Pecatonica River Wisconsin Buffer Initiative (WBI) Pilot Project

Testing the WBI's Theories 6 Years Later…

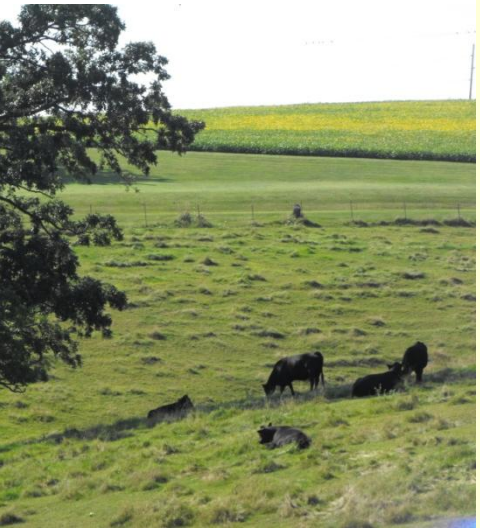


Photo credits: (Top) Gerald H. Emmerich, Jr.; (Bottom) Timothy Lindenbaum/TNC; Flickr Creative Commons; (Left) Dane County LWRD

Project Partners *Successfully Merged!!!*

Dane County, Land Conservation Division

Iowa and Green County Land Conservation Departments

US Geological Survey (USGS)

University of Wisconsin-Madison

University of Wisconsin-Extension

Natural Resource Conservation Service

Wisconsin DNR

Wisconsin DATCP

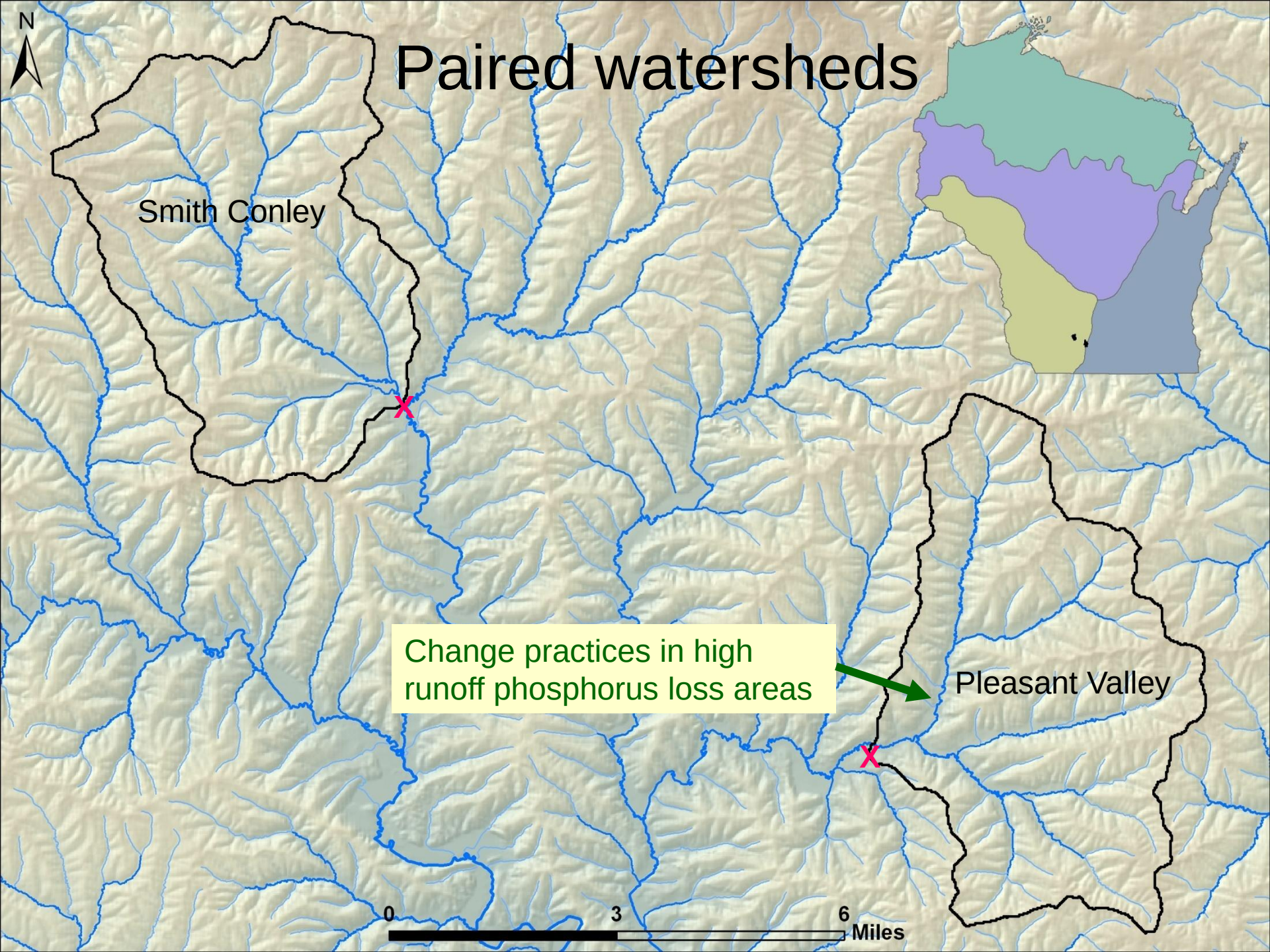
The Nature Conservancy

Monsanto Corporation

McKnight Foundation

WBI Hypothesis

Targeting watershed implementation efforts to the fields that contribute the most nutrients to water is an effective way to improve water quality.


N
Paired watersheds
Smith Conley
Change practices in high runoff phosphorus loss areas
Pleasant Valley
0
3
6
Miles

WBI Theory Ground Truthing

Implementation Strategy
10-Year Project, 2006 – 2015

Pecatonica partnership formed & USGS monitoring installed, 2006

Identify priority field and farms based on potential P losses, 2007 - 2009

Implement conservation “soft” practices on PI fields greater than 6, 2010 - 2015

Implement conservation “soft” practices on fields with PI 3-6, 2011-2015

Implement conservation “hard” practices, i. e. waste management systems, streambank protection, 2011 - 2012

Track all conservation practice implementation in time and space & compare it to water quality changes at the USGS station. Final report – 2015

Implementation dollars critical to getting project off the table and on the ground!

TNC & NRCS staffing support, i.e. Monsanto Corporation, McKnight Foundation and NRCS Contribution Agreement

Applied for and received Cooperative Conservation Partnership Initiative (CCPI) Grant for $621,000 dollars

Staff successfully planned recommended BMP's and contracted all grant funds on all (but 2) prioritized farms

WBI Strategy:
Use WI P Index to target high P loss areas within watersheds

P Index estimates annual P delivery in runoff from each field to surface water

WI P Index annual runoff P loss estimates

- Sediment-bound P
- Dissolved P from soil
- Dissolved P from manure or fertilizer

P delivery factor

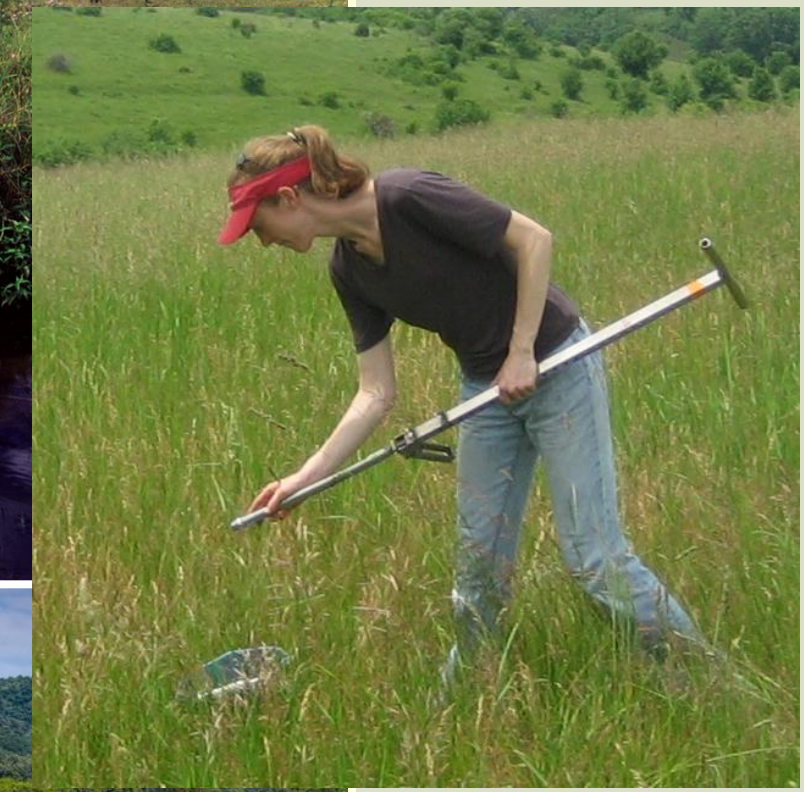
Wisconsin P Index Standards

All fields and pastures:

No rotational average P Index over 6

TMDL watersheds may (eventually) have lower P Index standard

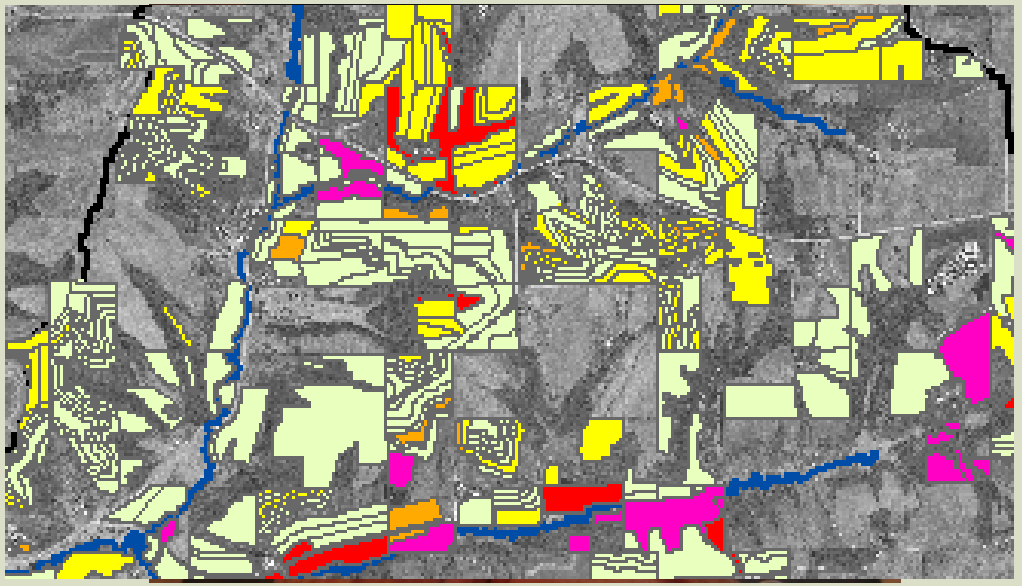
Runoff Sediment and P Loss Inventories, 2007-2010



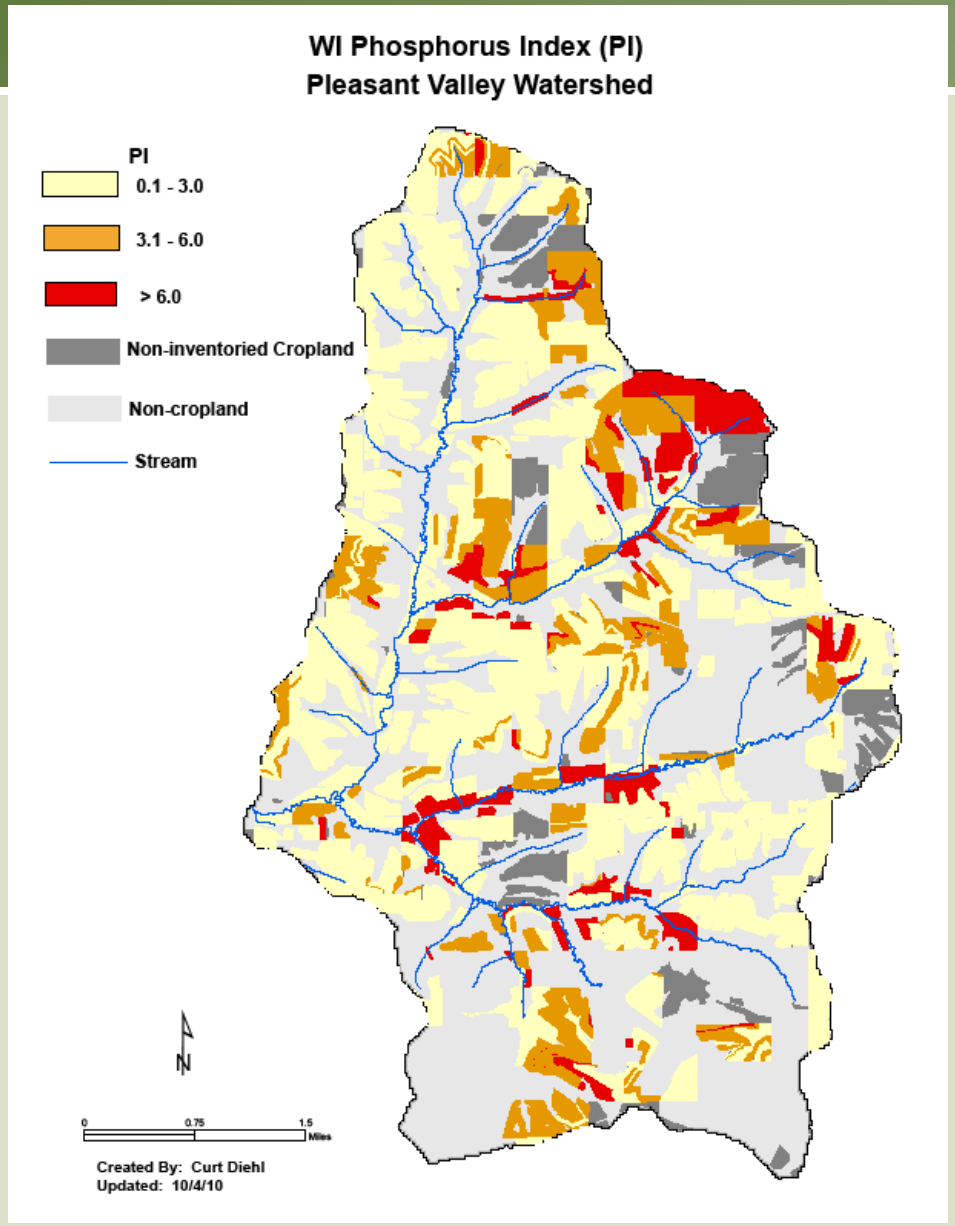
Interview operators and soil sample fields

