Maumee AOC Summit
Spring/Summer 2012

Wednesday, May 2, 2012
9:00am to 12:00pm
University of Toledo Lake Erie Center
6200 Bayshore Rd., Oregon, Ohio 43618
(light breakfast will be provided)

AGENDA

9:00-9:15am Welcome and Introductions, also MRAC Report (Patrick Lawrence)

9:15-9:30am Report on PCS Activities (Kristina Patterson)

9:30-11:20am Partner Presentations

9:30 – 10:10	Lake Erie Tributaries and Lower Maumee River Tributaries TMDL *(Beth Risley, Ohio EPA and Bruce Cleland, TetraTech)*
10:10 – 10:30	Eastern Maumee AOC Wetland & Riparian Inventory and Restoration Plans *(Tim Walters, EnviroScience)*
10:30 – 10:50	Reconnecting Wetlands to Crane Creek and Lake Erie *(Kurt Kowlaski, USGS)*
10:50 – 11:05	Interactions Between Human Decisions, Biophysical Processes, and Ecosystem Services: Maumee Watershed and Bay *(Jay Martin, Ohio State University)*
11:05 –11:20	Climate Change and Watershed Decision-Making Project *(Elizabeth LaPorte, University of Michigan)*

11:20-11:30am Break and Networking

11:30-12:00pm Agency Reports

11:30 – 11:40	US EPA Report *(Frank Anscombe, US EPA RAP Liaison)*
11:40 – 11:50	Ohio EPA Report *(Cherie Blair, Ohio EPA RAP Coordinator)*
11:50 – 12:00	TMACOG Report *(Matt Horvat, Lower Maumee River Coordinator)*

12:00-12:25pm Additional Partner Reports/Project Updates

- Open floor for project sharing by any other partners
  (i.e. Duck and Otter Creek Partnership, City of Toledo, Metroparks, TNC, DU, etc.)

12:25-12:30pm Closing comments and announcements

Next Maumee AOC Summit
Fall/Winter 2012
Thursday, December 6, 2012
9:00am-12:30pm
Location: TBA

Ohio EPA Report on Activities in the Maumee AOC

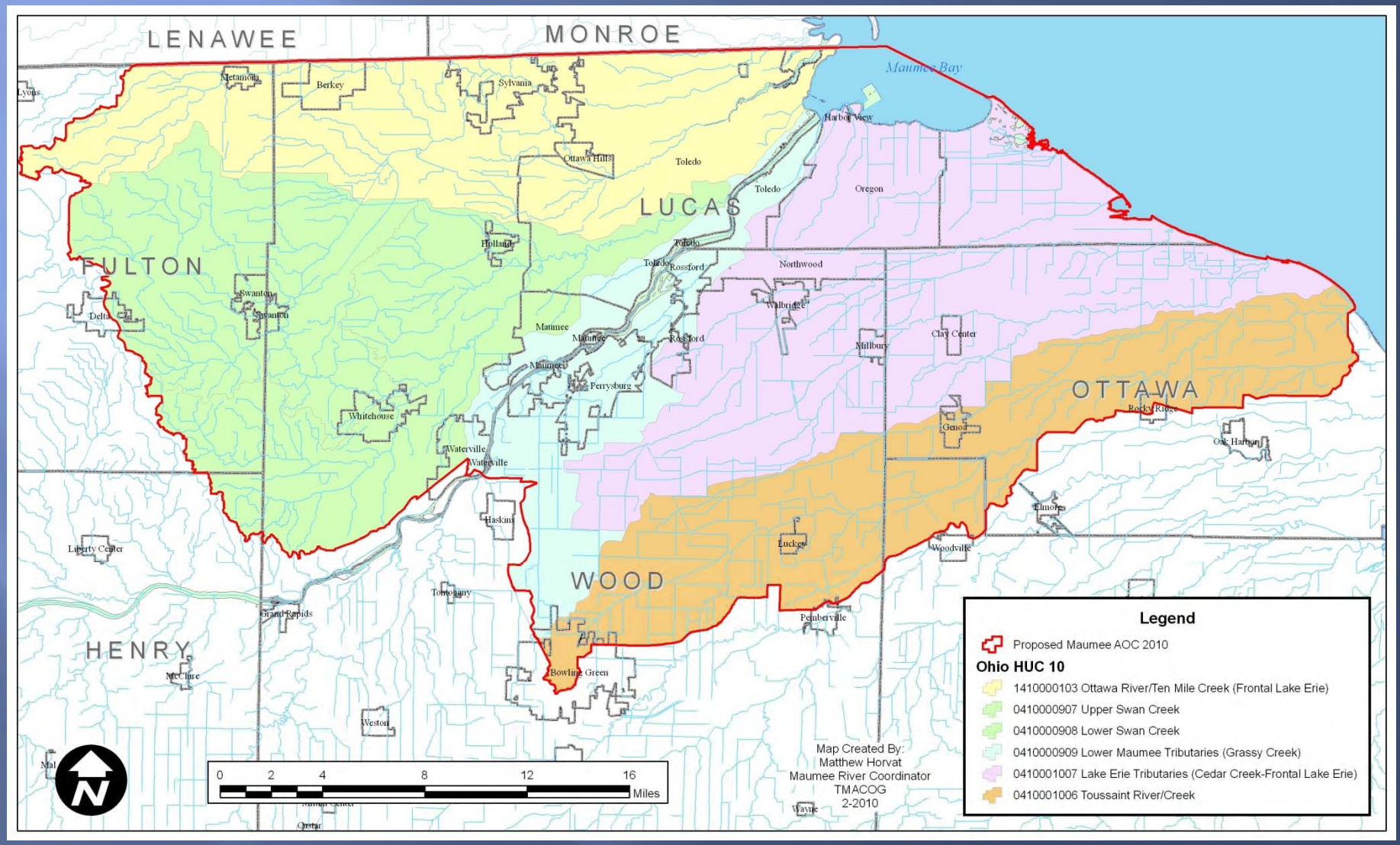
Maumee AOC Spring Summit 2012
University of Toledo Lake Erie Center
May 2, 2012

