Targeting High Impact Farm Fields Using Nutrient Management Models to Reduce Phosphorus Discharge and Decrease HAB Production

Presented By:
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Institute of Water Research
Michigan State University

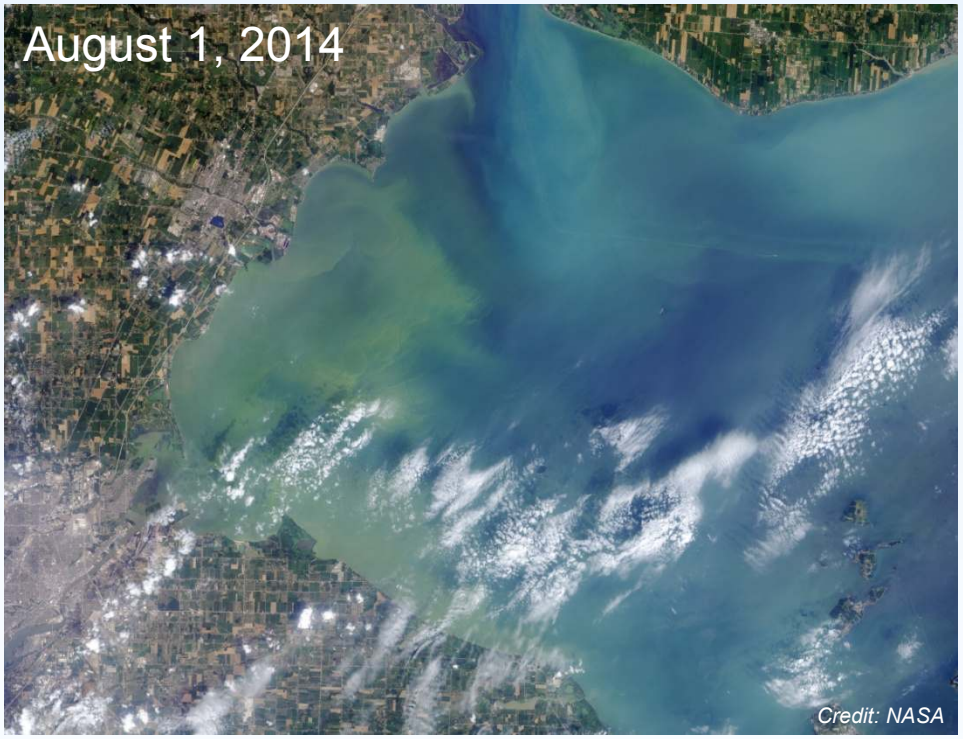
Region 5 Harmful Algal Bloom Clean Water Act/Safe Drinking Water Act Workshop and Public Meeting

April 27, 2016

Outline

- The Problem
- The Goal
- The Actions: From Specific to Broad
  - The set of players
    - Regional Conservation Partnership Program (RCPP) - NRCS
    - CWA, SDWA, GLRI-EPA
    - MAEAP, Oneida, Army Corp, States
    - Agribusiness, Farm Organizations, and ect.
    - 4Rs of Nutrient Stewardship
- The Assessment of Actions for Integration of Phosphorus Reduction
- The Pulse of Progress