Calculate soil loss and P Index in Snap-Plus

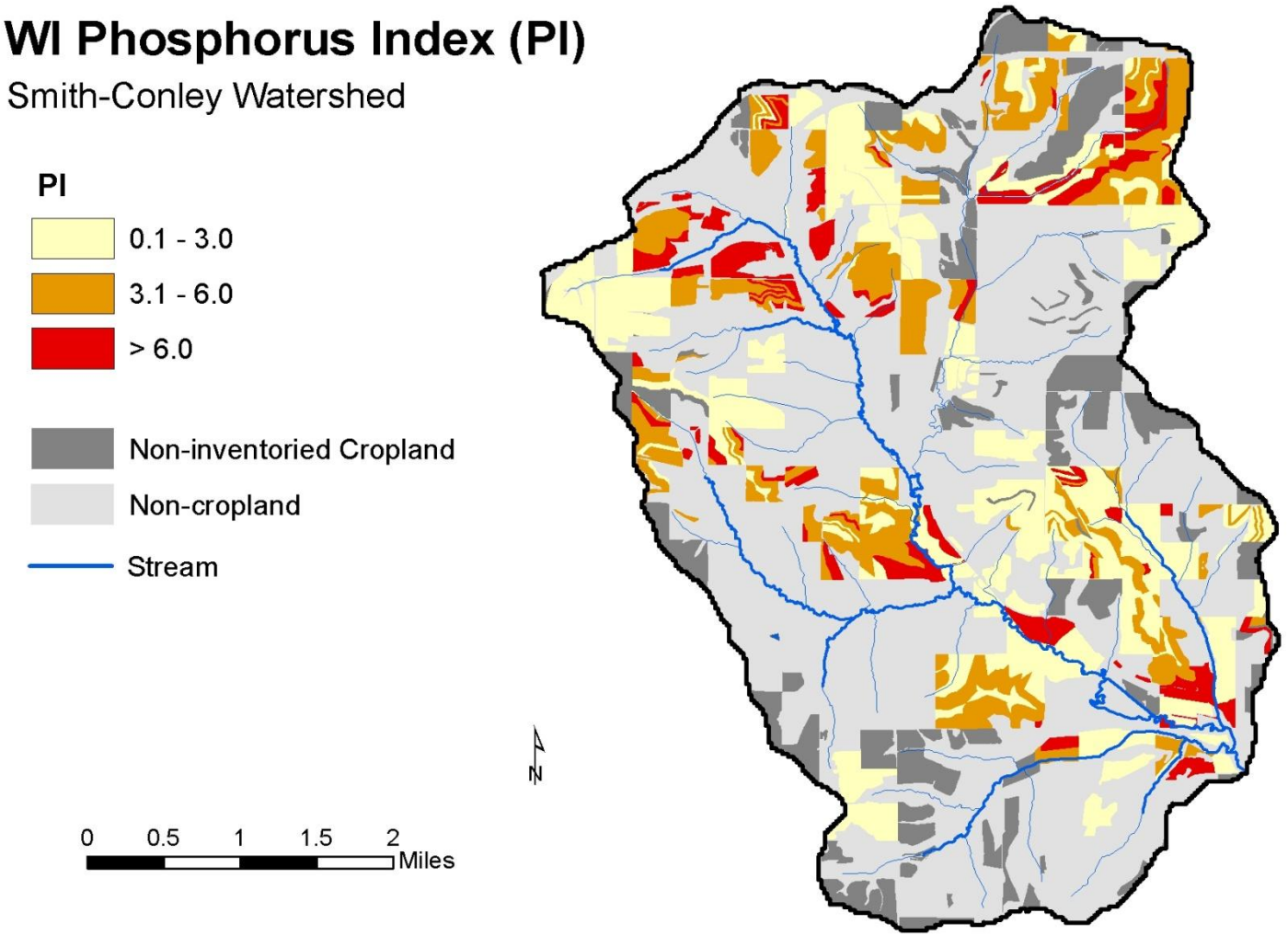
Map results



Pleasant Valley PI values



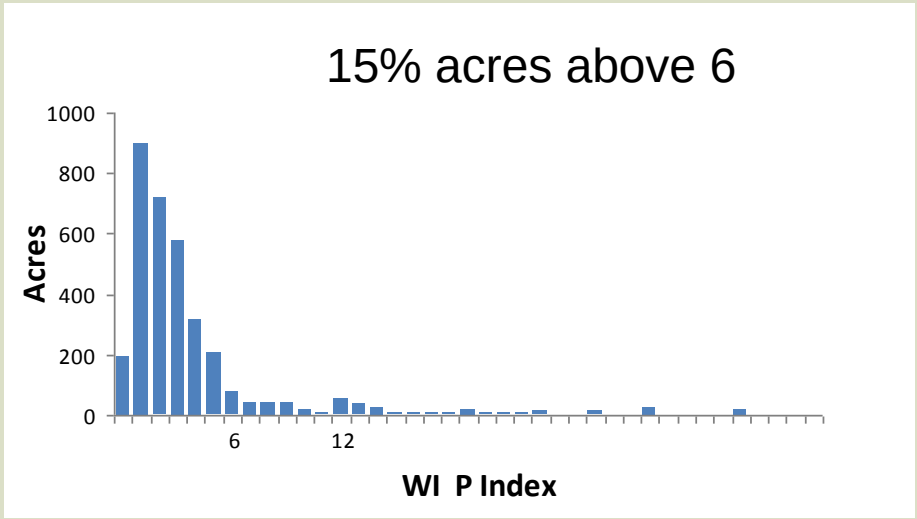
Smith Conley PI map



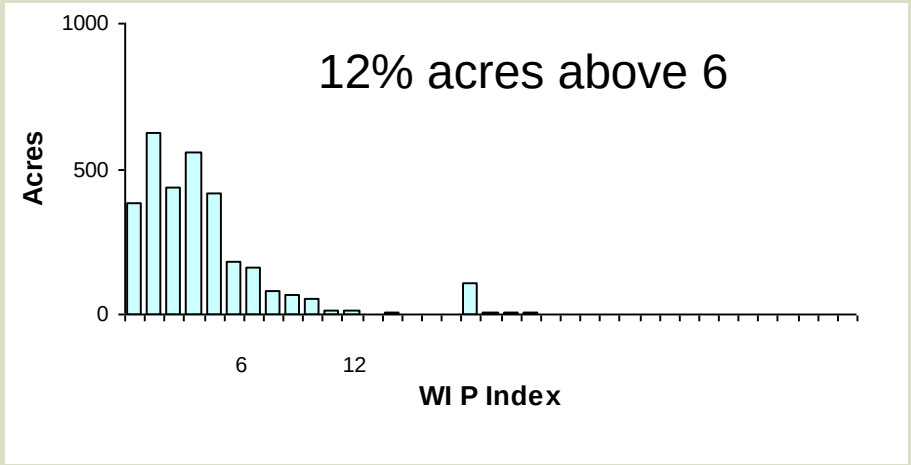
Paired watersheds have similar PI Index distribution

Inventoried cropland and pasture

Pleasant Valley



Smith Conley



Lessons learned:
Runoff P loss potential not evenly distributed in watershed

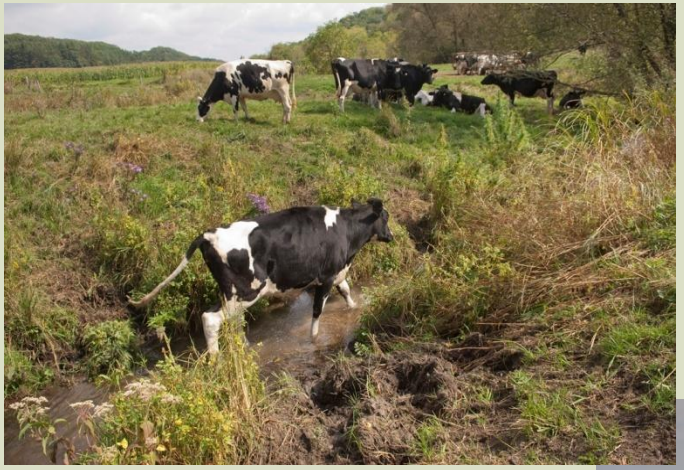


Photo credit: Stefanie Grieve/TNC

Night pastures, grazed woodlots and sites with past livestock history

Active:
Soil Test P = 345 ppm

Soil Test P not evenly distributed in woodlots and on large pastures.

Highest PI's in areas where livestock tend to concentrate and with high erosion potential.