Ohio Environmental Protection Agency

Today's Presentation

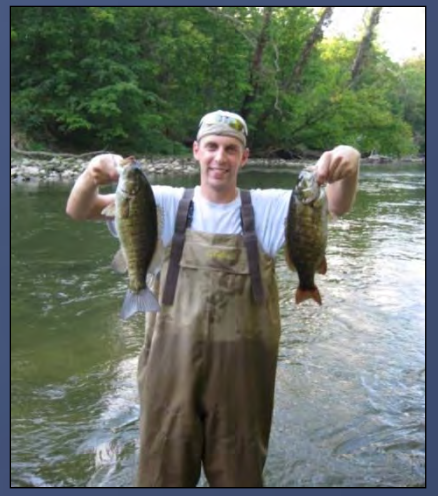
- Assessments & TMDLs
- Ohio EPA Projects
- 319 Projects
- Ottawa River Consumption Advisory
- GLRI Needs
- Report from US EPA Liaison

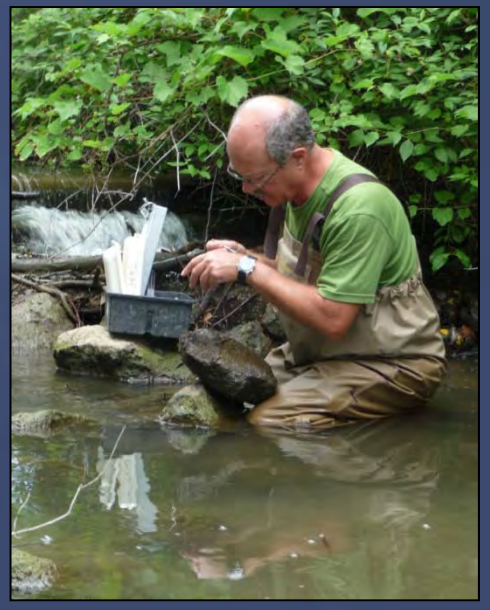
Maumee Area of Concern



Sampling to Assess a Watershed for TMDLs

- **Physical habitat**
- **Water chemistry**
- **Sediment chemistry**
- **Biological community health**
  - examine & count fish & aquatic insects





Assessments and TMDLs in the Maumee AOC

- **Maumee R (lower) Tributaries (assessed in '06) & Lake Erie Tributaries (assessed in '08)**
  - Report do soon be released for public comment
  - Created by Tetra Tech using Ohio EPA collected data
- **Tenmile Crk/Ottawa River (assessed in 2011)**
  - Expect TSD Spring '13; TMDL Rpt expected Winter '13
- **Maumee River (Large River Unit-mainstem only – assessing in 2012)**
  - Study plan and sampling sites being finalized
  - Expect TSD Spring '14; TMDL Report timing has not been determined