Harmful Algae Blooms



Lake Erie Algae Bloom

City of Toledo Water Intake

Harmful Algae Blooms

Fish Kills

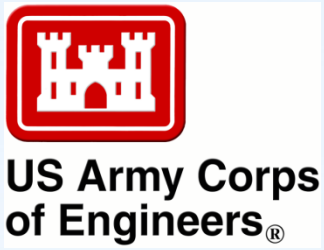
Beach Warnings

WLEB Phosphorus Targets

RECOMMENDED BINATIONAL PHOSPHORUS TARGETS TO COMBAT LAKE ERIE ALGAL BLOOMS

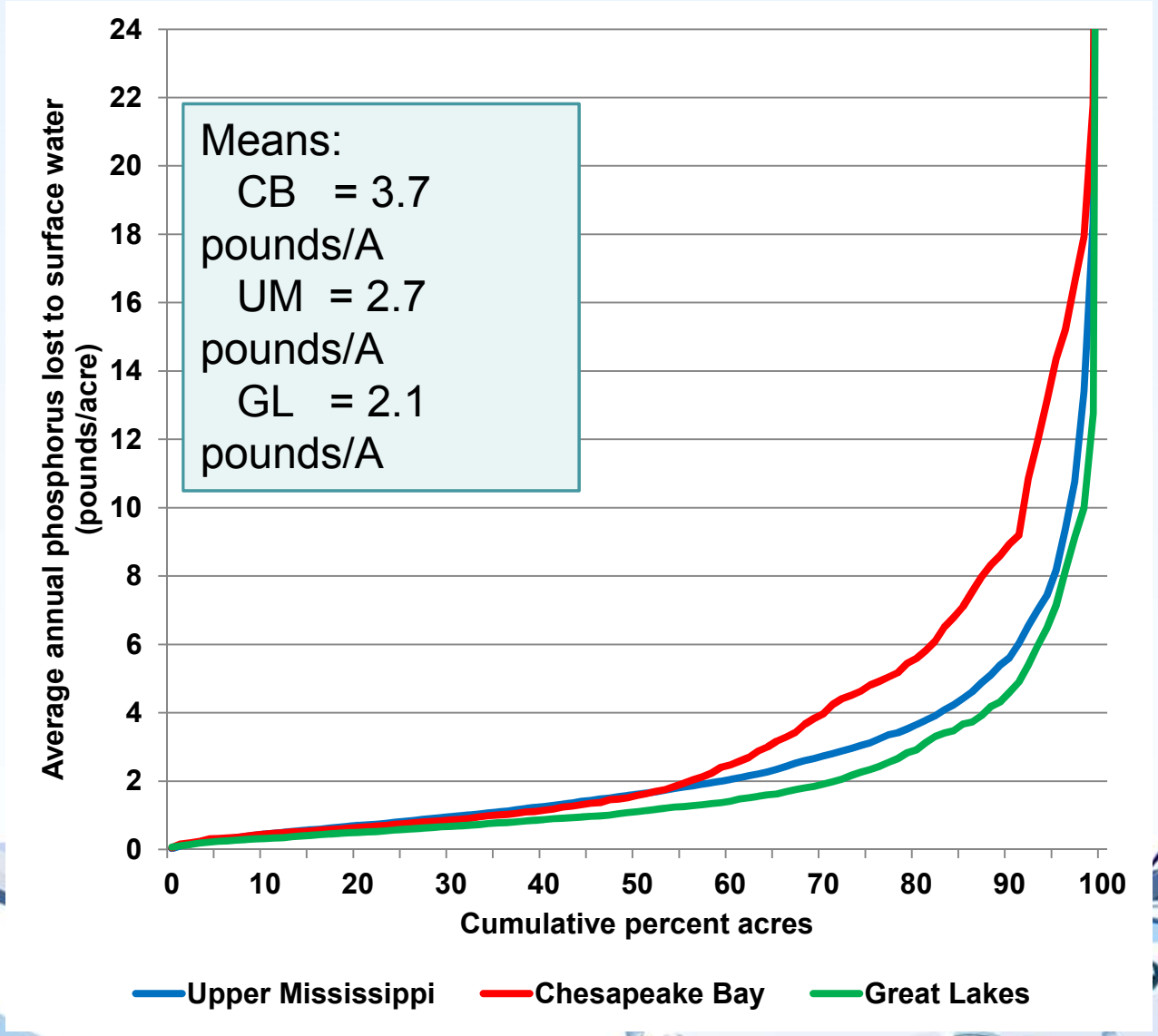
GREAT LAKES WATER QUALITY AGREEMENT NUTRIENTS ANNEX SUBCOMMITTEE JUNE 2015

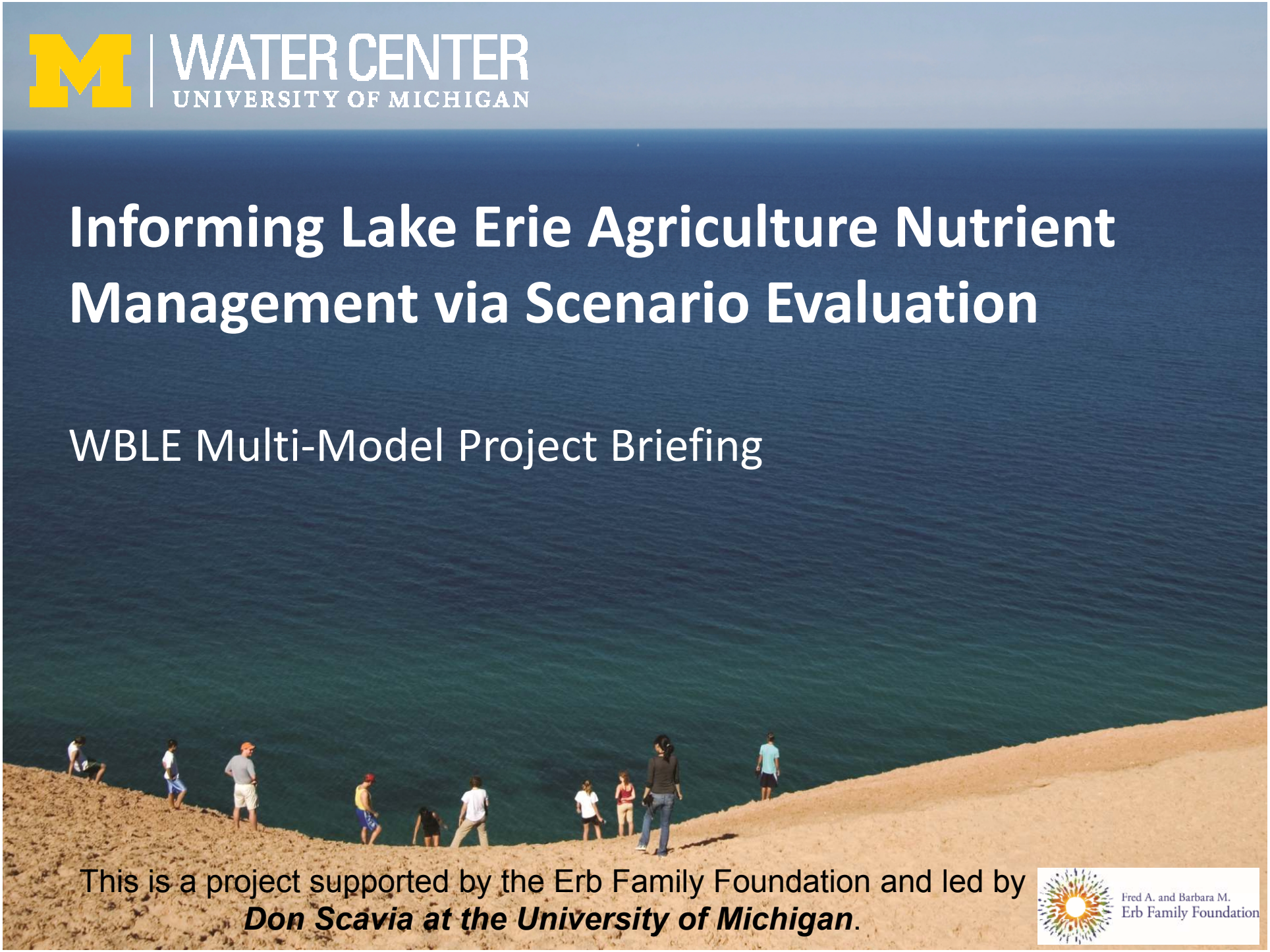
Multi-Scale Partnerships



And many more….

Spatial Distribution of Sources





WATER CENTER
UNIVERSITY OF MICHIGAN

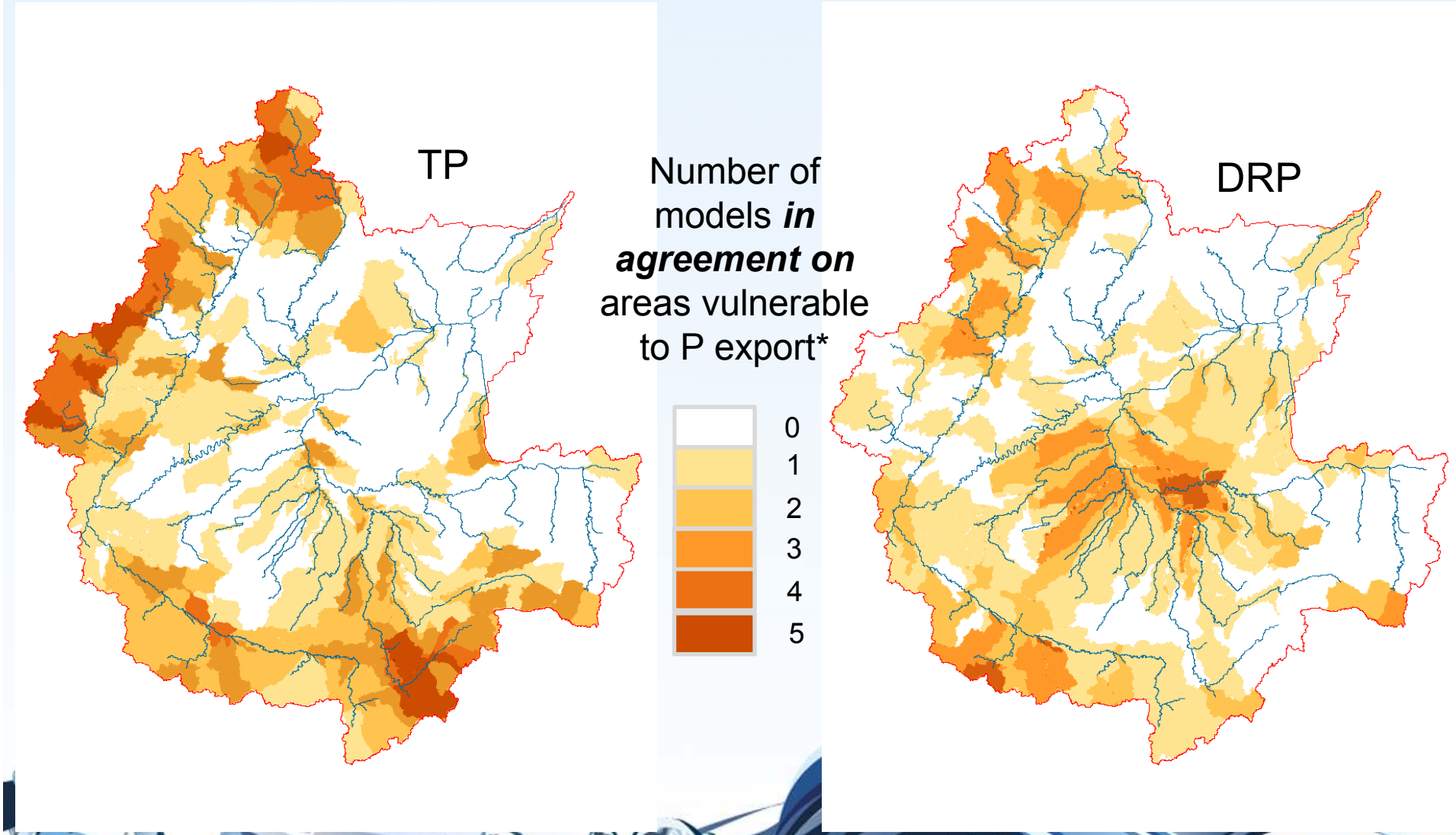
Informing Lake Erie Agriculture Nutrient Management via Scenario Evaluation