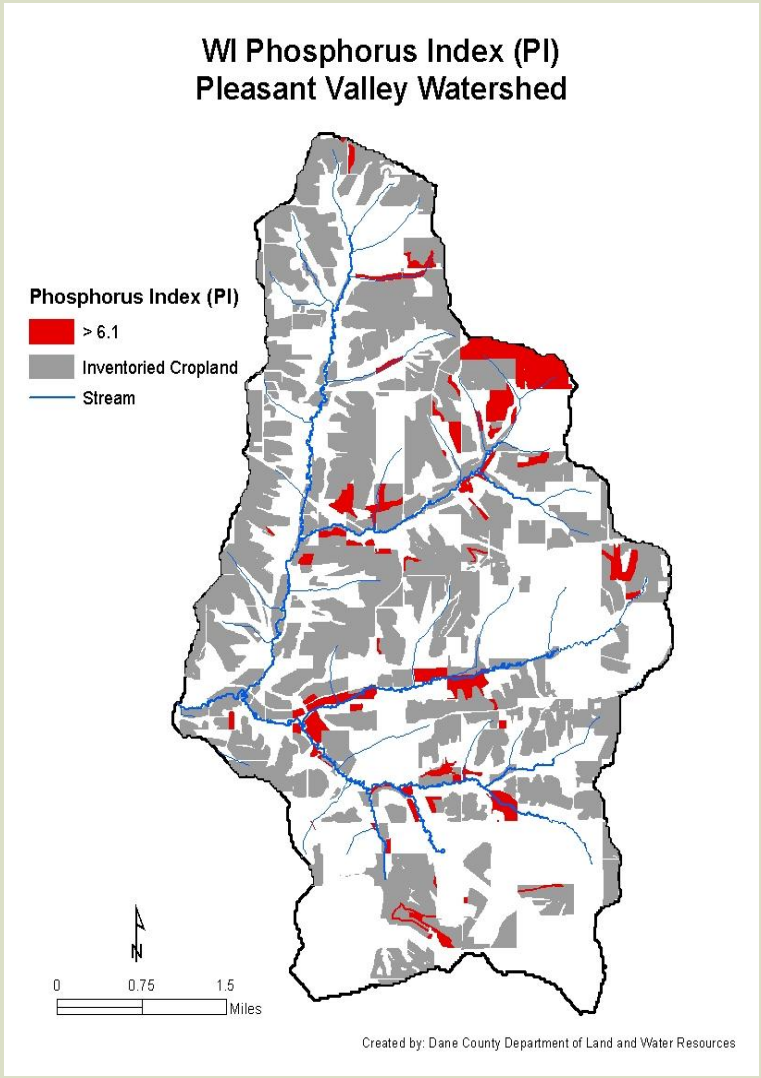
Inactive:
Soil Test P = 147 ppm

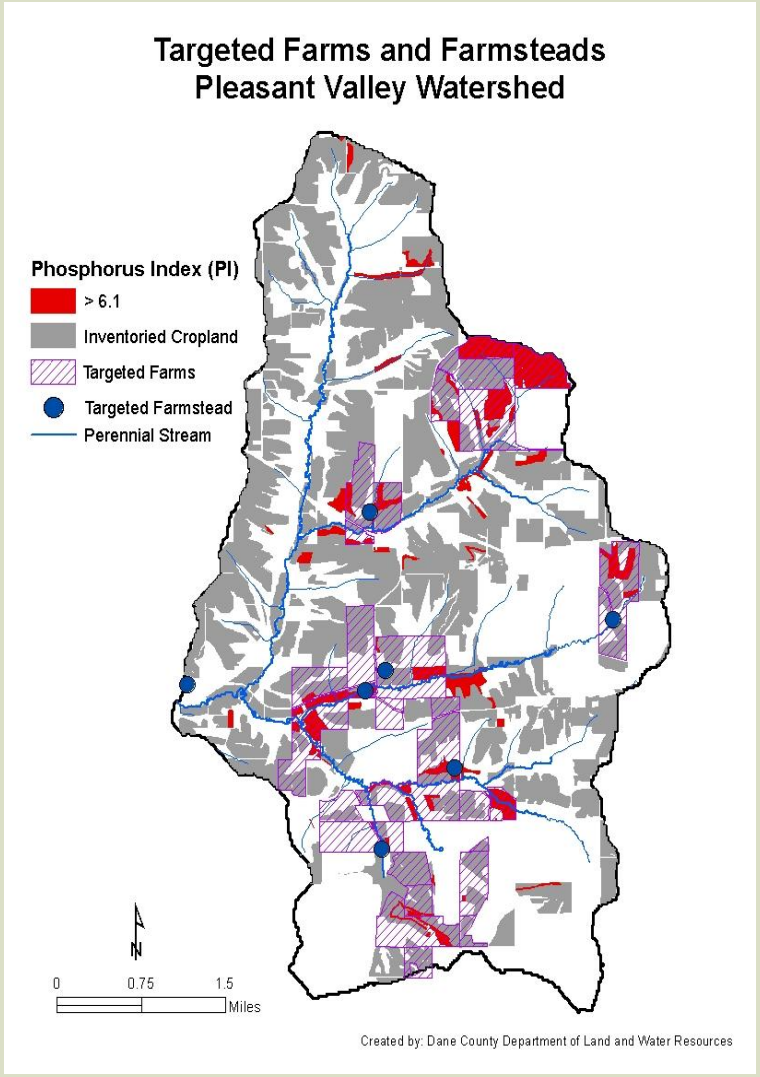
Potential Runoff P Source Land Areas

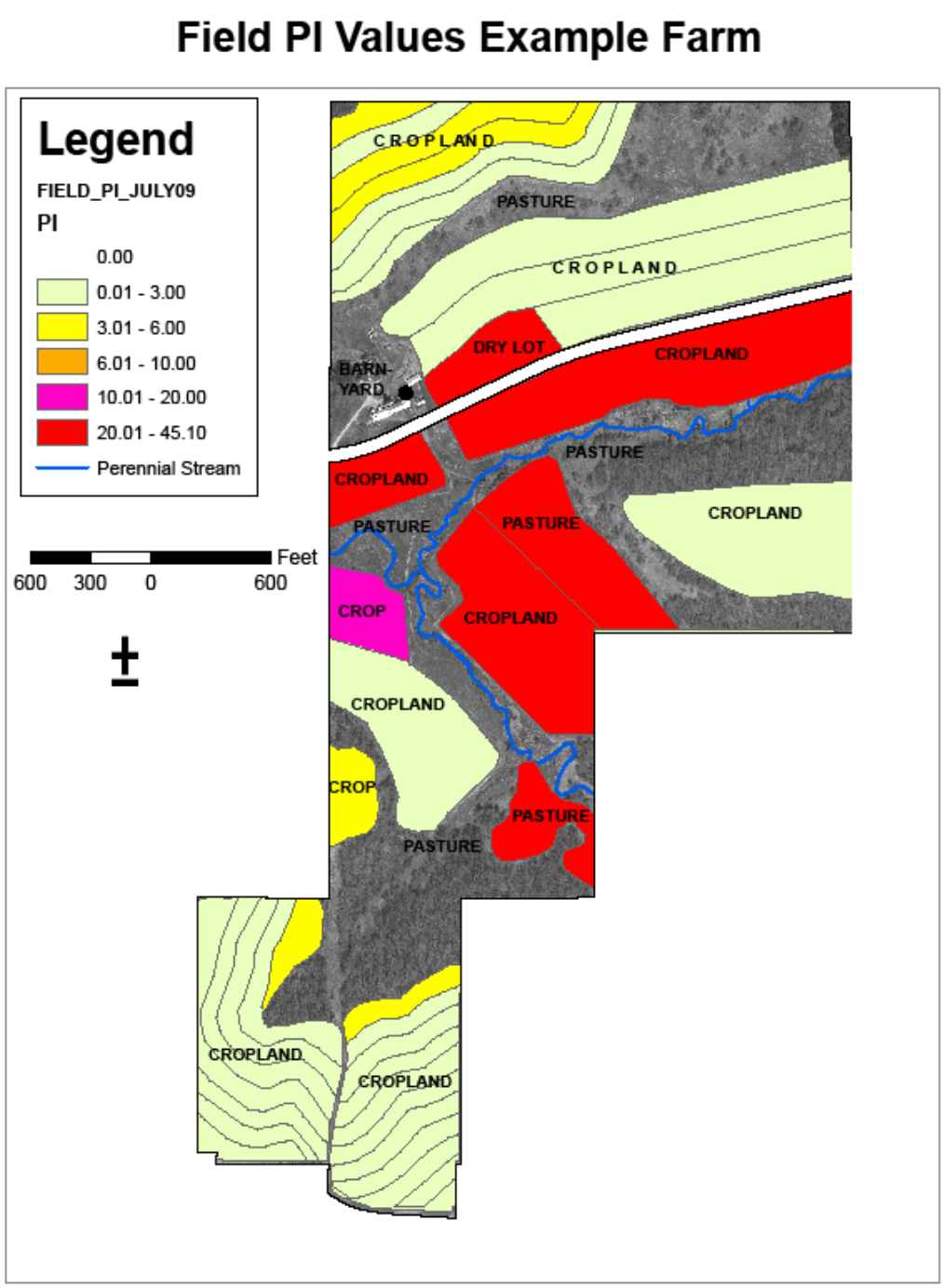
	Area	Soil Test P	
	Acres	Average	Range
Cropland and MIG pastures	4921	32 ppm	2 – 383 ppm
Dry lots	22	144 ppm	32 – 345 ppm
Managed and unmanaged continuous grazing areas	471	55 ppm	5 – 292 ppm

Inventoried 62 farms.
10 farms where selected for project focus based on fields having PI's greater than 6.

Identify priority farms based on PI fields >6 plus total P from all sources







Need to address the whole farm

Phosphorous Delivery to the Stream by Land Use

Cropland	**73%**
Pasture	**15%**
Drylot	**5%**
Barnyard	**7%**

Phase 1. Change management on areas with PI above 6

Cropland practices:

- No-till
- Cover crops after silage
- Rotation change
- Nutrient management planning

No-till

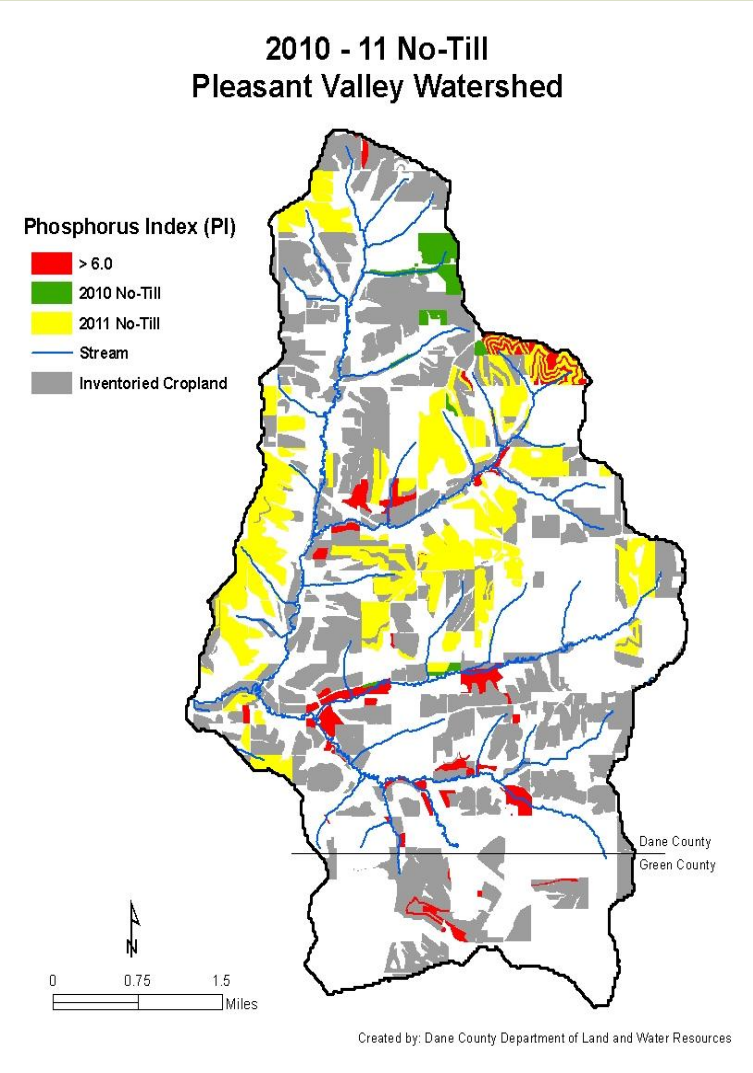
These cows have been fenced from stream bank

Pasture practices:

- Pasture management, reseeding
- Stream bank fencing, cattle crossings

Phase 2. Change management on fields with PI 3-6

Implementation Strategy
No-till

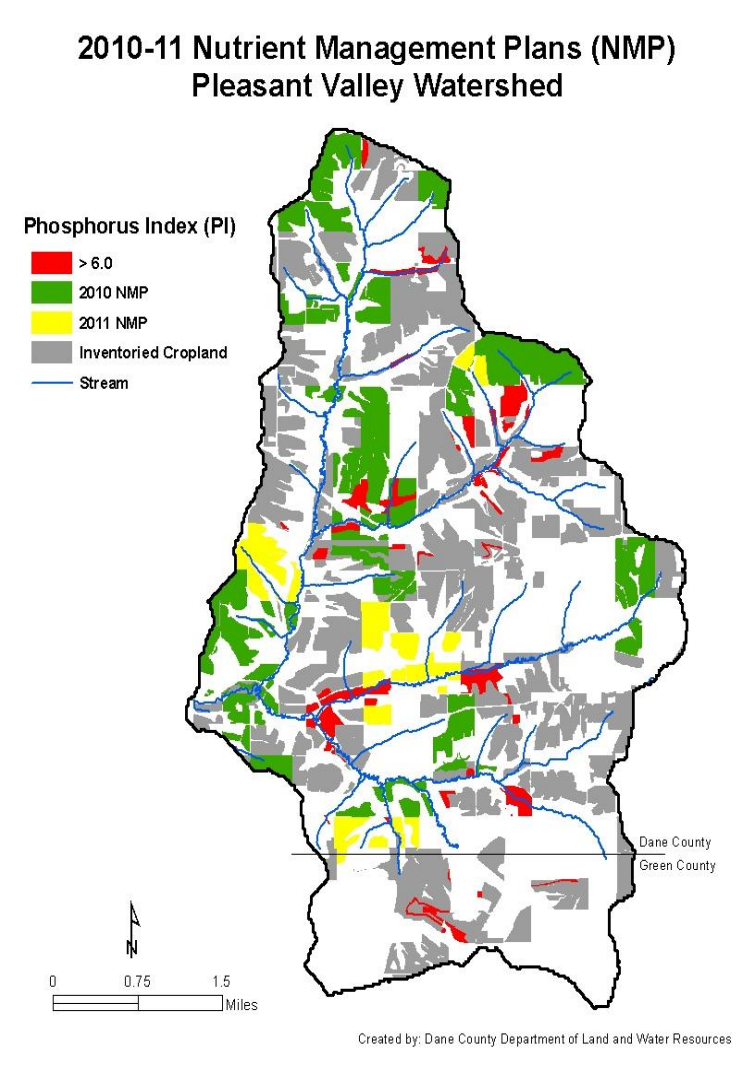


PI fields > 6

Year	Acres	%	Cost
2010	194	4	$2,990.30
2011	2102	43	$20,971.01
Total	2296	-	$23,961.31

Based on Cropland = 4921 previous slide

Implementation Strategy
Nutrient Management Plans

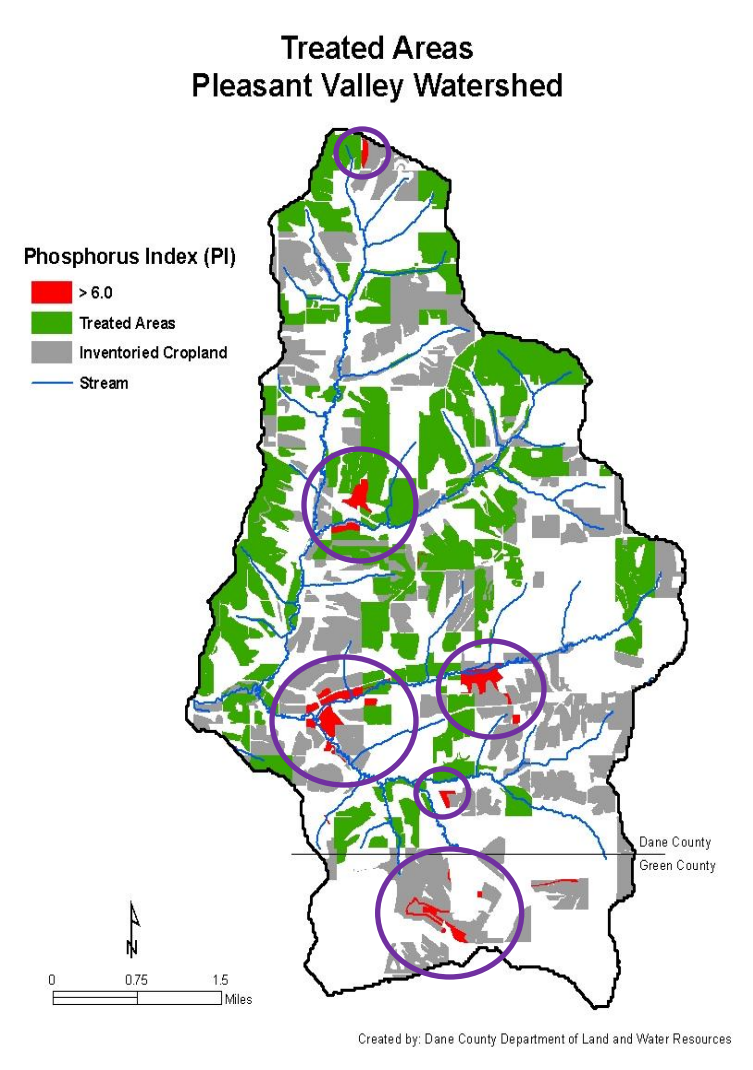


PI fields > 6

Year	Acres	%	Cost
2010	1380	28	$10,124.53
2011	395	8	$3,942.46
Total	1775	-	$14,066.99

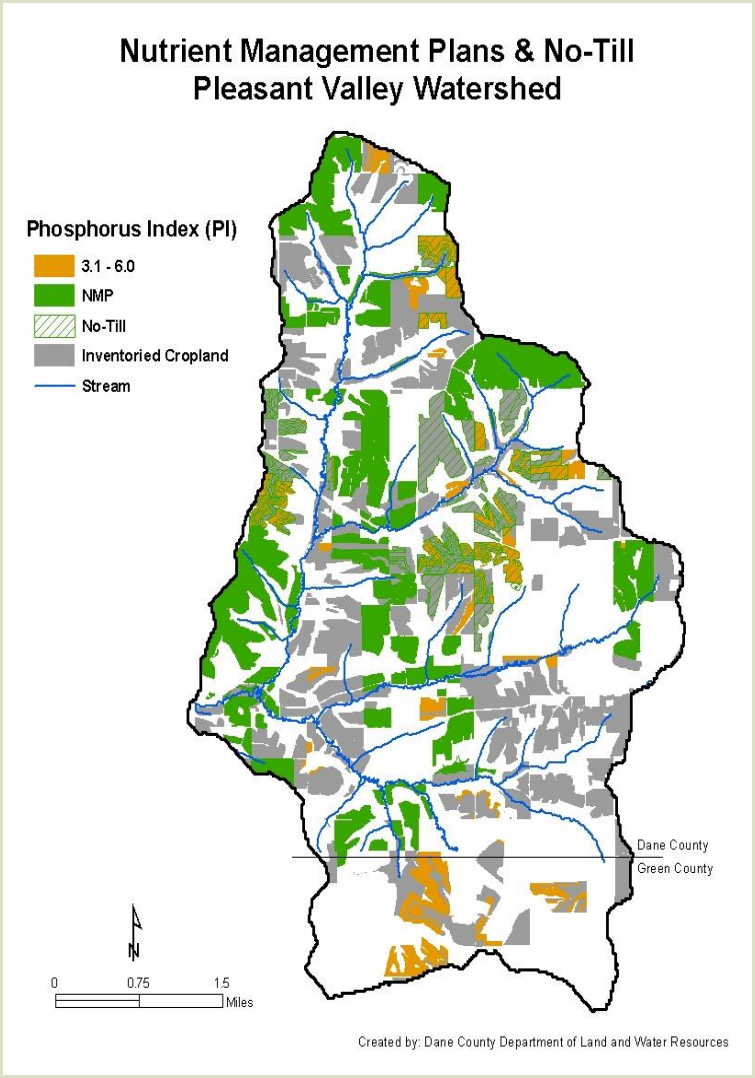
Based on Cropland = 4921
previous slide

Current Progress



- 57% of targeted fields (PI >6.0) have been treated.
- Next step – continue focusing on targeted fields

Identify priority fields with PI 3 to 6. Implement conservation practices starting year 2 for duration of project (2011-2014)



Goal is to reduce PI to less than 3.