Ohio EPA Projects Benefitting the Maumee AOC

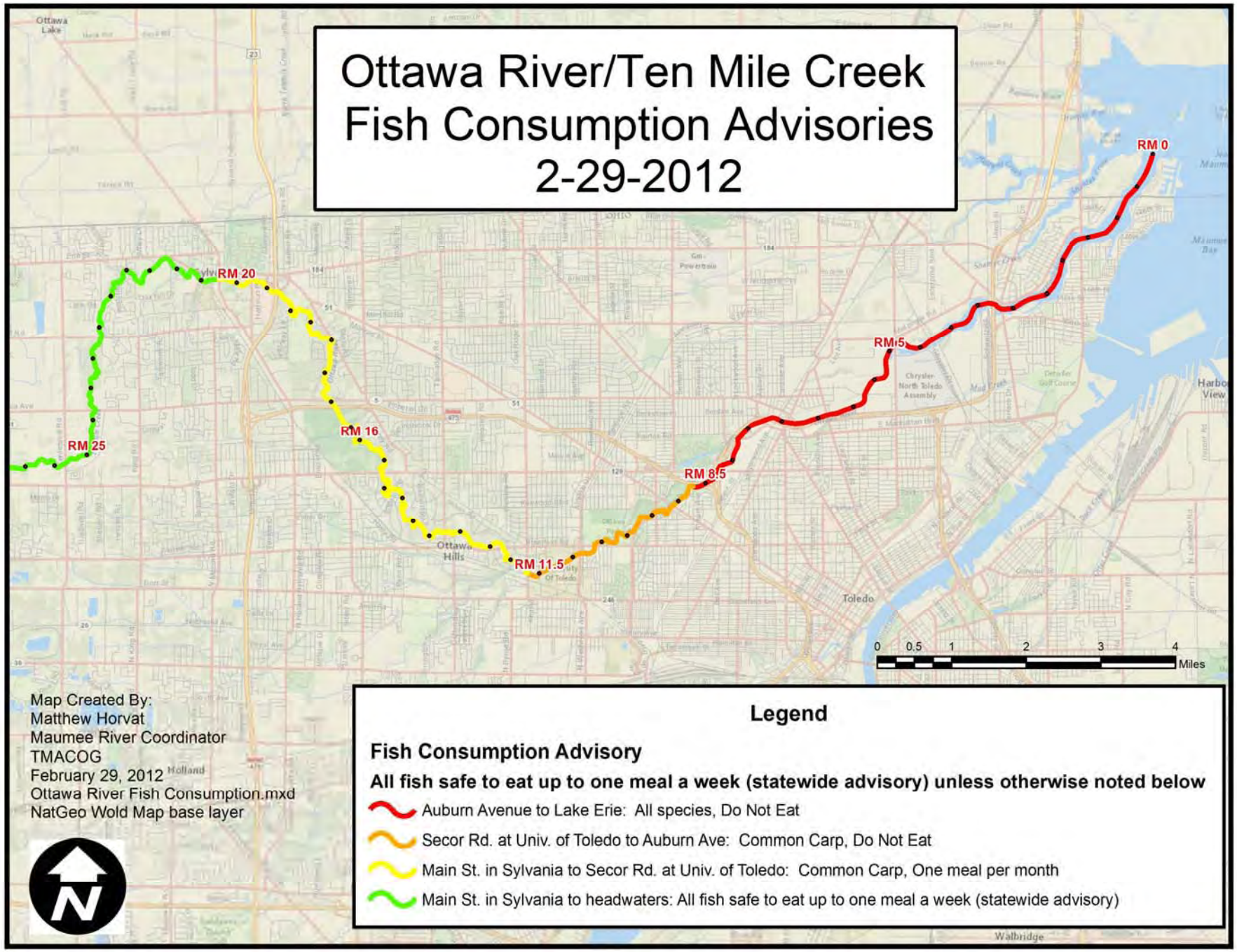
- **Nearshore Monitoring Project**
  - Goal: Track trends and develop biological index for lacustuary/nearshore areas
  - In second year of three years of sampling
  - Collecting water, sediment, fish, nutrients , phytoplankton, etc.
- **Brown Bullhead Study**
  - Goal: Determine if BUI 4 is impaired in Ohio AOCs
  - Contracted with MBI & West Virginia Histology lab to do work
  - Collecting fish samples for all river mouths in three AOCs
  - Expect sampling to begin late Summer/early Fall 2012
- **New Boat for NWDO**
  - Sampling Lake Erie in a 19' boat without cover
  - Getting new 24' vessel with a cabin soon (via grant funds)
  - Safer for staff, protection of gear and equipment
  - Should be able to sample more places, more often

