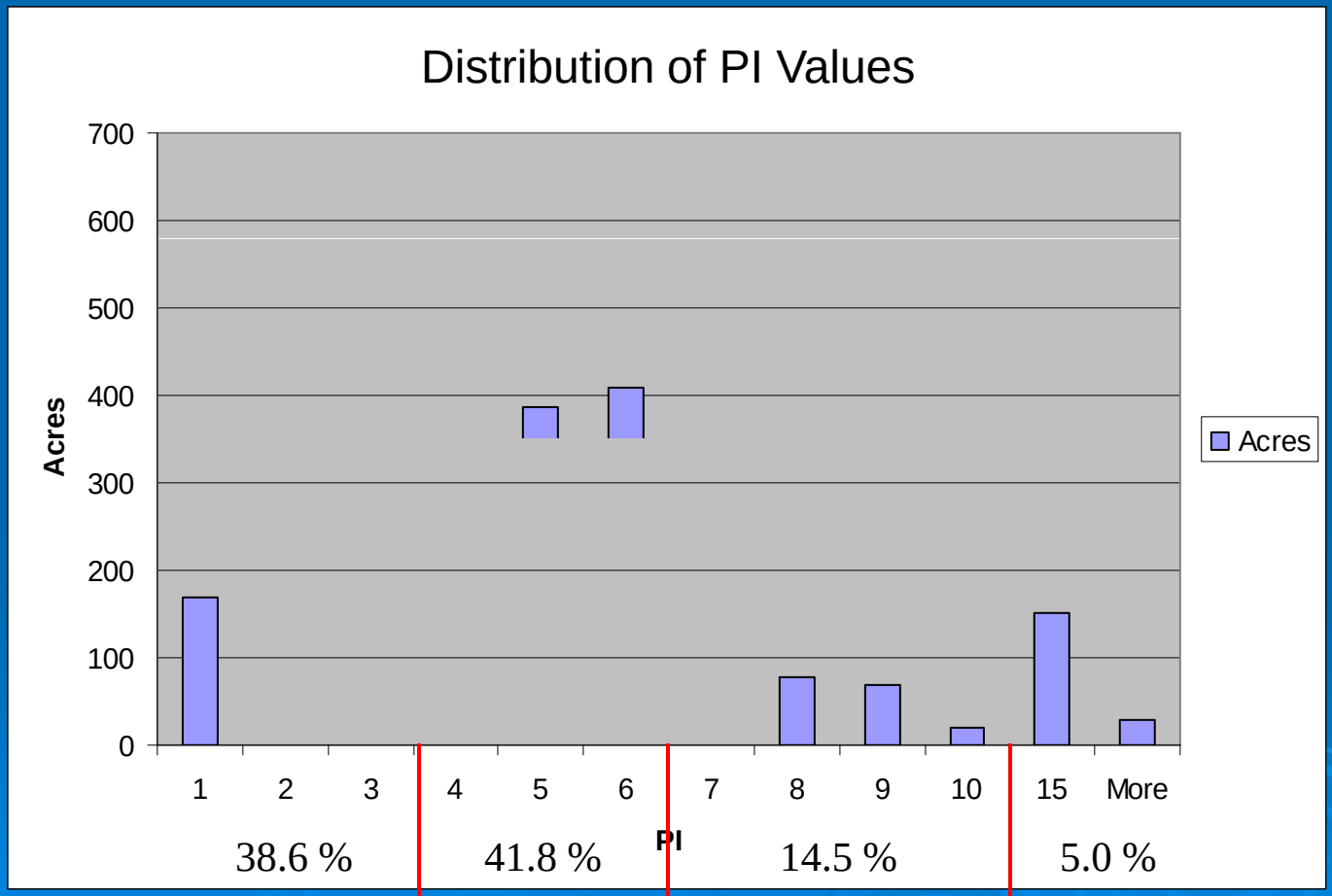
Pheasant Branch – Yahara Basin



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WI Statewide Assessment Project

Develop a set of tools to assess statewide sediment and nutrient loadings from point and nonpoint sources