Nutrient Management

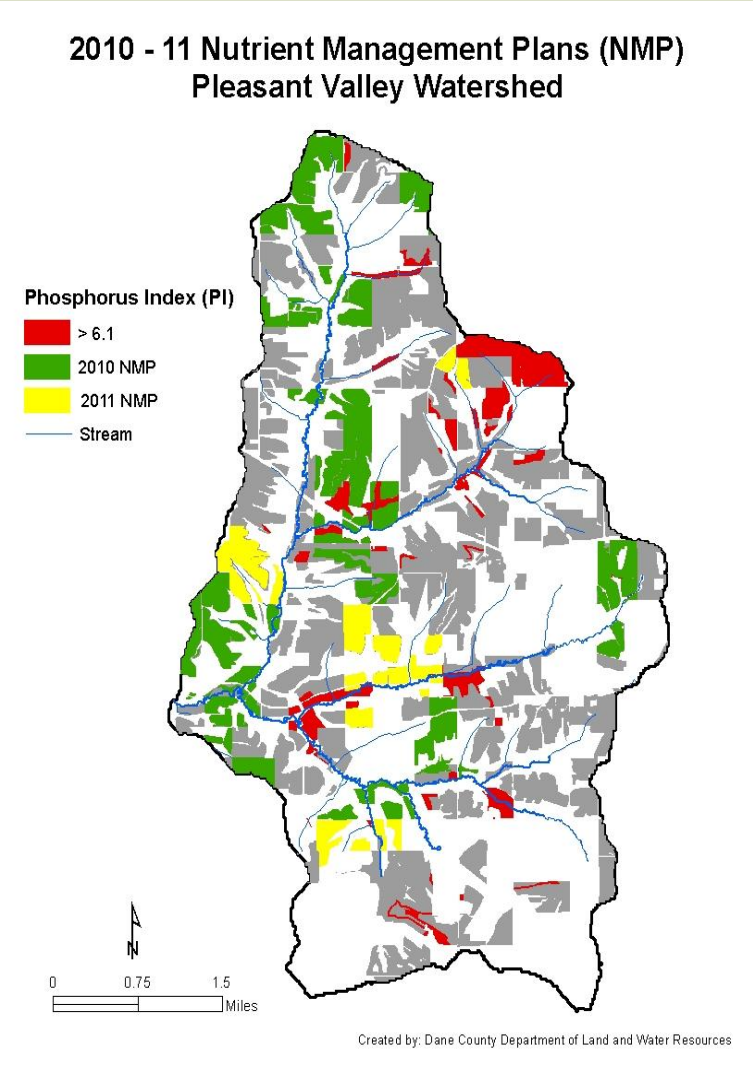
No-till

Apply “hard” practices years 3-5 of project, i.e. high cost practices

Stream bank restoration

Barnyard runoff systems

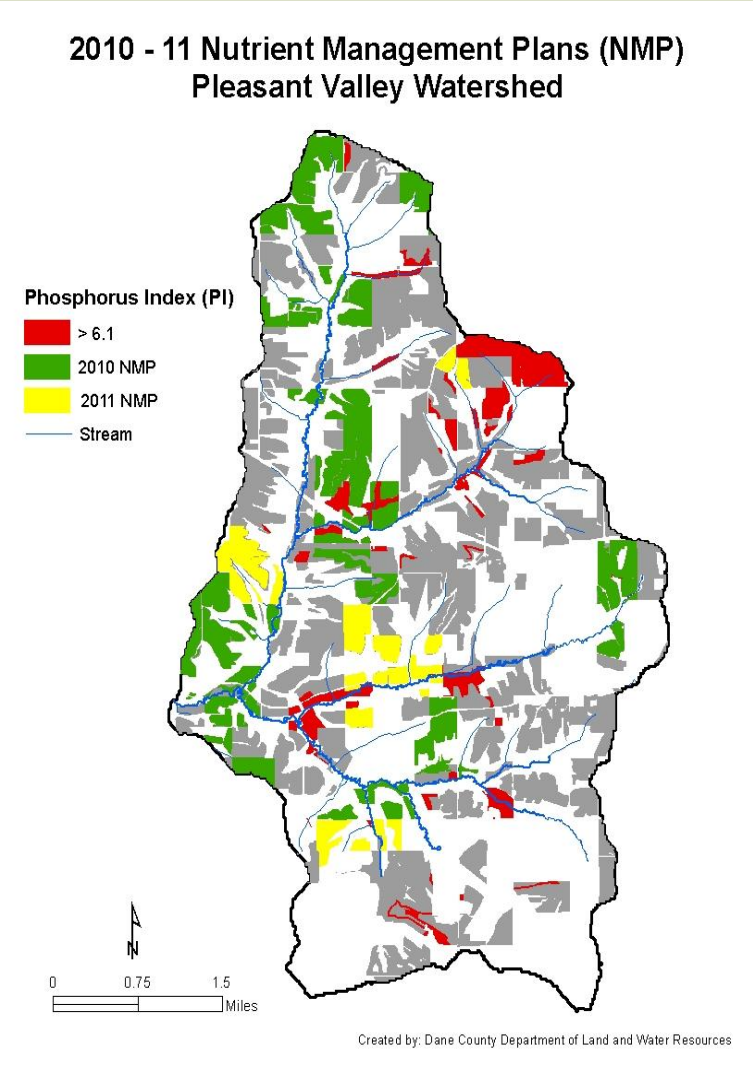
Implementation Strategy
Barnyard Runoff System



Practice	Amount	Cost
Barnyard Runoff System	8 no.	$186,806
Diversion	448 ft.	$3,037
Roof Runoff System	197 ft.	$3,412
Total		$193,257

Based on Cropland = 4921 previous slide

Implementation Strategy
Stream Protection & Restoration



Practice	Amount	Cost
Stream Protection	5960 ft.	$116,715
Improved Habitat	5220 ft.	$9154
Stabilize Bank	1073 ft.	$6557
Total		$132,426

Based on Cropland = 4921
previous slide

Monitoring

USGS monitoring storm and base flow since Fall 06

- Sediment
- Total P
- Dissolved P
- Flow

Photo credit: Steve Richter/TNC

Sediment and Phosphorus Loads from 2007 to 2011

for Pleasant Valley, Wis.

Suspended sediment loads in 2009

Annual total =

82 twenty-ton dump trucks

On Feb. 26, 2009...

16.8 dump trucks in a single day

Total phosphorus loads in 2009

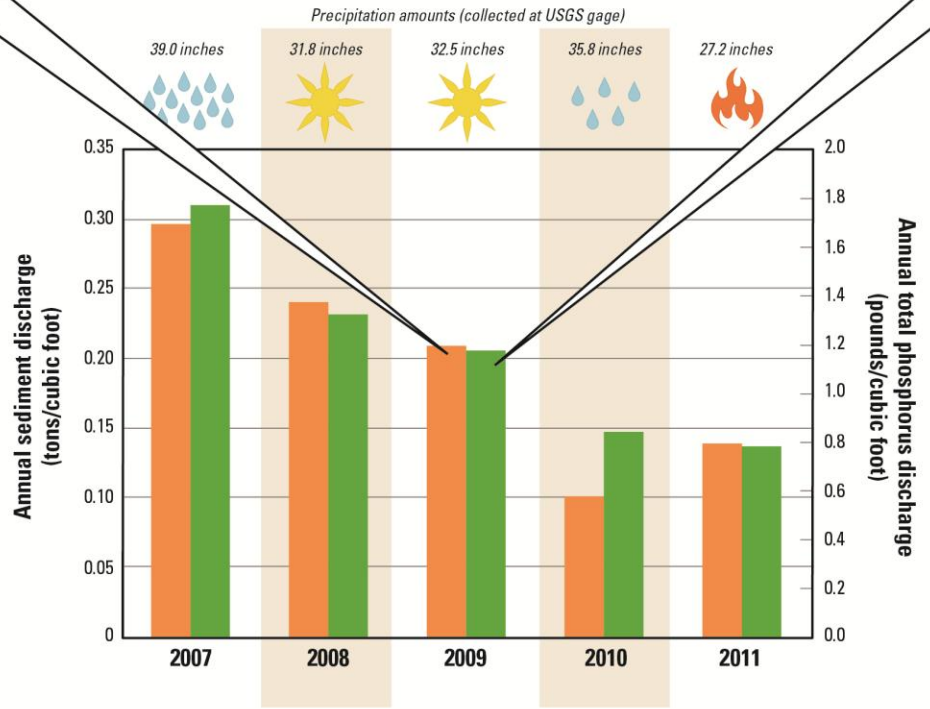
Annual total =

913 fifty-pound bags of DAP* fertilizer

On Feb. 26, 2009...