Ohio EPA 319 Grant Projects

- **Summer 2012 Ohio EPA conducted pre-/post-project sampling for 319 grants**
  - Report available in report on Ohio EPA web site: *http://epa.ohio.gov/portals/35/documents/319_SWIF_TSD_2011.pdf*
  - Sites in report include:
    - Toledo Botanical Gardens – Hill Ditch & Crosby Lakes
    - University of Toledo – mainstem Ottawa R. on Campus
    - TMACOG – mainstem Ottawa River in Ottawa Hills
    - Also: Camp Miakonda – Ottawa R. at former dam site
- **New 319 project with FFY12 funding**
  - TMACOG – stream and restoration project on Swan Creek

Changes to the Ottawa River Consumption Advisory

- **Evaluation of Consumption Advisory**
  - Summer 2011 Ohio EPA collected fish tissue samples from Auburn Ave to Main St (in Sylvania)
- **Ohio EPA evaluated the data in conjunction with the Ohio Dept of Health**
- **On Feb., 29, 2012 Advisory was reduced and signs were authorized for removal**
  - Auburn Ave. to Lake Erie
    - All species, Do Not Eat *(did not collect data here, expected in 2014)*
  - Secor Rd. at University of Toledo to Auburn Ave.
    - Common Carp, Do Not Eat
  - Main St. in Sylvania to Secor Rd. at University of Toledo
    - Common Carp, One meal per month


Ottawa River/Ten Mile Creek
Fish Consumption Advisories
2-29-2012
RM 0
RM 5
RM 8.5
RM 11.5
RM 16
RM 20
RM 25
Ottawa Hills
Toledo
Harbor View
0 0.5 1 2 3 4
Miles
Map Created By:
Matthew Horvat
Maumee River Coordinator
TMACOG
February 29, 2012
Ottawa River Fish Consumption.mxd
NatGeo Wold Map base layer
Legend
Fish Consumption Advisory
All fish safe to eat up to one meal a week (statewide advisory) unless otherwise noted below
Auburn Avenue to Lake Erie: All species, Do Not Eat
Secor Rd. at Univ. of Toledo to Auburn Ave: Common Carp, Do Not Eat
Main St. in Sylvania to Secor Rd. at Univ. of Toledo: Common Carp, One meal per month
Main St. in Sylvania to headwaters: All fish safe to eat up to one meal a week (statewide advisory)

FFY 2013-14 GLRI Projects

I Need Your Help!

- US EPA needs to submit budget requests/placeholders for FFY13 & 14 GLRI budget
- Ohio EPA is reworking its Delisting Targets
- Current Maumee BUI status can not be determined until Targets are updated
- BUT they still need a list of projects!
- What does our AOC need? What shall I tell them to hold money for us for?
- I have to tell US EPA something next week!

From US EPA Liaison Frank Anscombe

- **Sorry he couldn't be here**
- **GLNPO is busy preparing for RFAs**
- **US EPA will the awarding $20 million**
- **Wanted to remind everyone**
  - Deadline is May 24
  - Webinars
    - Thu, May 3, 2012 2:00 PM - 4:00 PM CDT
    - Mon, May 14, 2012 10:00 AM - 12:00 PM CDT

Questions

Cherie Blair

Maumee RAP Coordinator

Ohio Environmental Protection Agency

419-373-3010

Cherie.Blair@epa.state.oh.us

Ohio Environmental Protection Agency

CLIMATE IMPACTS ON GREAT LAKES WATER QUALITY

Carnegie Institution for Science, Grace College, Heidelberg University, Limno-Tech, Inc., University of Michigan, and University of Toledo

Project Focus: Western Lake Erie

Key Question:
What are the possible effects of climate-change-induced extreme events on water quality and ecology in the Great Lakes system, and what management strategies will be effective in addressing these changes?