WBLE Multi-Model Project Briefing

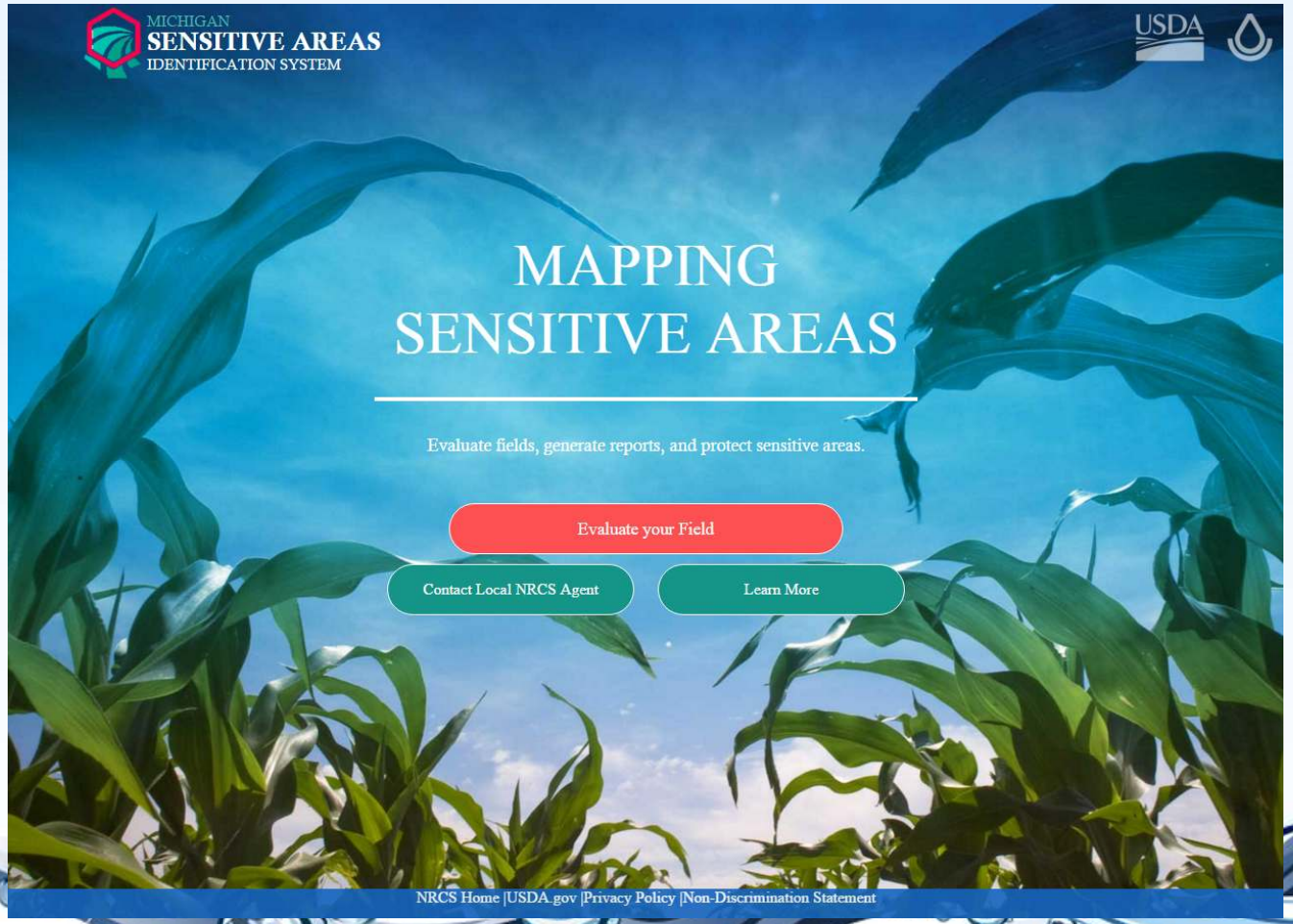
This is a project supported by the Erb Family Foundation and led by ***Don Scavia at the University of Michigan***.

Fred A. and Barbara M. Erb Family Foundation

Combined Estimate of Potential P Delivery to Lake Erie

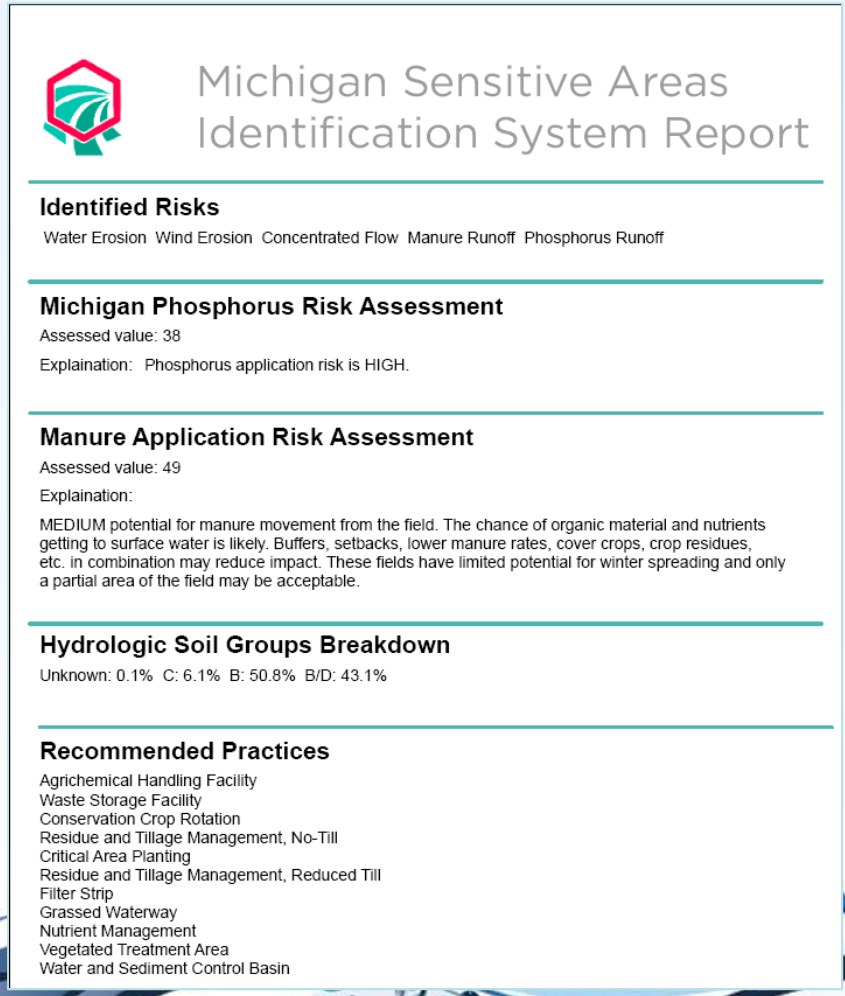


Sensitive Areas Identification System



Sensitive Areas Identification System

- Report Contains:
  - Identified Risks
  - Michigan Phosphorus and Manure Risk Index
  - Soil Information
  - Recommended Practices
  - Field-specific maps of identified risks
  - NRCS Practice Guidelines for recommended practices



Michigan Sensitive Areas Identification System Report

Identified Risks

Water Erosion Wind Erosion Concentrated Flow Manure Runoff Phosphorus Runoff

Michigan Phosphorus Risk Assessment

Assessed value: 38

Explaination: Phosphorus application risk is HIGH.

Manure Application Risk Assessment

Assessed value: 49

Explaination:

MEDIUM potential for manure movement from the field. The chance of organic material and nutrients getting to surface water is likely. Buffers, setbacks, lower manure rates, cover crops, crop residues, etc. in combination may reduce impact. These fields have limited potential for winter spreading and only a partial area of the field may be acceptable.

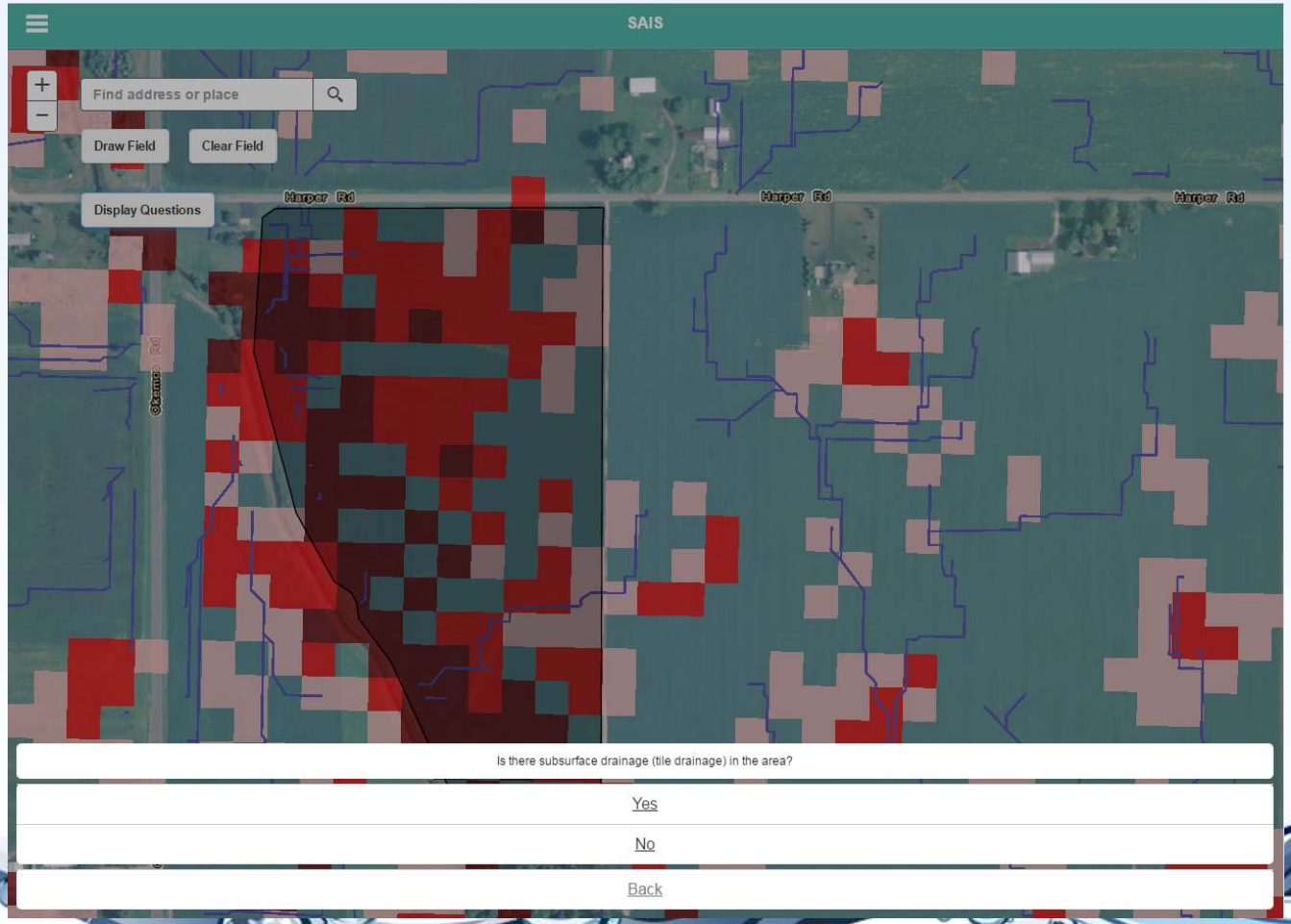
Hydrologic Soil Groups Breakdown

Unknown: 0.1% C: 6.1% B: 50.8% B/D: 43.1%

Recommended Practices

Agrichemical Handling Facility
Waste Storage Facility
Conservation Crop Rotation
Residue and Tillage Management, No-Till
Critical Area Planting
Residue and Tillage Management, Reduced Till
Filter Strip
Grassed Waterway
Nutrient Management
Vegetated Treatment Area
Water and Sediment Control Basin