125 bags in a single day

* DAP; Diammonium Phosphate

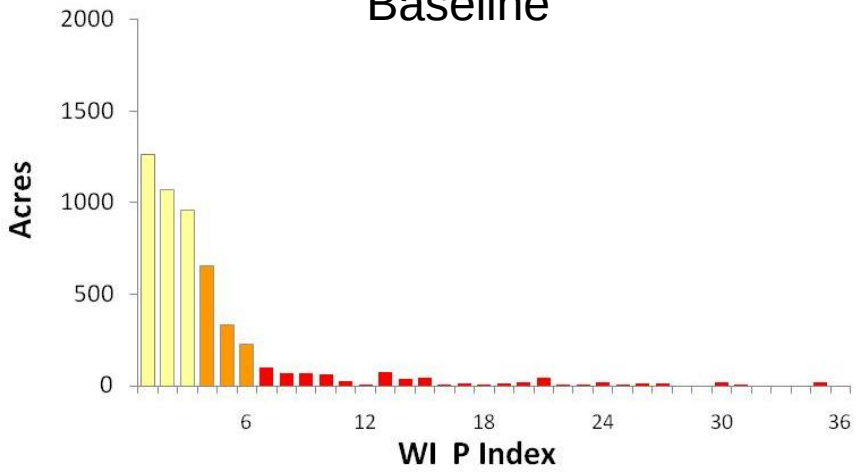


U.S. Geological Survey, 2012. Discharge, loads, and precipitation data for USGS site 05432927 available online at *http://waterdata.usgs.gov/nwis*

USGS
science for a changing world

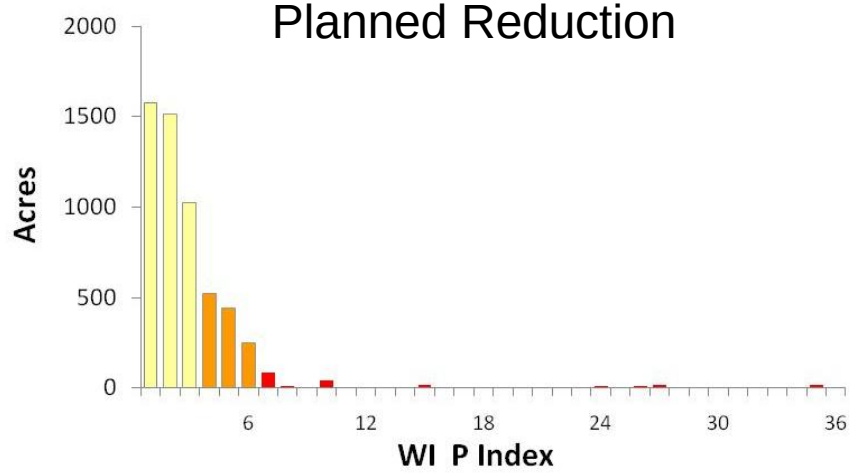
Will implemented practices change watershed loads?

Baseline



30% lower PI load

Planned Reduction



Research: Field-to-stream transport, Stream sediment and P storage/release

US Geological Survey and UW-Madison

Photo credits:; Dane County Land Conservation Division

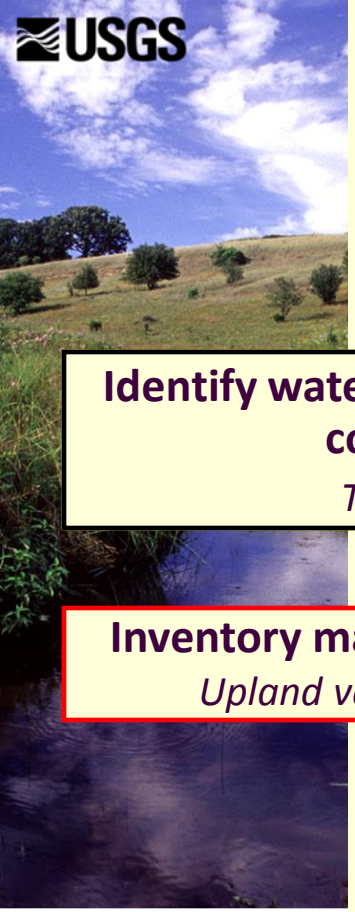
Connecting Field to Stream Transport of Sediment

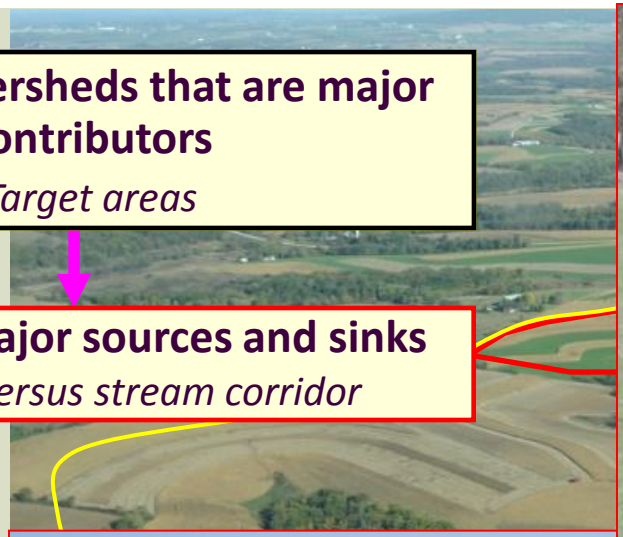
Identify watersheds that are major contributors

Target areas

Inventory major sources and sinks

Upland versus stream corridor





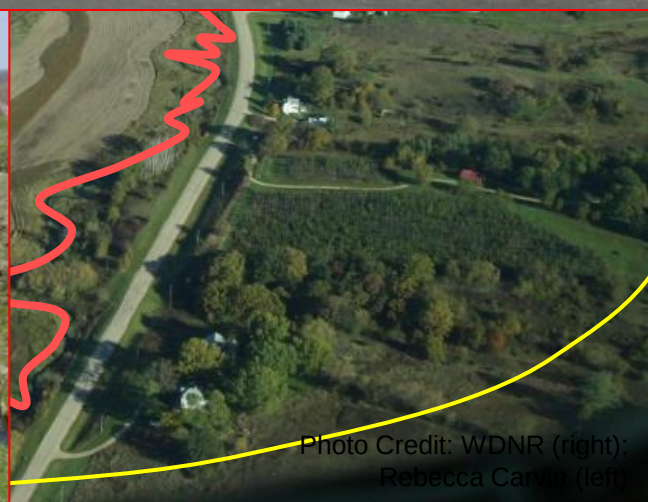


Photo Credit: WDNR (right); Rebecca Carvin (left)

Connecting Field to Stream Transport of Sediment

Identify watersheds that are major contributors

Target areas

Inventory major sources and sinks

Upland versus stream corridor

Target best management practices in areas with high losses

Stream corridor rehabilitation

Soil conservation

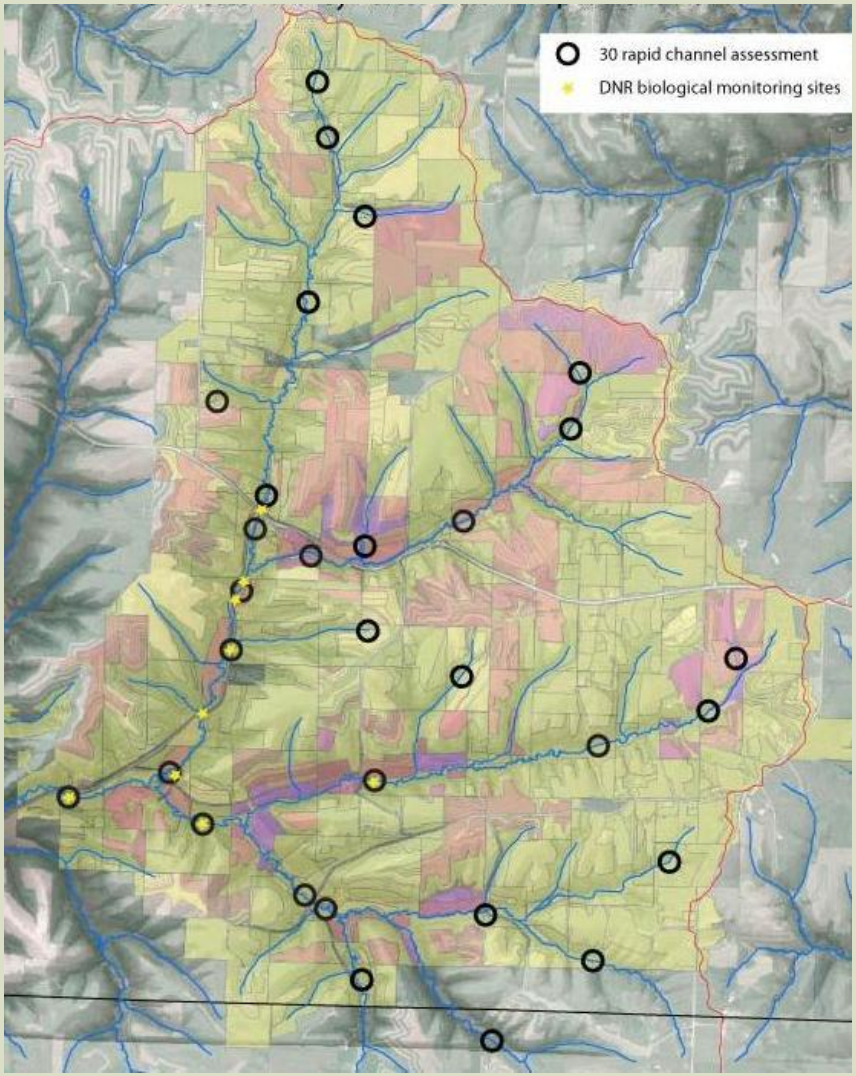
LAG TIME?

Evaluate effectiveness

geomorphology, water chemistry, habitat, biological response

Photo Credits: Rebecca Carvin (top), Mark Godfrey (middle), WDNR (bottom)

Pleasant Valley
Phosphorus from Bank Erosion



Bank Erosion Total Phosphorus

- Unstable banks
  ~ 105 (lbs/mi/year)
- Primarily stable banks
  ~ 15 (lbs/mi/year)

Roughly 10 times more phosphorus loss from unstable banks than stable banks.