Project Components & Leaders

1. **Hydrologic and Ecological Response**
   Donald Scavia, *Co-PI*

2. **Regional Climate and Extreme Events**
   Alison Steiner, *Co-PI*

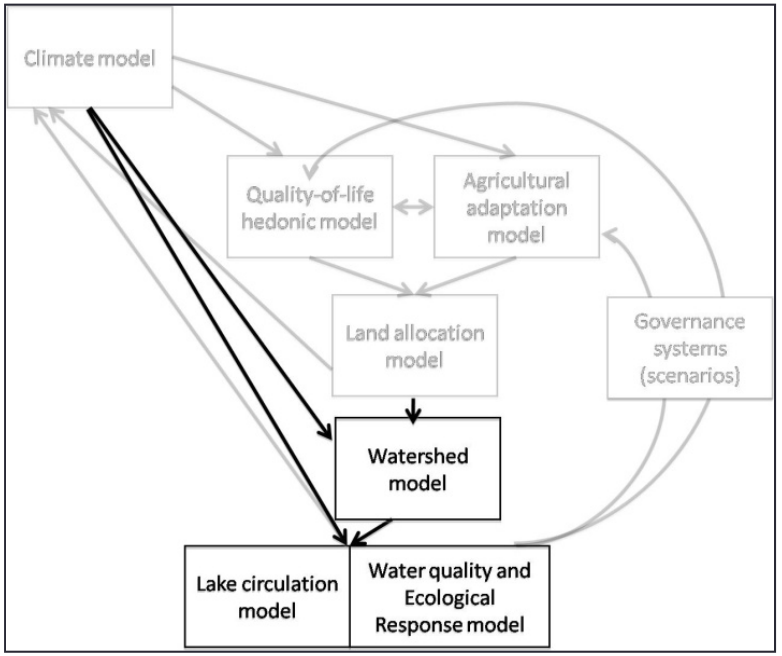
3. **Land Use Change and Water Governance**
   Michael Moore, *Co-PI*

4. **Broader Impacts (Outreach/Education)**
   Elizabeth LaPorte, *Senior Personnel*

Principal Investigator: Anna Michalak

Hydrological and Ecological Response

- How do changes in *climate, land-use, and Dreissenids (invasive mussels)* affect the amount of phosphorus reduction needed to avoid harmful algal blooms?
- How do increases in *intense storms influence the DRP:TP (dissolved reactive phosphorus; total phosphorus)* in river runoff?
- Which *changes in precipitation patterns* most effect altered eutrophication patterns and algal species shifts?



Hydrological and Ecological Response

Data Collection

Lake Monitoring:

- Microcystis abundance and nutrient concentration
- Lyngbya growth studies

High Resolution DRP measurements (Cycle P):

- Test unit on Maumee River, 2011
- Deploy in western Lake Erie, 2012 (storm events)

River Monitoring:

- Continuation of Heidelberg data collection on Maumee, Sandusky, Raisin, Cuyahoga and Grand