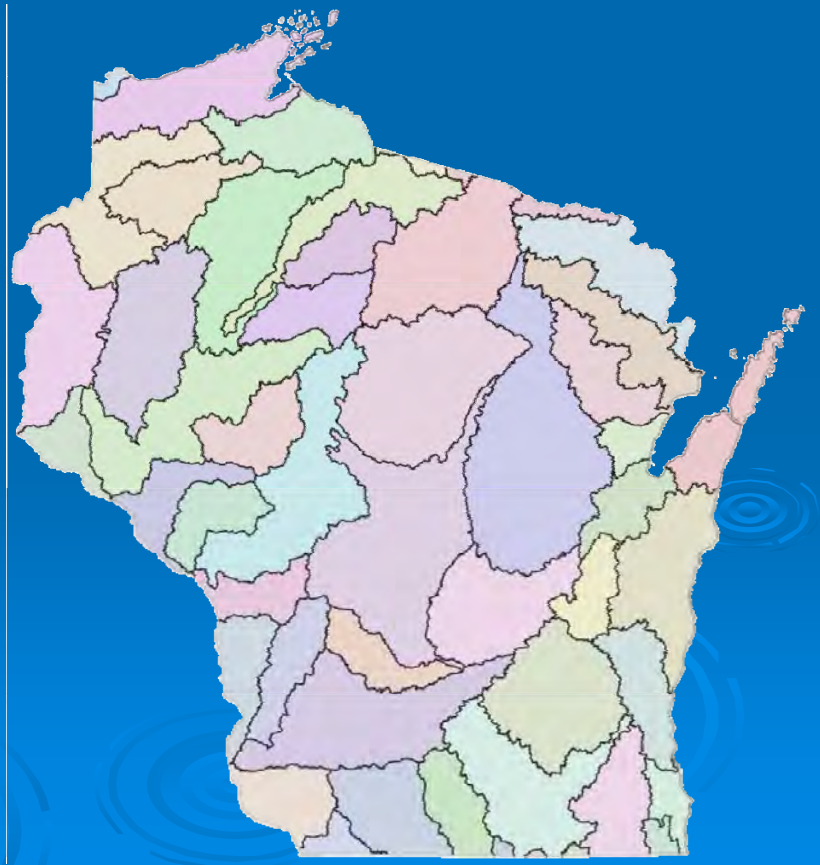
A Phased Approach

Phase I: Ratio Tool

Determine point and nonpoint contributions

Phase II: Export Tool

Locate critical source areas
Track point and nonpoint source reductions
Assist in water quality trading



