Targeted Control of Agricultural Sources of Phosphorus and Lessons Learned

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The Nature Conservancy

AWRA Conference

Oconomowoc, WI March 5, 2015

SHEBOYGAN COUNTY WISCONSIN

The Nature Conservancy

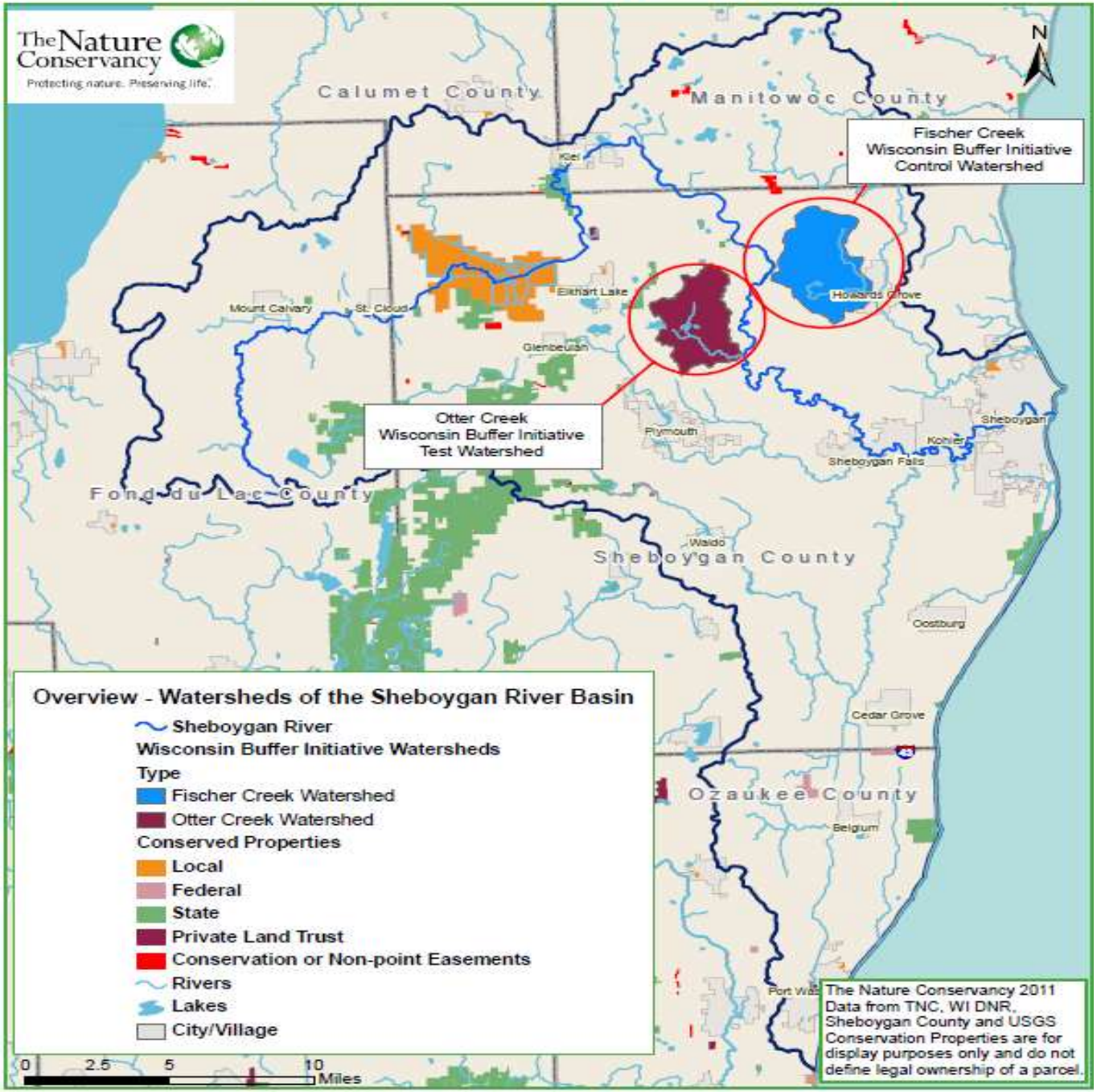
Protecting nature. Preserving life.™

Outline

- Background
- Soil Test Results
- SNAP-Plus Modeling
- SNAP – Results
- Examples of Practices
- Lessons Learned
- Application to Adaptive Mgmt. / P Trading

Sheboygan River Partners

Wisconsin Buffer Initiative Watersheds



Otter Creek – Test Watershed

- 2,590 Hectares
- Sampled 233 Fields (96%)
- Predominately Kewaunee Soils
- Average P of 28.4 mg/l
- Fairly Stable Base Flow
- Groundwater input