Hydrological and Ecological Response

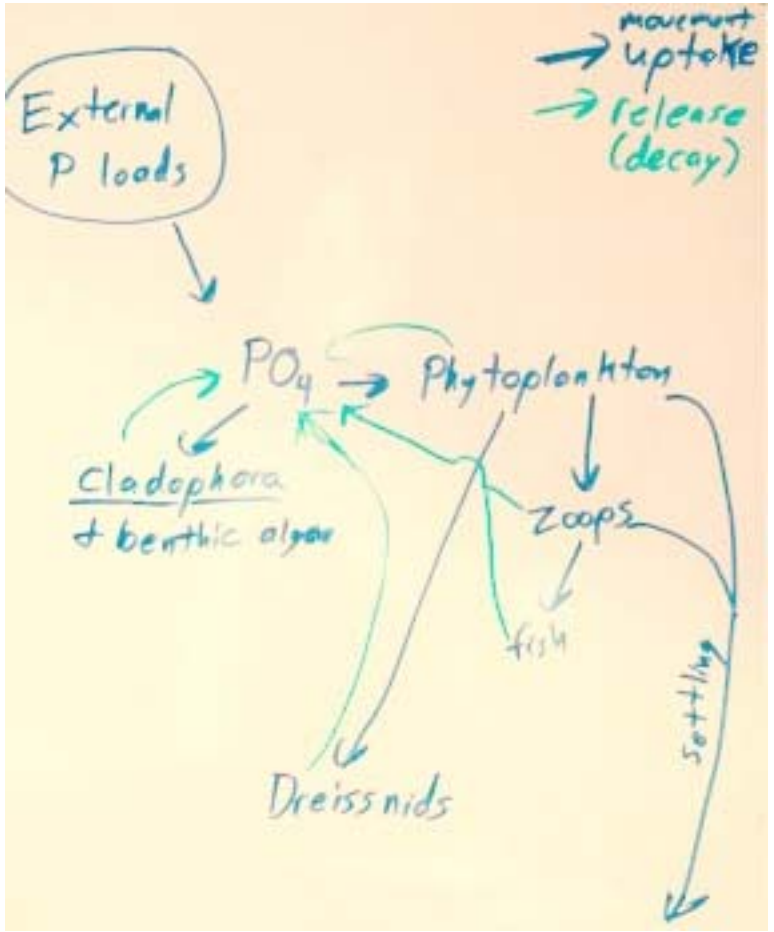
Modeling

Watersheds:

- Controls on TP and SRP runoff
- Climate effects
- Land use effects

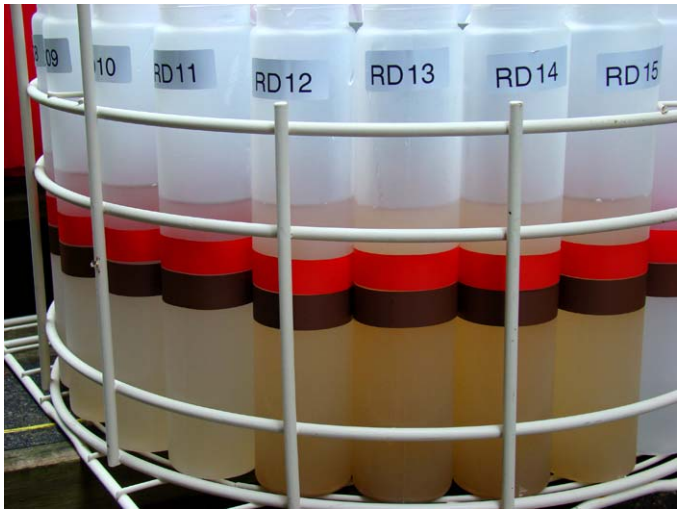
Western Basin of Lake Erie:

- 2011 Microcystis bloom
- 3-D grid-based water physics, chemistry and biology



Regional Climate and Extreme Events

- Present-day Baseline Climate
- Future-climate Baseline
- Future-climate Land Cover
- Develop an analytical system for predicting outcomes and feedbacks --- using a complex array of factors:
  - Precipitation, runoff and evapotranspiration
  - Soil temperature
  - Lake-effect precipitation



Land Use Change & Water Governance

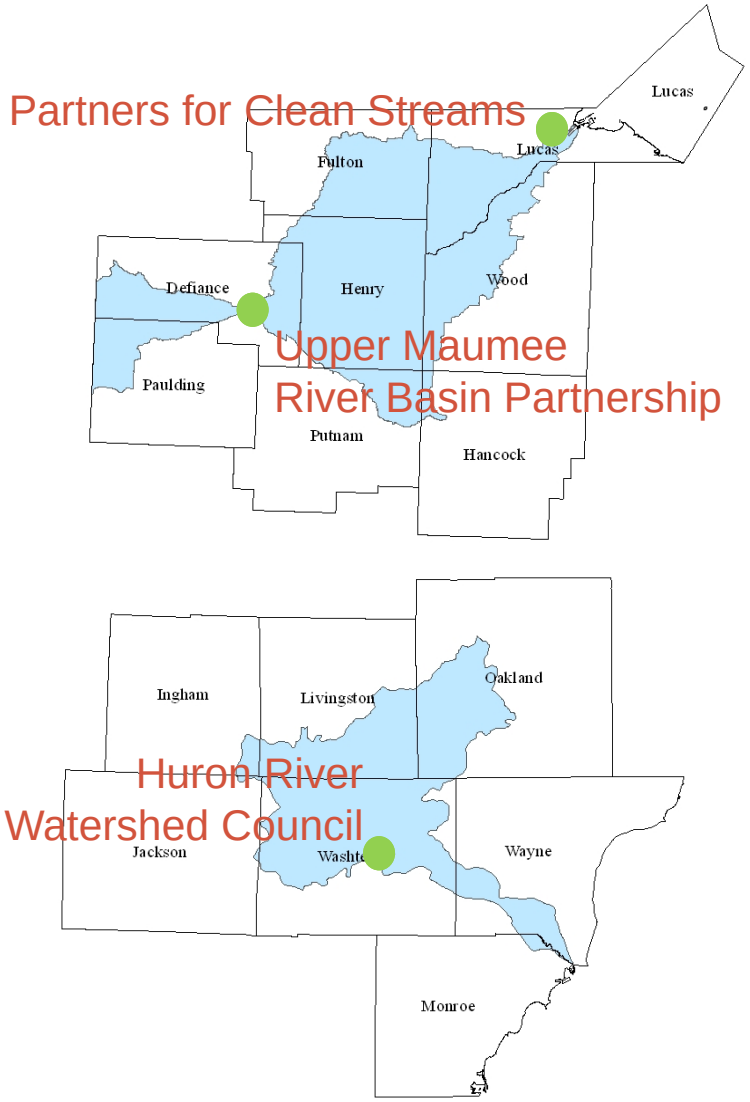
Goals:

1. Understand current water management approaches and use of climate information to build baseline database
2. Assess adaptive capacity of management systems & develop tool for self assessment
   - **Adaptive capacity**: Economic, political/organizational, human, and social capital
3. Understand role of coupled water management systems & climate knowledge (this project) in building adaptive capacity

Water Governance - Partners

Focus:
Developing partnerships with key management groups/agencies in two watersheds OH and MI:

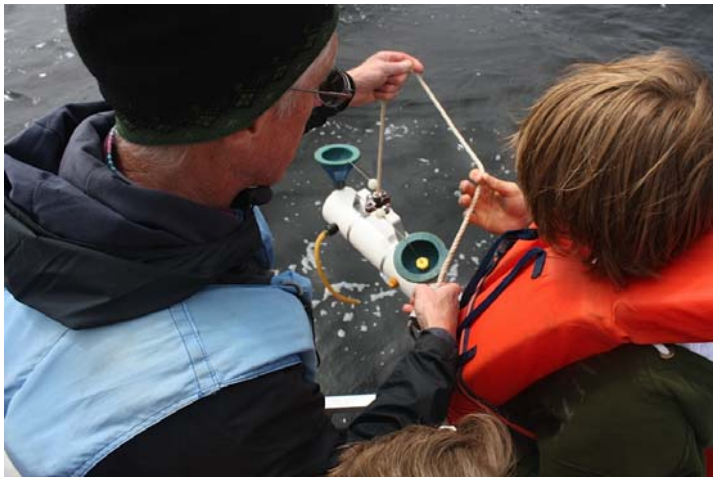
- **Maumee River/Lake Erie**
  TMACOG, Partners for Clean Streams, and Upper Maumee River Basin Partnership, State EPA/ODNR
- **Huron River/Lake Erie**
  Huron River Watershed Council, State MDEQ