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1

WDNR Ratio Tool

Identifies Dominant Source of Loading

- Point vs. Non Point Source Analysis

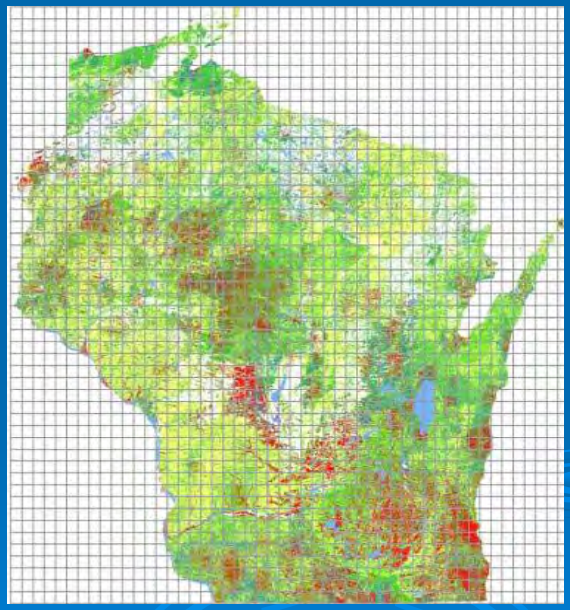
NR217 Guidance for Adaptive Management

2

WDNR Export Tool

Locates and Track Critical NPS Contributions

Grid Based Sediment and Phosphorus Export Tool



3

Prioritize TMDLs

- Relies on coupling Steps 1 and 2 with 303d listing

4

TMDL Development and Implementation Tracking

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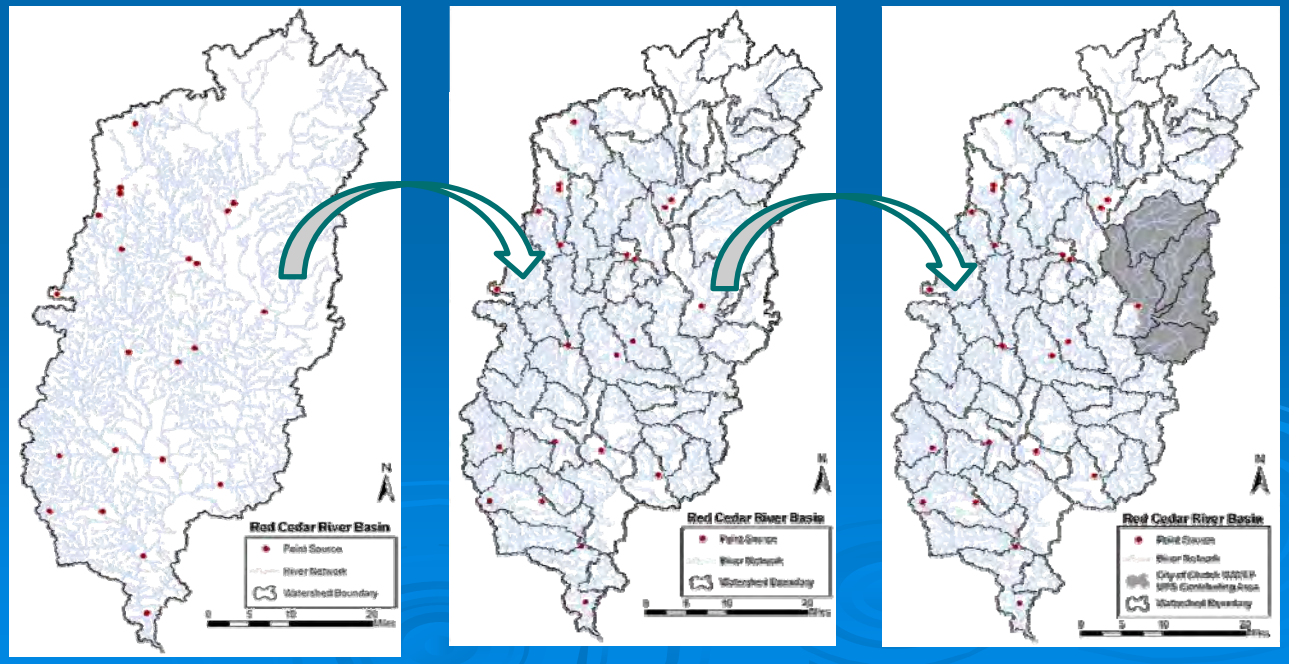
1 Phosphorus Ratio Tool

Question: What is the major contributor of pollutants in the watershed?

Tools Required: GIS, Spatial Datasets, Python Programming, SWAMP



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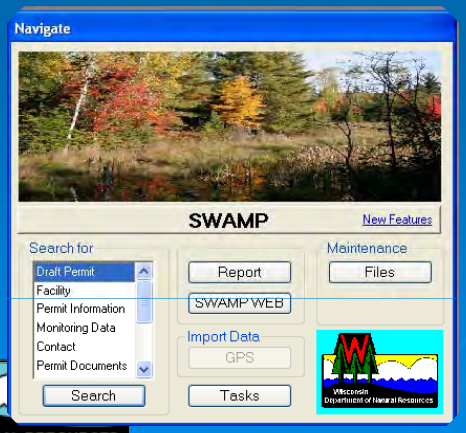
Phosphorus Ratio Analysis