Sensitive Areas Identification System



From Headwaters to Mouth: A Top-Down Model for Successful Watershed Restoration

J.L. Snitgen, S.A. Gilmore and M.J Melchior

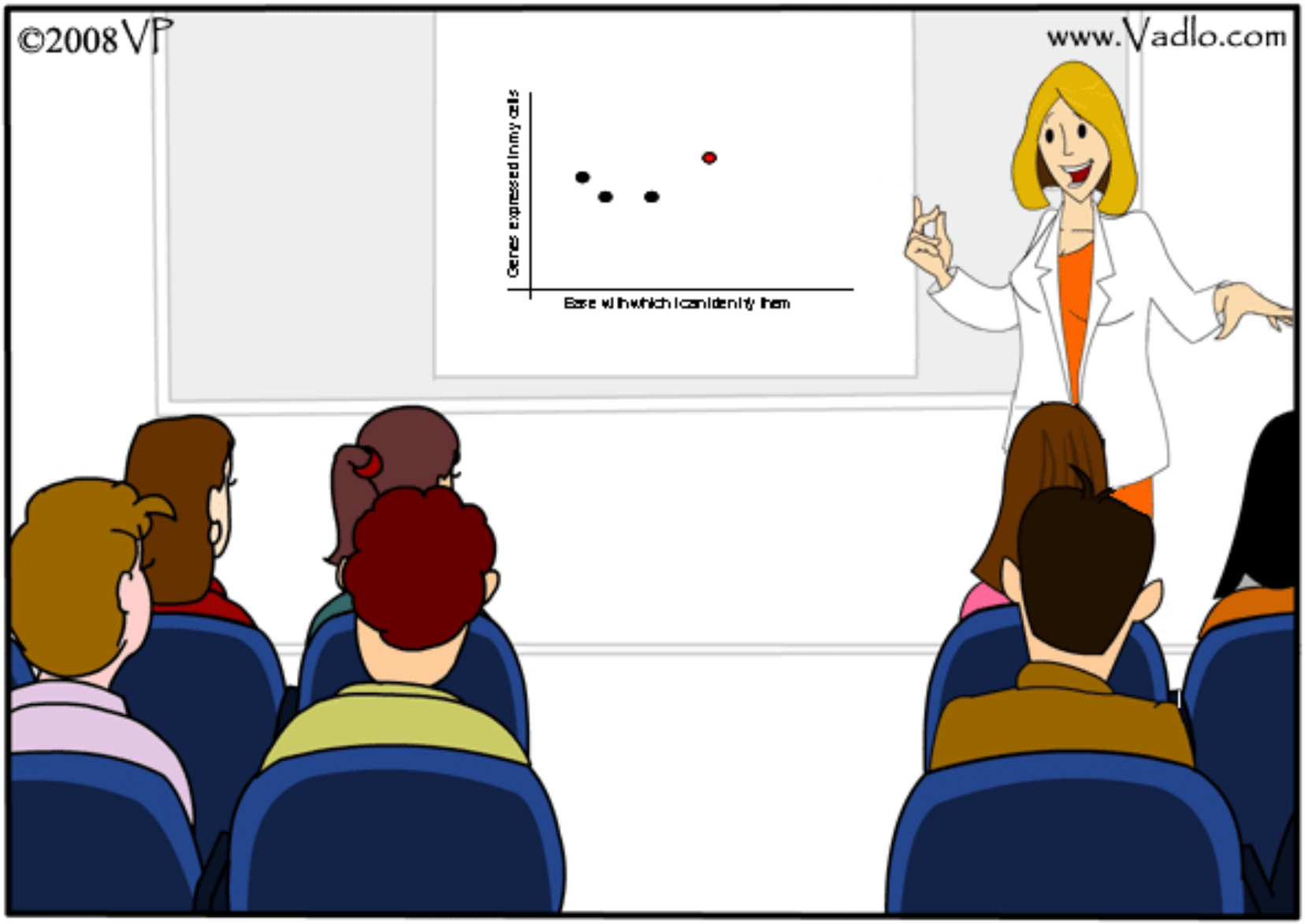
inter·fluve, inc.

Methods

- Addressed largest impact to stream first
- Formed partnerships
- Conducted Fluvial Geomorphic survey of entire system to identify hierarchy of stressors to be addressed
  - Lack of habitat
  - Temperature
  - Flow
  - Sediment loading

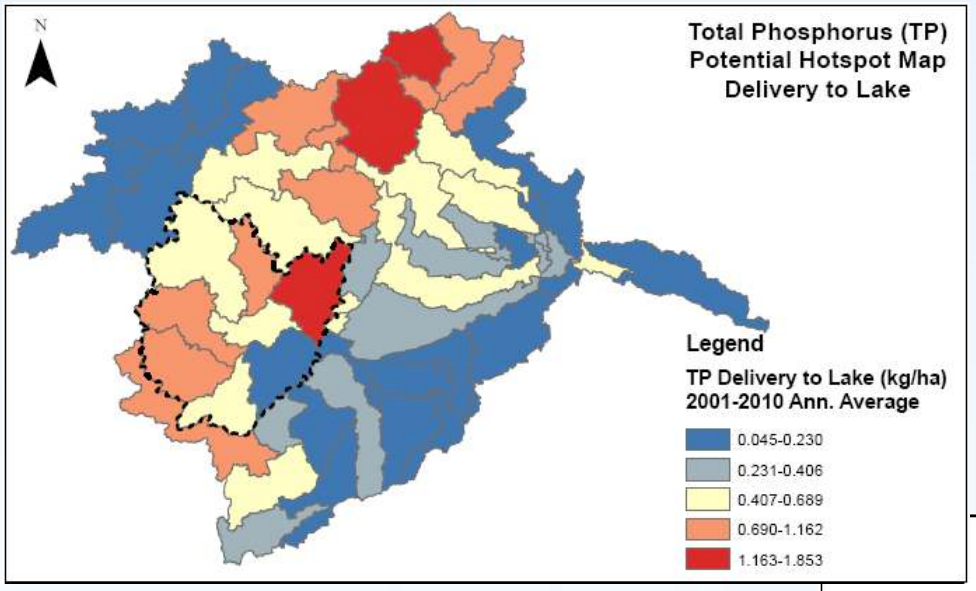
Methods *continued*

- Began implementing BMPs in headwaters
- Conducted water quality and biological monitoring to gauge efficacy of BMPs (performance indicators)
- Working our way downstream implementing BMPs, gaining constituency along the way
- Trout Management Plan/Reintroduction of Brook Trout

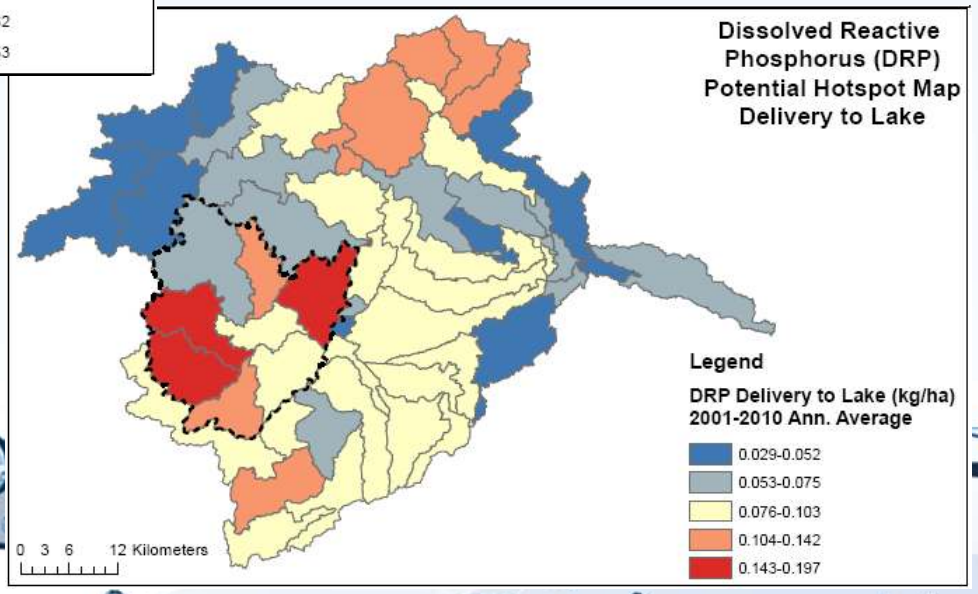


Same graph as the last year, but now I have an additional dot.