USGS

Pleasant Valley
Bank Erosion

Bank Erosion

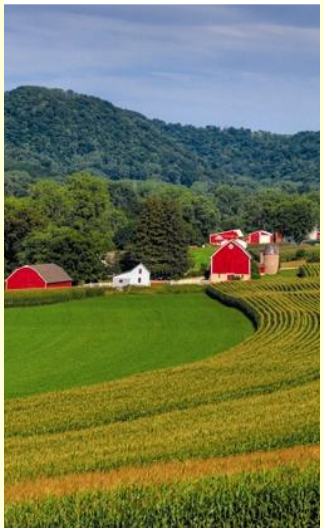
- Unstable banks
  ~ 80 (tons/mi/year)
- Primarily stable banks
  ~ 8 (tons/mi/year)

Roughly 10 times more erosion from unstable banks than stable banks.

USGS

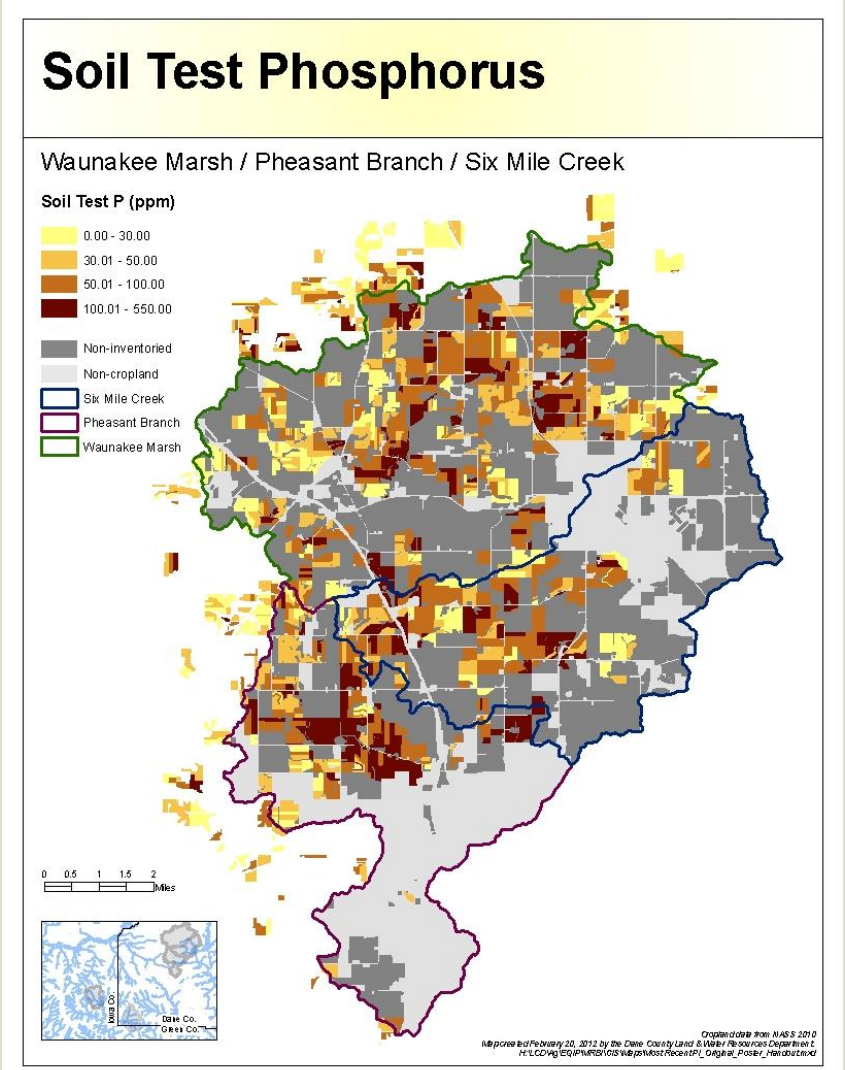
Lessons Learned: Implementation

- Get farmer buy in ASAP! Ask them what they think should be done to get higher levels of More flexibility in contracts.
- Communicate with and involve all farm partners, including agronomists from the start.
- Experienced staff important.
- Continued adaptation as land use changes work against conservation goals.
- Variation in data collected…check accuracy.
- More flexibility in contracts.
- Keep open minds to new ideas…think outside the box



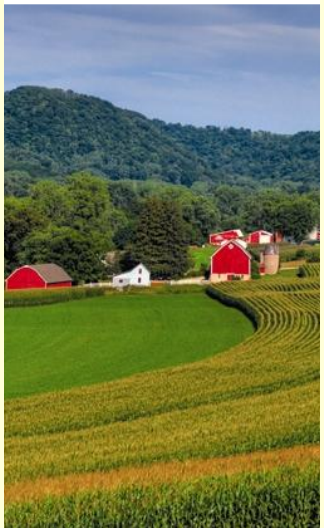
Lessons learned:

Soil phosphorus storage not evenly distributed across the landscape

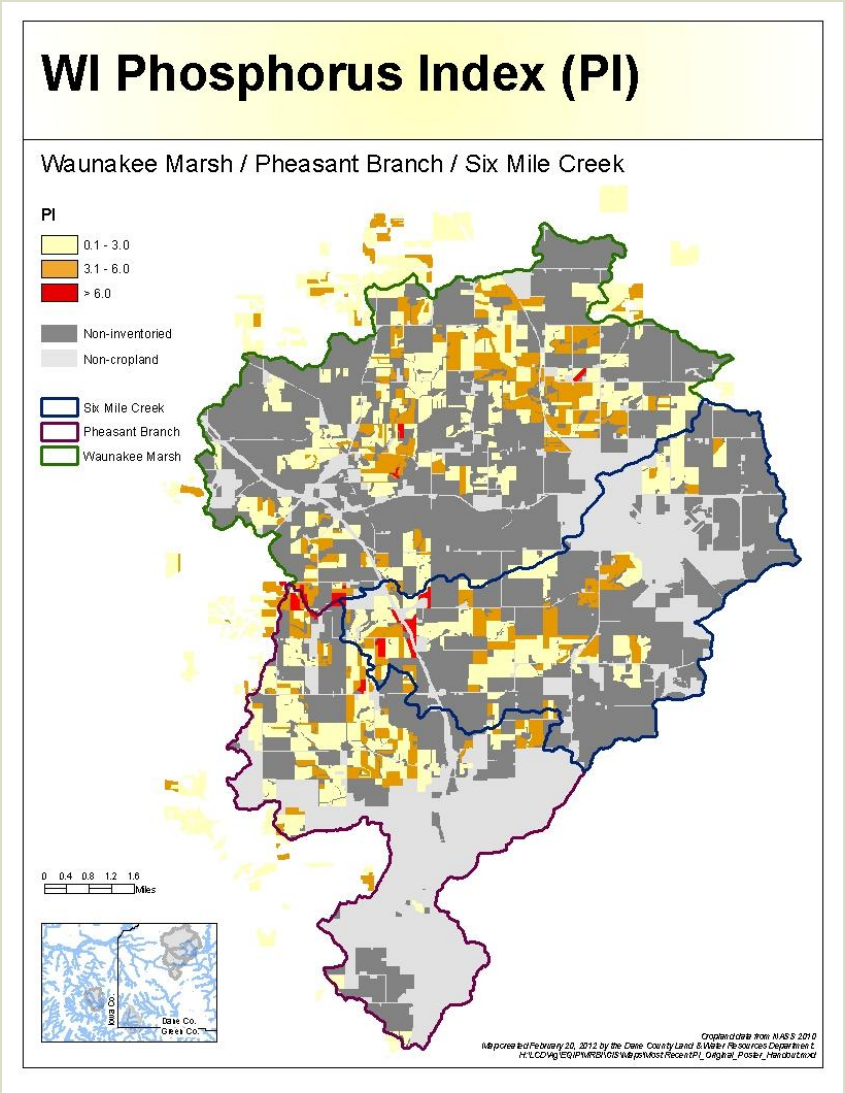


Average soil test P:

- Pleasant Valley
  39 ppm
- Waunakee Marsh
  68 ppm
- Pheasant Branch
  95 ppm
- Six Mile
  44 ppm



Lessons learned: Runoff P loss potential not evenly distributed in watershed



Average PI: lbs./ac/yr.

- Pleasant Valley
  4.3
- Waunakee Marsh
  3.0
- Pheasant Branch
  3.1
- Six Mile
  3.1

Documentation Critical

Goal is to match implementation of conservation practices to water quality improvements at the USGS station.

Tracking Methods:

- GIS
- Snap Plus comparison
- Conservation Plan Annual Status Reviews

End Goals

Improve water quality while maintaining agriculture

Test targeting approach and provide a final report that is based on science/real life, not just theory

Develop least-cost methods for achieving water quality goals

Develop screening tools

Improve efficiency of Wisconsin agricultural non-point water quality programs

What's next?

- Keep the project going!
- Funding needed, staff & monitoring
- Tools to make field-level targeting within watersheds easier
- Telling the story

Team Approach

Finding acceptable management alternatives may require whole farm analysis, team approach. Partnerships formed…

Photo credit: Cate Harrington/TNC

Landowner involvement…key to successful ending!