Fisher Creek – Control Watershed

- 2,850 Hectares
- Sampled 180 Fields (81%)
- Predominately Kewaunee Soils
- Average Soil P of 25.0 mg/l
- Less stable base flow
- Substantial Wetland Drainage
- Less groundwater input

Monitoring

Photos by Heather Baker

SNAP – Plus Modeling Significant Inputs

- Individual Field Soil Characteristics - Soil Type, Average P
- Slope, proximity to surface water
- Crop Rotation
- Tillage Strategy
- Nutrient Application
- Presence/Absence of Buffers
- Calculates Phosphorus Index (PI) value

Snap-Plus 1.132.8

File Edit Tools Reports Options Help

Farm Name: [redacted] Farm data directory: D:[redacted]

Farm | Field | Soil Tests | Nutrient Sources | Cropping

Field Name: 248 26 **Subfarm:** [redacted]

County	Acres	Slope	Soil Name	Symbol	Restrictions	Soil Group	Soil Texture
WI-Sheboygan	9	9	KEWAUNEE	KpC2	?	C	CLAY_LOAM

pH	OM %	P (ppm)	K (ppm)
7.2	3.2	21	146

Rotation Wizard | NPM Fast Facts | Calculate all years | 2016 soil test date: 9/21/2011

First Year | Page Back | Prev Year | Next Year | Page Fwd | Last Year

	2014	2015	2016	2017	2018
Crop:	Alfalfa	Corn silage	Corn silage	Barley grain + straw	Oat-Pea Forage w/ A
Yield Goal:	4.6-5.5	16-20	16-20	51-75	2-3.5
Tillage:	None	Fall MB Plow	Fall MB Plow	Fall MB Plow	Fall MB Plow
Soil Test Date:	9/21/2011	9/21/2011	9/21/2011	9/21/2011	9/21/2011
Lime Rec:	0	0	NA	NA	NA
Irrigation / MRTN info:	Irrigated	Irrigated 0.05/MRTN	Irrigated 0.05/MRTN	Irrigated	Irrigated
Season notes:					

(lbs/acre)	2014 N	2014 P2O5	2014 K2O	2015 N	2015 P2O5	2015 K2O	2016 N	2016 P2O5	2016 K2O	2017 N	2017 P2O5	2017 K2O	2018 N	2018 P2O5	2018 K2O
Recommendation:	0	65	75	170	65	40	170	65	40	50	45	0	10	30	0
Prior years' extra:		0	0		0	0		0	5		42	178		43	238
Adjusted recommendation:	0	65	75	170	65	40	170	65	35	50	3	0	10	0	0
1st & 2nd year legume credit:	0			190			50			0			0		
Ext. manure credits (unused):	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
This year's manure:	24	24	56	0	0	0	84	72	168	0	0	0	0	0	0
This year's fertilizer:	0	0	0	14	35	45	14	35	45	18	46	60	14	35	45
Total credits & applications:	**24**	**24**	**56**	**204**	**35**	**45**	**148**	**107**	**213**	**18**	**46**	**60**	**14**	**35**	**45**
Over(+)/Under(-) adj UW rec:	**24**	**-41**	**19**	**34**	**-30**	**5**	**-22**	**42**	**178**	**-32**	**43**	**60**	**4**	**35**	**45**
Annual Total PI	2			9			13			8			5		

Details

Field notes:

Rotation Settings

7 year crop rotation starting in 2012

Contouring: None | On contour | Strip cropping

Filter strips: None | Designed, field edge | Designed, in-field

Rotation Summary Results 2012 - 2018

Avg soil loss	5.4	t/acre/yr
Field "T"	3	t/acre/yr
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P2O5 removal	385	lb/acre
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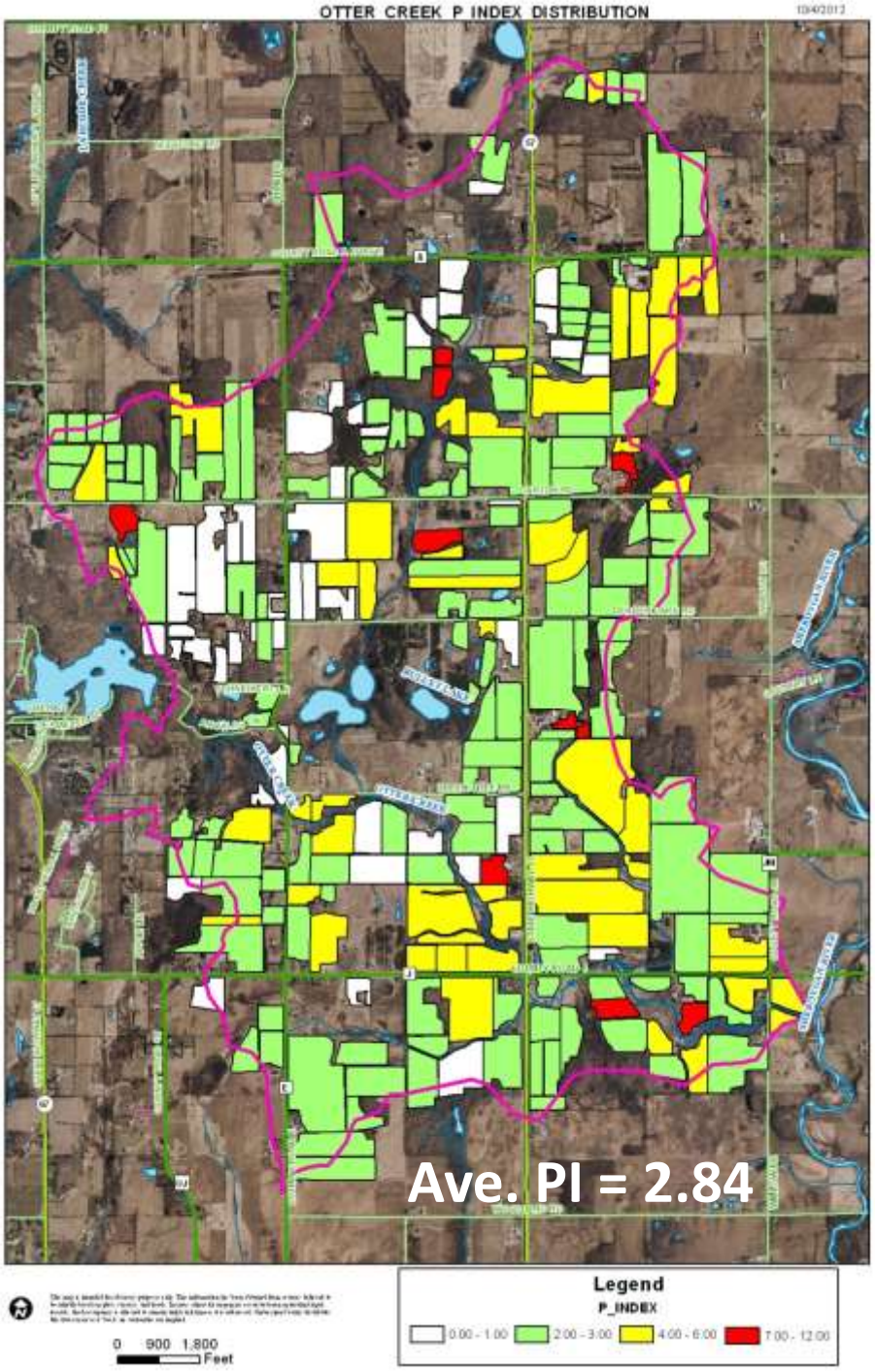
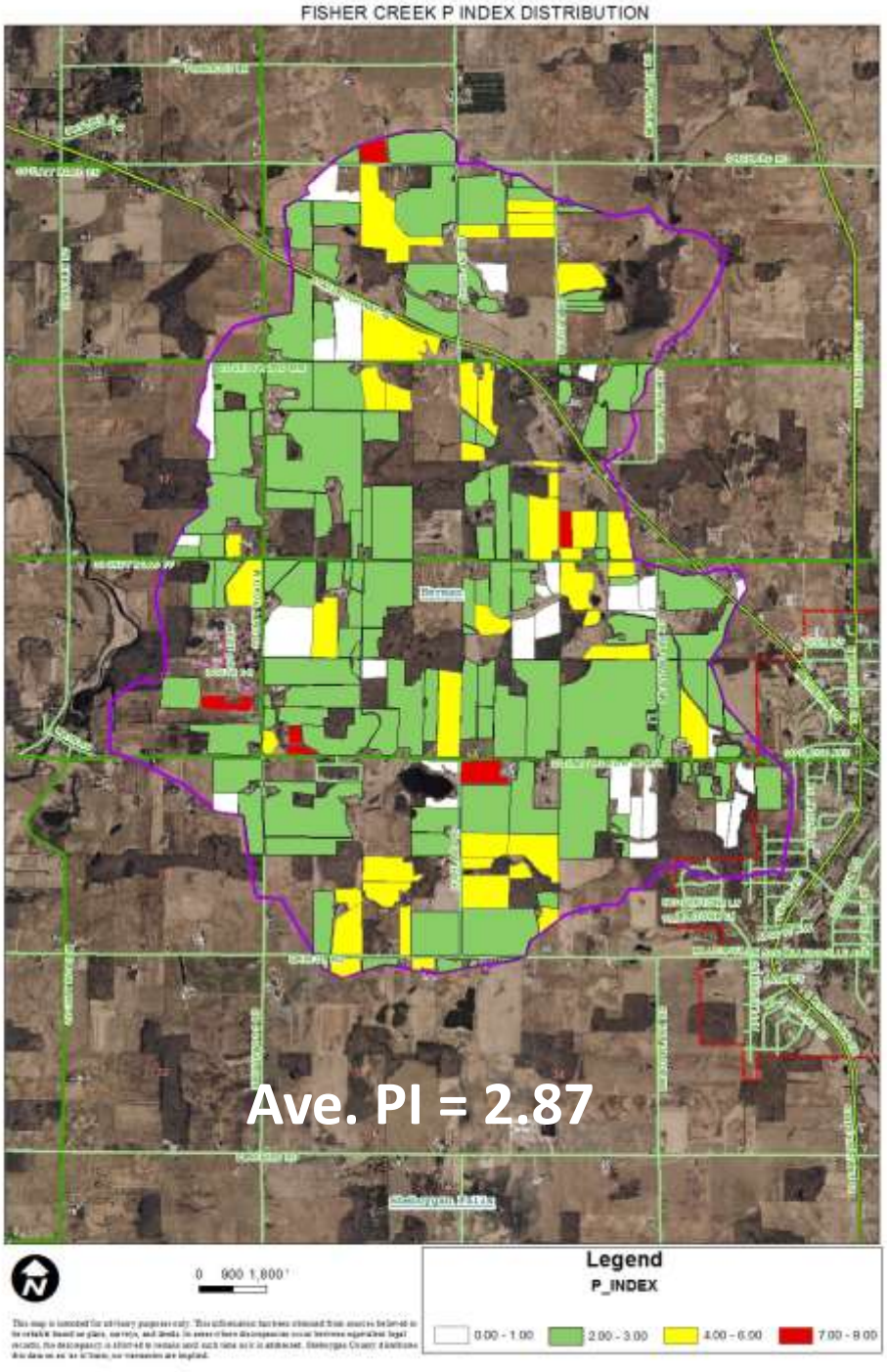
P2O5 balance	-138	lb/acre
K2O balance	-926	lb/acre