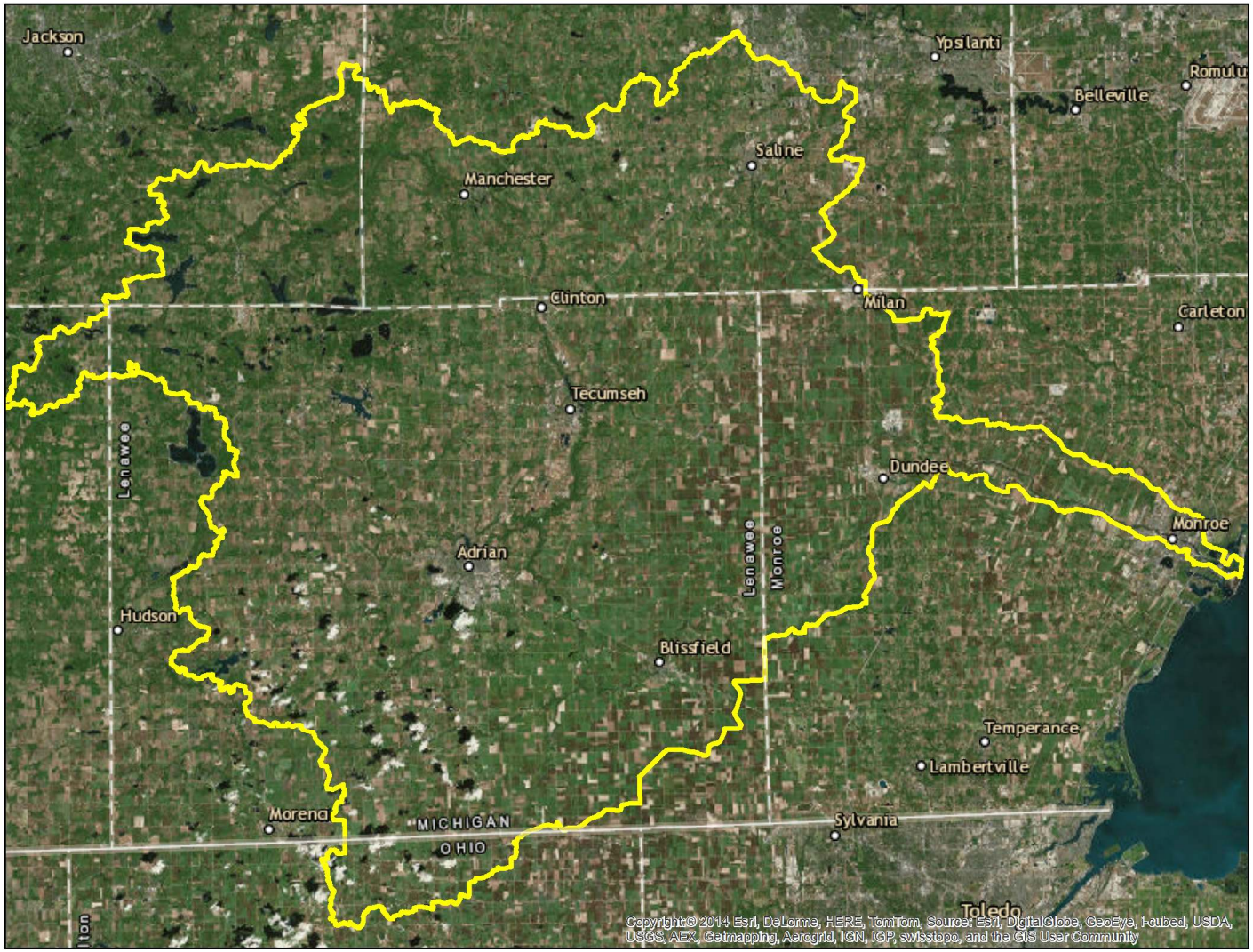
SWAT Modeling in Michigan



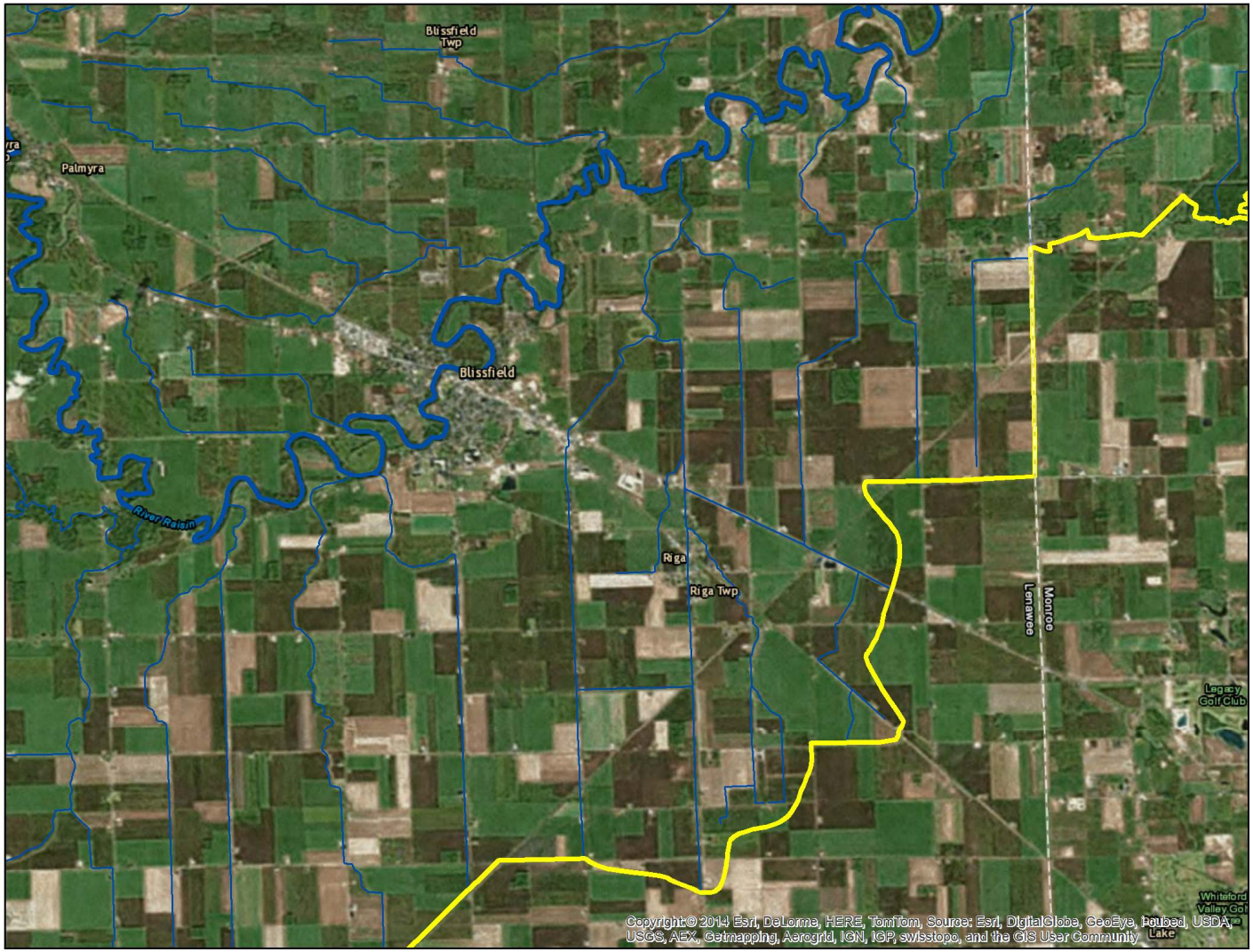
Note: River Raisin watershed hotspot maps were developed based on the University of Michigan Water Center's Soil and Water Assessment Tool (SWAT) model. The SWAT model uses soils, land use, elevation, climate, and land management information to model hydrology and nutrient processes. These maps are considered potential hotspots because not every conservation practice on the land is represented, as some practice information is not publicly available. The South Branch basins of the River Raisin are noted by the dashed black line.