Outfall Locations

Elevation

Land use

Point Source : Nonpoint Source Load Ratio



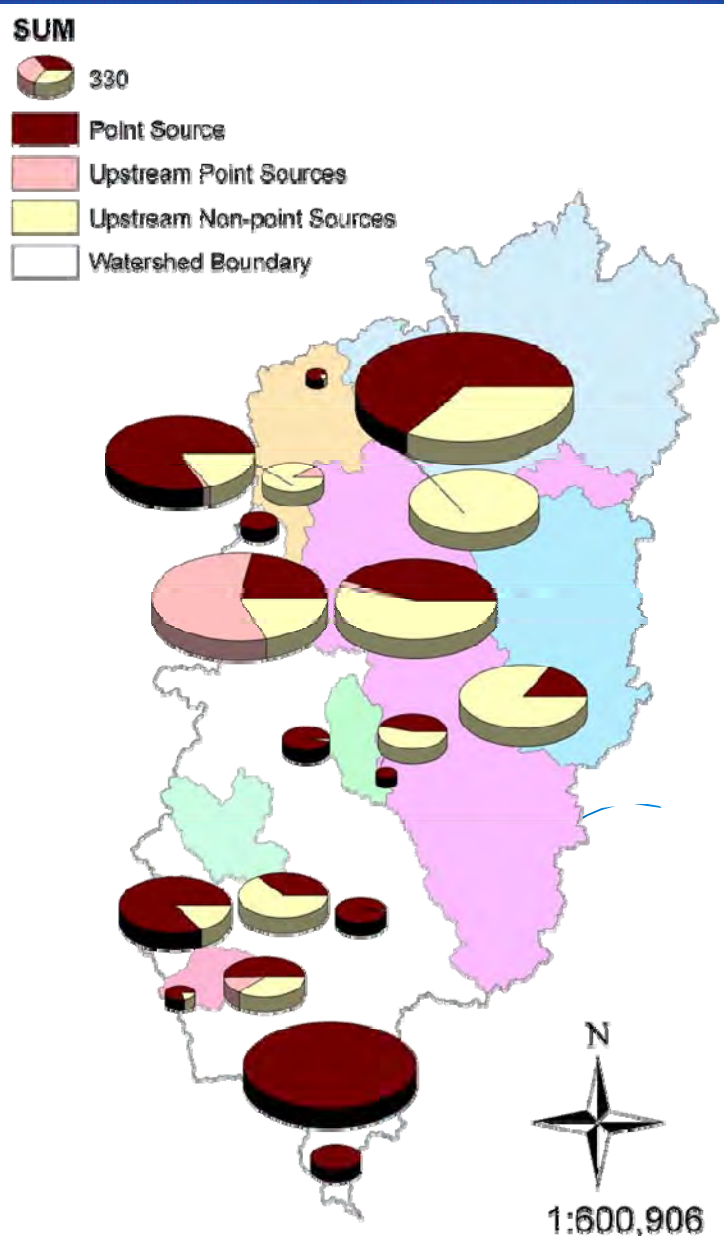
Effluent Pollutant Loads

Hydrology

Land use Export Coefficient Table
Obtained from WI Buffer Initiative

Phosphorus Ratio Tool

Facility Name	Upstream PS	Upstream NPS	Point Source	Drainage Area (mi^2)
Almena Village Of	60%	18%	22%	89.4
Birchwood Manufacturing Co	0%	100%	0%	384.5
Boyceville Wastewater Treatment Facility	0%	63%	37%	51.5
Chetek City Of	0%	84%	16%	204.5
Colfax Wastewater Treatment Facility	32%	59%	9%	1163.4
Crystal Lake Sanitary District	0%	0%	100%	0.0
Cumberland City Of	2%	16%	82%	71.2
Dallas Village Of	0%	54%	46%	22.0
Downsville Sanitary District #1 Wwtf	0%	0%	100%	0.1
Glenwood City Wastewater Treatment Facility	0%	15%	85%	15.4
Jennie O Turkey Store Inc Barron Plant	2%	54%	44%	159.3
Knapp Wastewater Treatment Facility	11%	39%	50%	27.3
Lakeland Sanitary District # 1	0%	11%	89%	0.5
Menomonie Wastewater Treatment Facility	0%	0%	100%	0.9
Prairie Farm Village Of	0%	3%	97%	0.5
Rice Lake Utilities City Of	0%	36%	64%	388.3
Ridgeland Wastewater Treatment Plant	0%	0%	100%	29.9
Seneca Foods Corporation Cumberland	10%	90%	0%	70.8
Wheeler Wastewater Treatment Facility	0%	1%	99%	0.6
Wilson Wastewater Treatment Facility	0%	18%	82%	1.3



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2 Phosphorus Export Tool

Question: Where is NPS pollution originating from across Wisconsin?

Tools Required: GIS, Spatial Datasets, Python Programming, Established algorithms (WI Phosphorus Index)

- GIS interface and use of pre-existing equations make the tool more transparent
- Applies a SNAP - Plus allowing counties to identify target areas
- Spatially distributed (i.e. 30-meter grid represents land identity better than watershed model)

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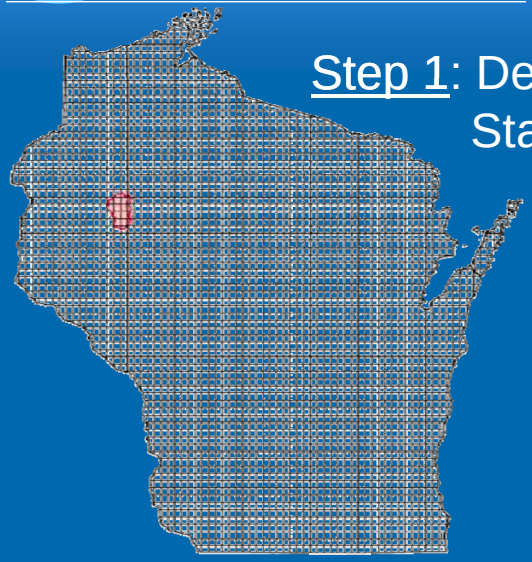
2 Phosphorus Export Tool