Soil test P is 50 or less so no P2O5 balance target is needed.


OTTER CREEK P INDEX DISTRIBUTION
Ave. PI = 2.84
Legend
P_INDEX
0.00 - 1.00
2.00 - 3.00
4.00 - 6.00
7.00 - 12.00
0 900 1,800
Feet


FISHER CREEK P INDEX DISTRIBUTION
Ave. PI = 2.87
0 900 1,800
Legend
P_INDEX
0.00 - 1.00
2.00 - 3.00
4.00 - 6.00
7.00 - 9.00

Nutrient Management

Heather Baker Photo

Cover Crops

Mike Ballweg Photo

Crop Rotation

No-Till Planting

Heather Baker Photo

Grassed Waterways & Buffers

Heather Baker Photo

Tillage and Residue Management

Managed Grazing

Photos by Chris Ertmann

Snap-Plus 1.132.8

File Edit Tools Reports Options Help

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Farm | Field | Soil Tests | Nutrient Sources | Cropping

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Soil & P Savings

- Before: 5.4 t/ac/yr – After: 2.6 t/ac/yr = 2.8 t/ac/yr
- 2.8 t x 9 ac = **25.2 t** of soil saved
- Before: 6 lbs P – After: 1 lbs P = 5 lbs P/ac
- 5 lbs x 9 ac = **45** lbs P reduced