River Raisin From Above

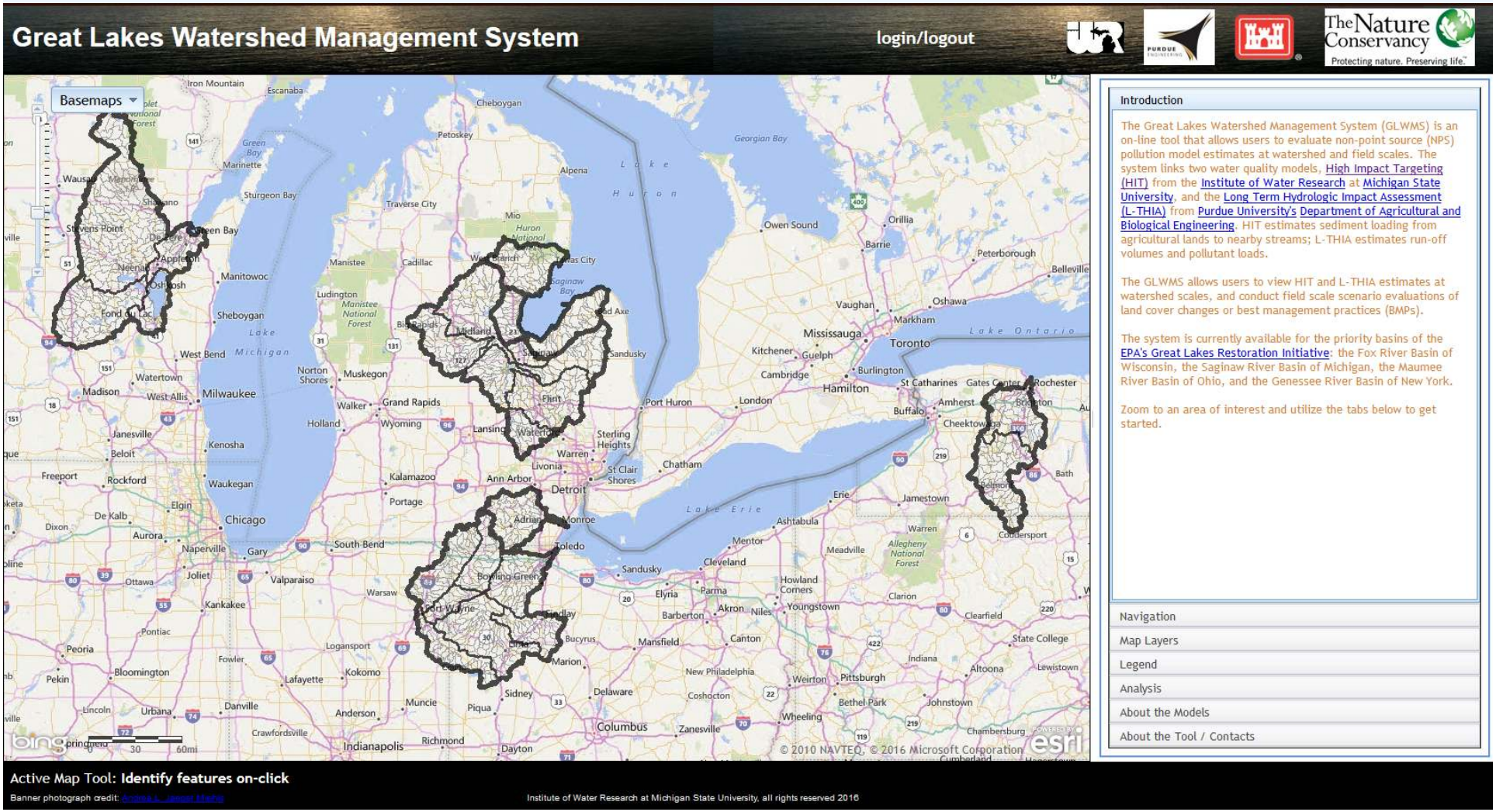


River Raisin From Above



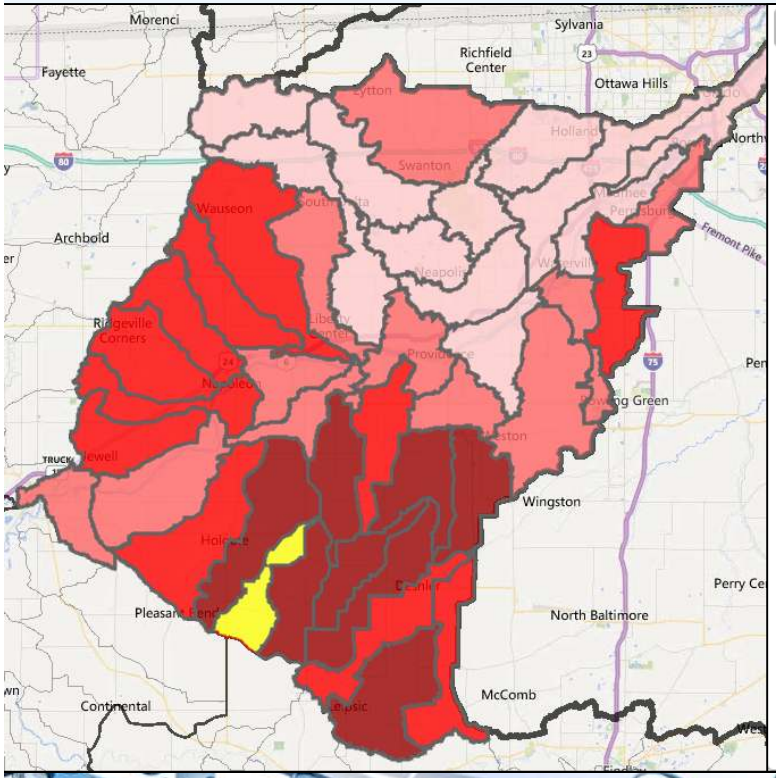
The Great Lakes Watershed Management System (GLWMS)

- An online tool to prioritize locations within GLRI priority basins for water quality.
- Users can prioritize at watershed and field scales.
- Users can evaluate land cover change and BMP scenarios at field scales.
- Results can be saved to an account, and cumulative reductions in pollutant loading viewed in auto-generated reports.



The Great Lakes Watershed Management System (GLWMS)

- Total annual Phosphorus loading rates in the Lower Maumee Watershed (lbs./acre).



Watershed-scale Analysis

Select watersheds to analyze | Selected watersheds and data | HIT analysis | L-THIA analysis | Apply a Map Legend

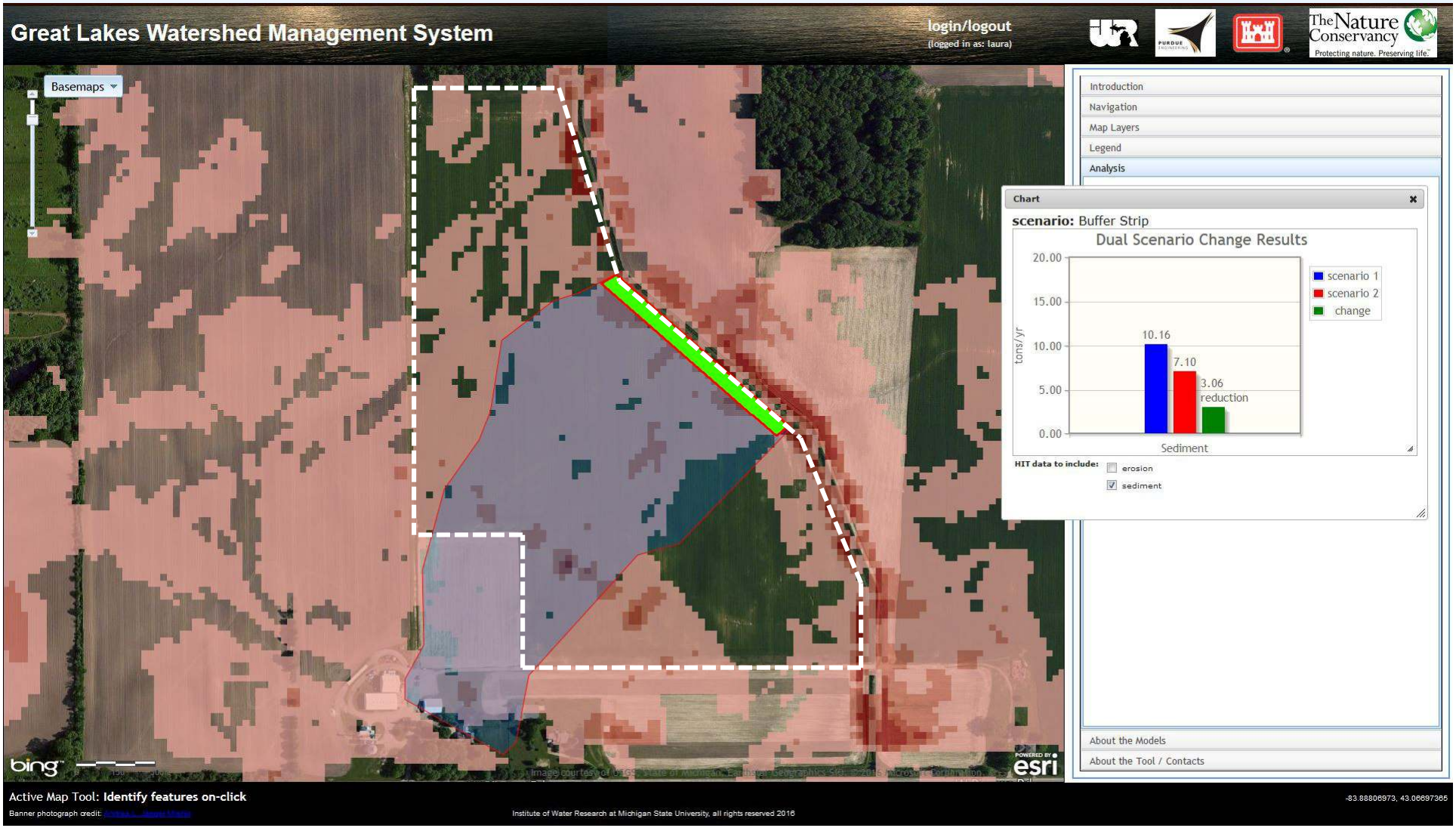
Search:

HUC	Name	Acres	Total P (lbs/ac/yr)
041000090101	West Creek	10200	1.362
041000090102	Upper South Turkeyfoot Creek	13444	1.356
041000090103	School Creek	24850	1.336
041000090104	Middle South Turkeyfoot Creek	23173	1.358
041000090105	Little Turkeyfoot Creek	14781	1.347
041000090106	Lower South Turkeyfoot Creek	8817	1.188
041000090201	Preston Run-Maumee River	10926	1.03
041000090202	Benien Creek	15362	1.302
041000090203	Wade Creek-Maumee River	23857	1.151
041000090204	Garret Creek	18276	1.285
041000090205	Oberhaus Creek	15343	1.279
041000090206	Village of Napoleon-Maumee River	13636	1.225
041000090207	Creager Cemetery-Maumee River	11446	0.965
041000090301	Upper Bad Creek	14575	0.934
041000090302	Lower Bad Creek	26501	0.95
Totals		691524	1.126

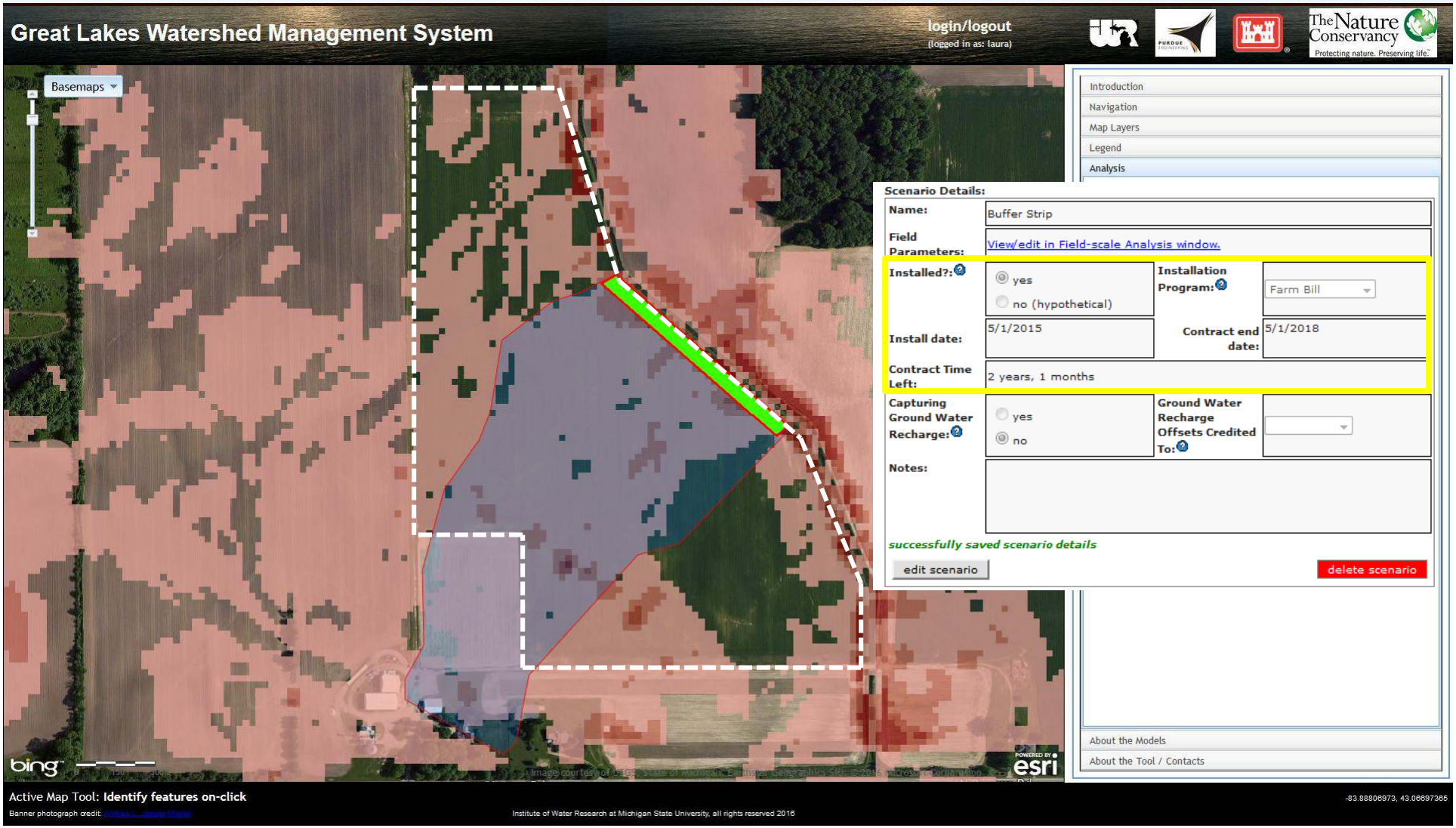
Showing 1 to 42 of 42 entries

Clear Selections

GLWMS: Quantifying Benefits I



GLWMS: Quantifying Benefits II



The Great Lakes Watershed Management System (GLWMS)

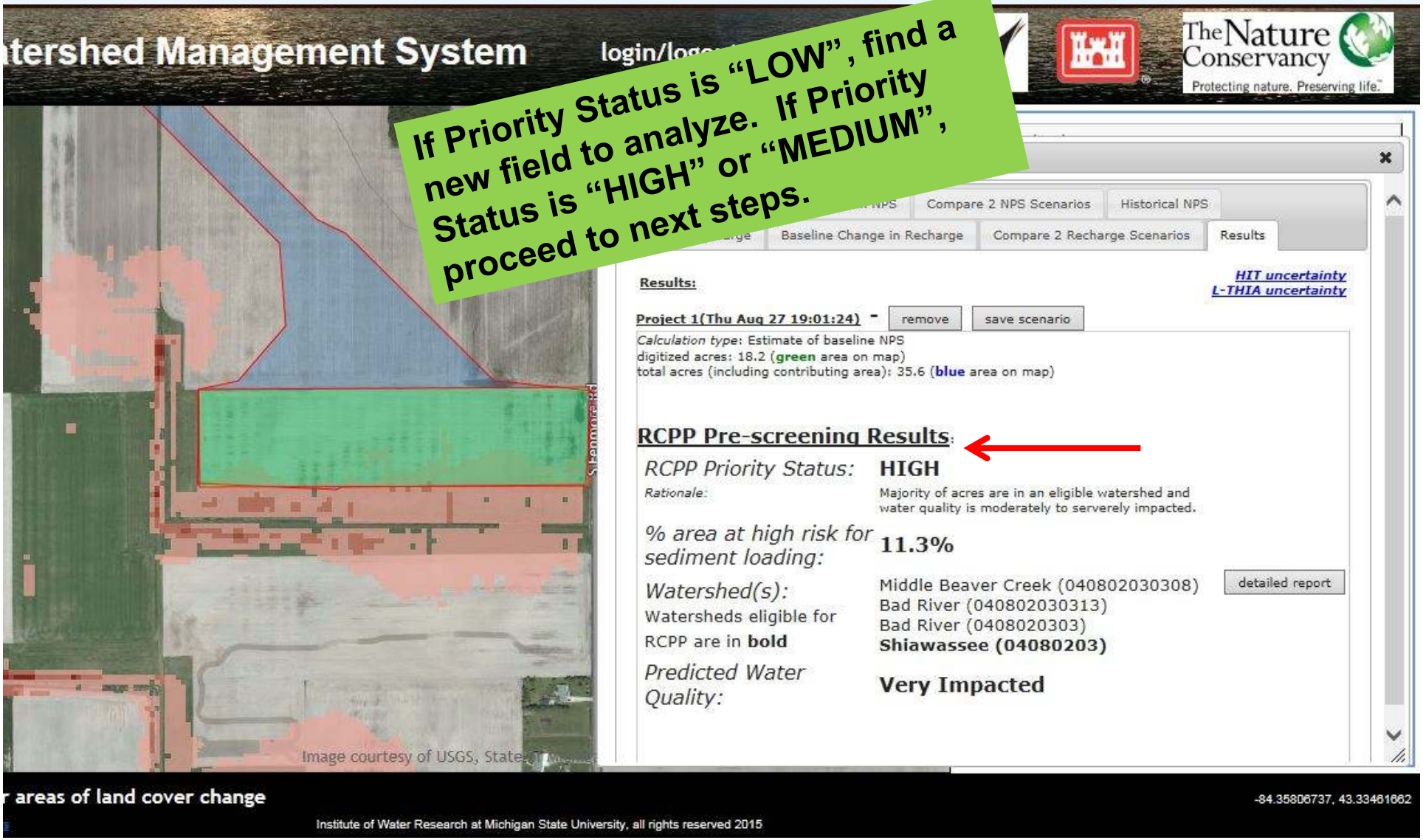
- BMP locations and modeled results can be saved to a private account.
- Results within that account can be included in a report listing cumulative benefits across projects