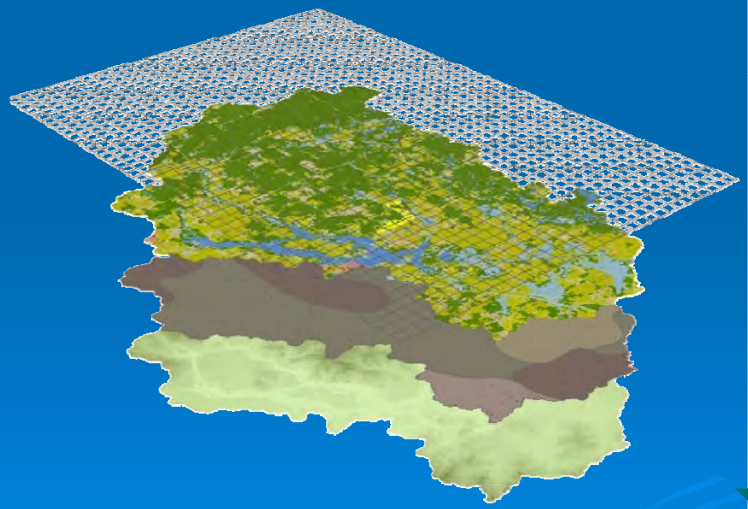


Step 1: Develop State Grid

Step 2: Formulate algorithms

WI Phosphorus Index
SNAP-Plus Model

Step 3: Acquire Spatial Datasets



Grid Tool Relies on Spatial Inputs Including:	
30-meter grid	Precipitation
Land cover	Slope
Land Management (Tillage, Rotation, Fertilizer)	Flow Direction and Volume
Soil Properties (AWC, HSG, K)	Closed Depressions
Soil Test P	Distance to Waterway

Step 4: Create relationship between cells (Downstream Delivery and Transport)

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3 Prioritize TMDLs

Ratio Analysis Tool + $_P$ Export Tool =

- Relative location of areas of high nutrient export
  - Can be used in combination with 303d Impaired Waters List
- Determination of what is driving the system's impairment
- Prioritization of TMDLs
- Location of areas requiring monitoring based on elevated simulated loads

2010 303d Impaired Reaches

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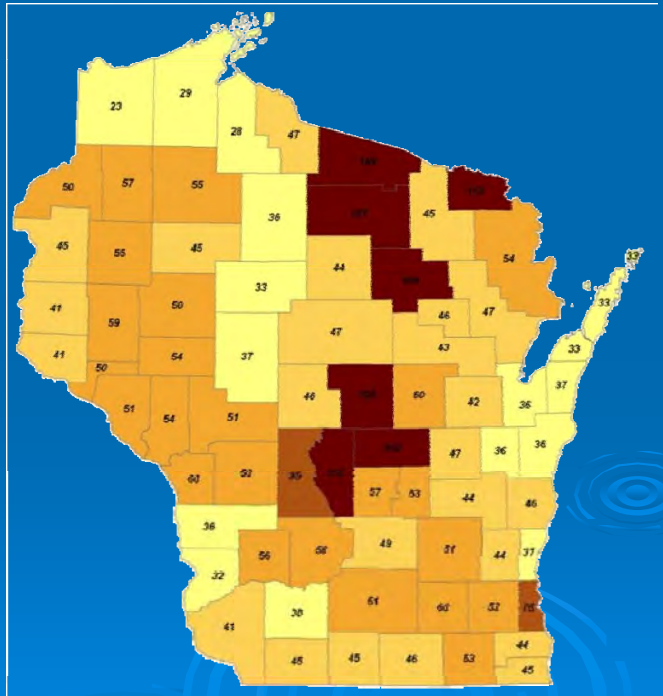
4 Implementation Tracking

Tracking of point and non-point phosphorus load reductions, assist in implementation planning, track potential water quality trading programs, and help target monitoring for de-listing efforts.

- Annual update of point source loads
- Update non-point grid as inputs are adjusted through implementation of nonpoint reductions.
- Track 319 funded and other nonpoint projects.



Summary of Soil Test-P by County

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Conclusions

- Refine LA to aid in implementation and reduction of nonpoint pollution.
- GIS coupled with field-scale models allowing targeting of nonpoint loads.
- Direct linkage with implementation planning and tracking.

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