P Savings to Date

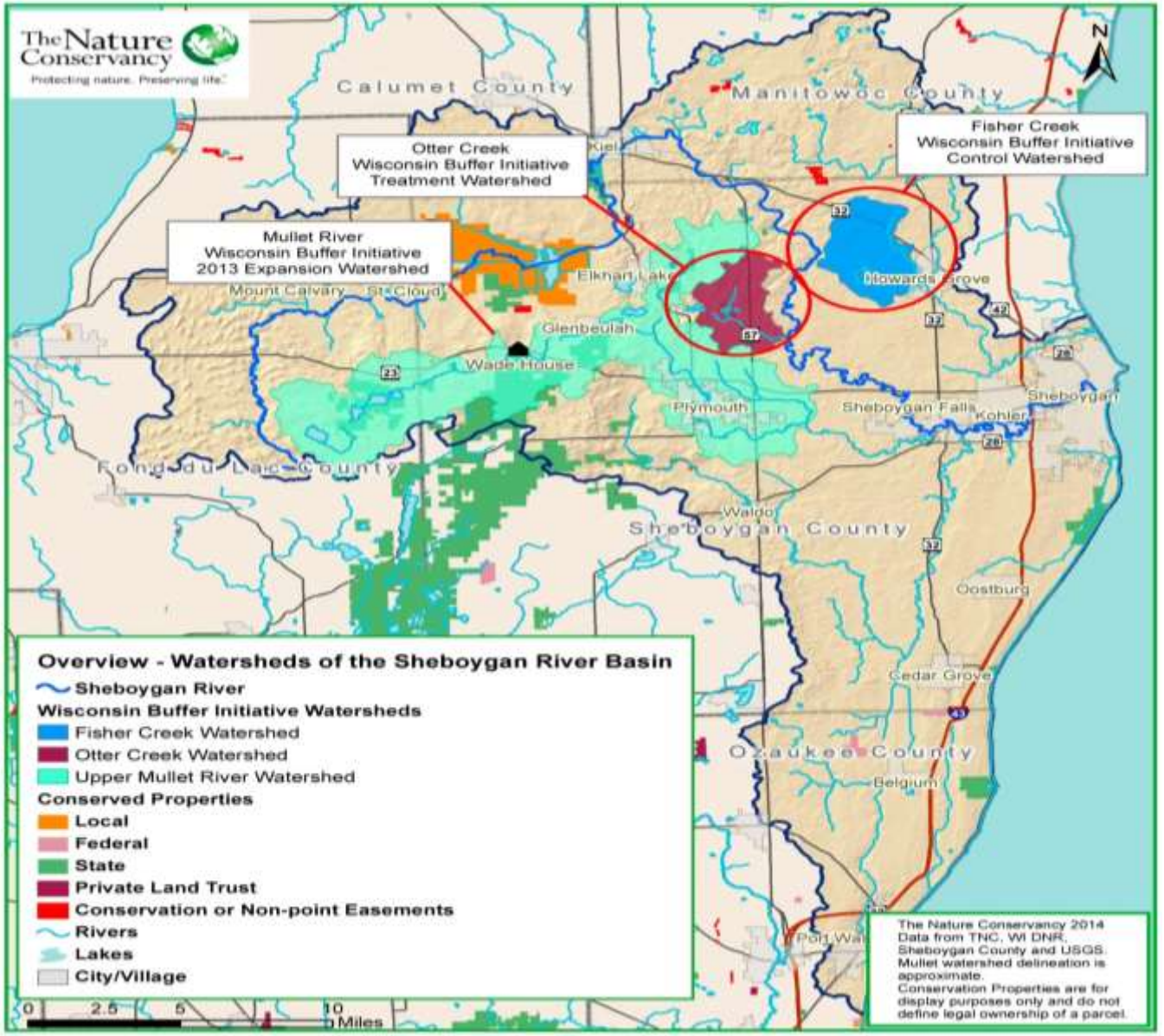
- Farm 1 NMP 155 lbs.
- Farm 2 NMP 31 lbs.
- Farm 3 Buffer 11 lbs.
- Farm 4 Buffer/WW 90 lbs.
- Farm 5 NMP 40 lbs.
- Farm 5 Rot. Grazing 211 lbs.

- Total **538** lbs.

Lessons Learned

- Field by Field Evaluations
- Other Models may be Useful – eg. EVAAL
- Voluntary Cooperation – Building Trust
- Success depends on watershed condition
- Cost Sharing Opportunities
- Adaptation dependent on Bottom Line
- Acceptance of New Practices Slow
- Access to Equipment

Adaptive Management/P Trading Opportunity



Can Targeting help?

- Whole Watershed Evaluation consumes time & money
- Other models available – EVAAL
- Need support of respected entities
- Cost-sharing available
- May require some WWTP changes also

Summary

- Small percentage of fields exceed standard
- Targeting helps focus/success
- SNAP-Plus a good tool
- Practice changes make a difference
- Working with farmers requires Trust
- Potential to support AM/WQT efforts

Soil Conservation

- *"The nation that destroys its soil, destroys itself"* Franklin Delano Roosevelt

- *"While a farmer holds the title to the land, actually it belongs to all the people because civilization itself rests upon the soil"* Thomas Jefferson