Great Lakes Watershed Management System Report

Report name:	Unspecified		
Report period:	Annual		
Scenarios included:	HIT BC 1, HIT DSC 1, LTHIA BC1, baseline_change_test1		
Acreage:	*Total acres (upland):*	417.3 (875.5)	
	Acres by scenario type:	Baseline Change -	295.8
		Dual Scenario Change -	121.5
	Acres by HIT LC/BMP:	no-till	225
		no-till with cover crop	121.5
	Acres by LTHIA LC/BMP:	Mixed Forest	70.8
	Acres (upland) with expring contracts within reporting period:	0	
Non-point Source Pollution:	*sediment loading (tons):*	24.38	
	sediment loading saved by LC/BMPs (tons):	13.42	
	per LC/BMP:	no-till	8.84
		no-till with cover crop	4.58
	soil erosion (tons):	160.24	
	soil erosion saved through LC/BMPs (tons):	63.46	
	per LC/BMP:	no-till	36.48
		no-till with cover crop	26.98
	total runoff (acre-ft.):	0	
	total runoff saved through LC/BMP (acre-ft.):	10.18	
	by LC/BMP:	Mixed Forest	10.18
	total Nitrogen (lbs.):	0	
	Nitrogen saved through LC/BMP (lbs.):	180.28	
	by LC/BMP:		
	total Phosphorus (lbs.):	0	
	Phosphorus saved through LC/BMP (lbs.):	58.96	
	by LC/BMP:	Mixed Forest	58.96

RCPP Prescreening and Scoring

Use the GREAT LAKES WATERSHED MANAGEMENT SYSTEM at www.iwr.msu.edu/glwms



Continual Research & Innovation

USDA

The Ohio State University
College of Food, Agricultural, and Environmental Sciences

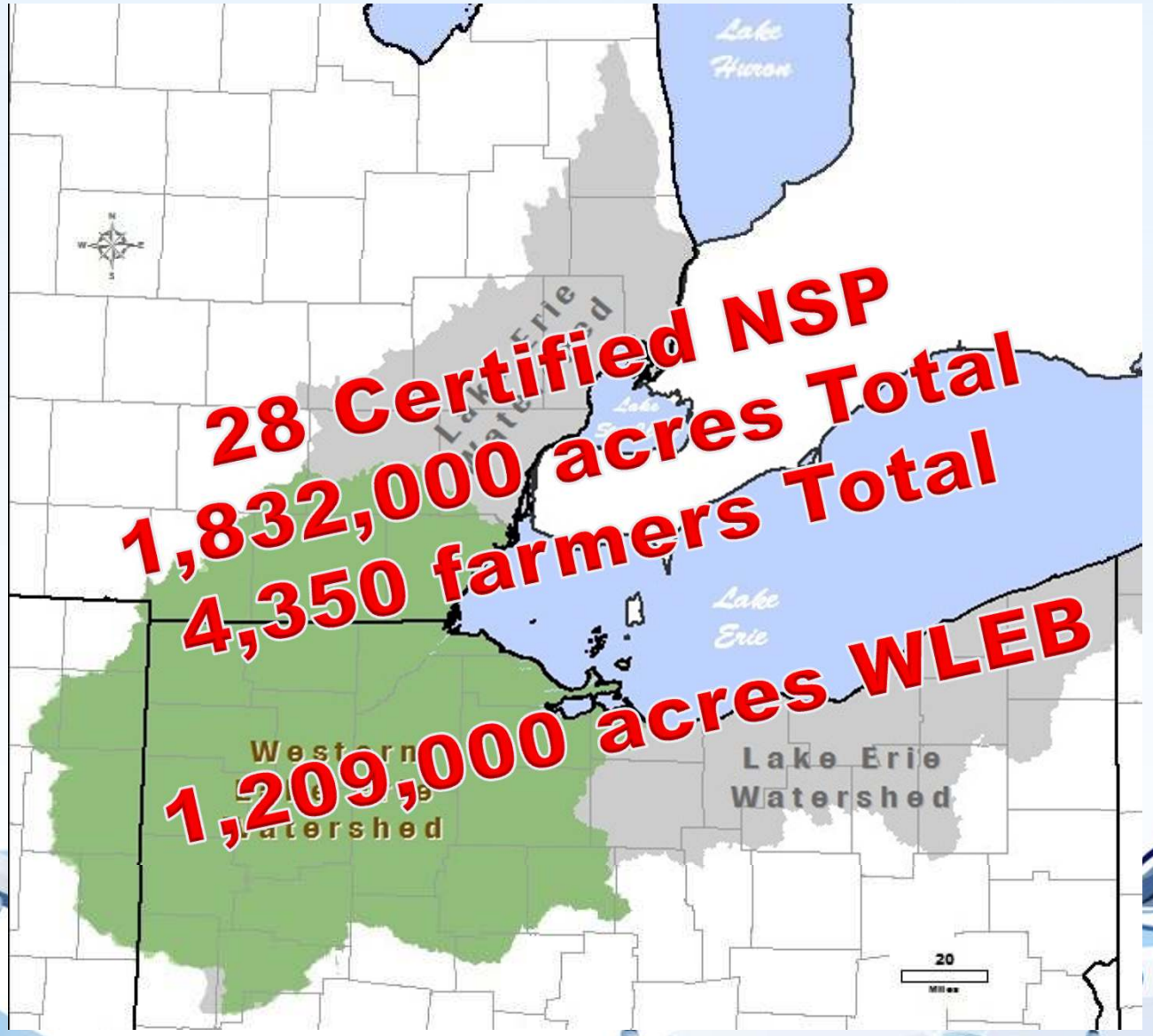
National Center for Water Quality Research

The Nature Conservancy
Protecting nature. Preserving life.™

LimnoTech
Water Environment | Scientists Engineers

IPNI International Plant Nutrition Institute

Success of the 4Rs



Accumulating and Reporting Benefits

Great Lakes Watershed Management System Report			
Report name:	Unspecified		
Report period:	Annual		
Scenarios included:	Compare 2 RCA to NTL, Compare_CTL_to_NCC, Denver and Vandecar No Till and Cover Crop, Buffer Strip		
Acreage:	*Total acres (upland):*	159.7 (250.4)	
	Acres by scenario type:	Dual Scenario Change - 159.7	
	Acres by HIT LC/BMP:	no-till	53.1
		no-till with cover crop	105.4
		buffer strip	1.2
	Acres (upland) with expring contracts within reporting period:	0	
Non-point Source Pollution:	*sediment loading (tons):*	33.59	
	sediment loading saved by LC/BMPs (tons):	94.02	
	per LC/BMP:	no-till	17.09
		no-till with cover crop	73.87
		buffer strip	3.06
	soil erosion (tons):	225.91	
	soil erosion saved through LC/BMPs (tons):	451.65	
	per LC/BMP:	no-till	73.44
		no-till with cover crop	369.19
		buffer strip	9.02

Summary

- Phosphorus is a major part of the problem
- We're aiming to reduce phosphorus delivery to Lake Erie by 40%.
- There are a great number of efforts and activities underway
- We need a system to better assess the progress we are making together.
- Meeting and working together is critically important

Questions?

- Contact Information:

  Dr. Jon Bartholic

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