Outreach – Broader Impacts

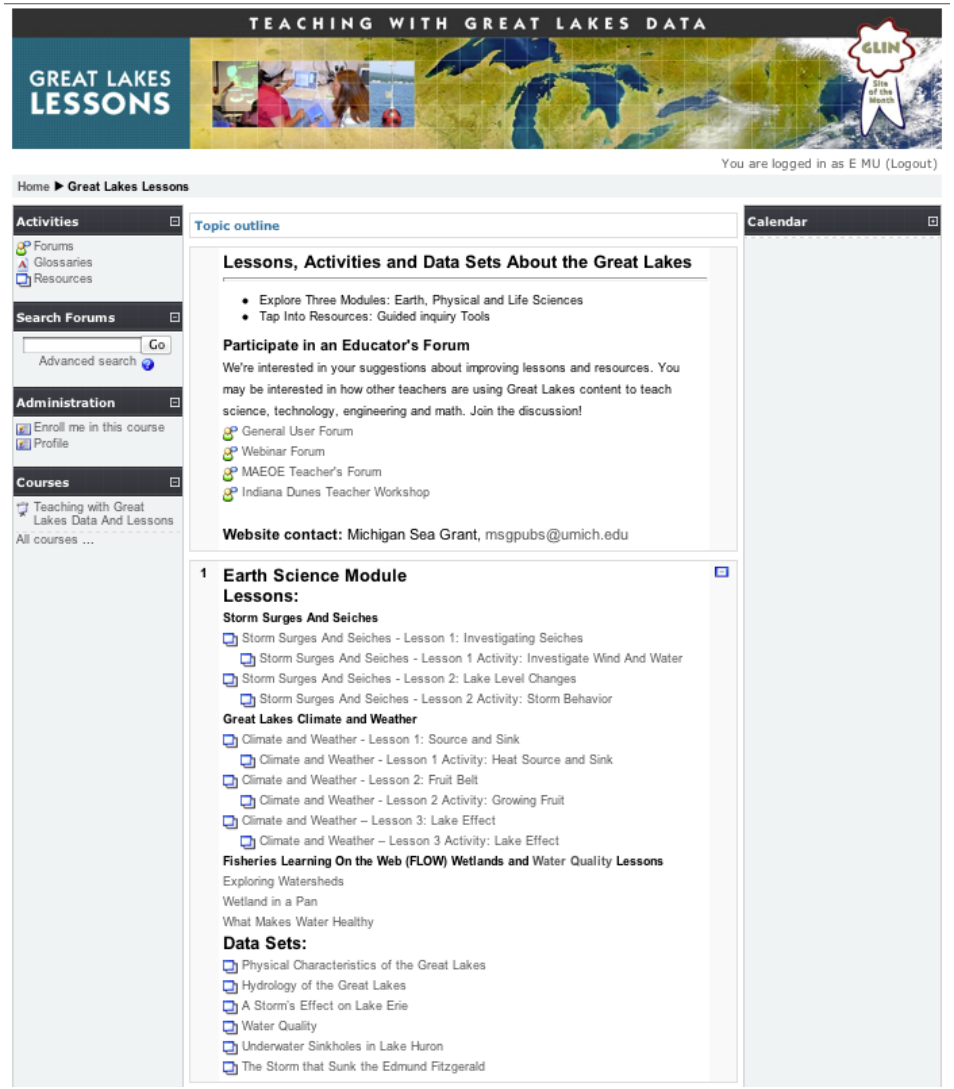
Goals

- Promote training, teaching and learning
- Leverage science-based information
- Integrate Great Lakes research into K-12 classrooms – addressing STEM
- Public outreach about the project activities and outcomes



Education

- Enhancing Existing Tools
- New educational materials about developing and applying models (lesson, activity, data sets)
- Teacher Outreach – New Tech High School (underrepresented groups)



Outreach

- Leveraging science about climate and water quality
- Promoting sustainable economic development, balancing environmental and ecological issues with economic issues
- Tapping into university researchers
- Identifying community needs

Questions?

URLs

- Project Website: www.miseagrant.umich.edu/nsfclimate
- Teaching with Great Lakes Data: www.greatlakeslessons.com

> "Climate change is not about a bunch of granola-munching hippies with nothing better to do than fabricate doomsday scenarios about the environment."
> — Tom Henry, *The Blade*

Contacts:

- Mary Anne Evans, mevans@umich.edu
- Christine Kirchhoff, orange@umich.edu
- Elizabeth LaPorte, elzblap@umich.edu

Ohio's Total Maximum Daily Loads (TMDL) Process

Maumee River (lower) Tributaries and Lake Erie Tributaries Watersheds (PART 1)

Beth Risley

Ohio Environmental Protection Agency

Today's Discussion

- Ohio's TMDL Process
- Maumee River (lower) tributaries and Lake Erie Tributaries TMDL
- Implementation ideas

Ohio Environmental Protection Agency

Today's Discussion

- Ohio's TMDL Process
- Maumee River (lower) tributaries and Lake Erie Tributaries TMDL
- Implementation ideas

Ohio Environmental Protection Agency

Why do we do TMDLs?

Ohio | Environmental Protection Agency

Clean Water Act

- Clean Water Act: to restore and maintain the “chemical, physical, and biological integrity of the Nation's waters.”
- TMDLs originate in CWA Section 303: provides a safety net for times when technological controls don’t work

Ohio Environmental Protection Agency

Ohio's CWA Responsibilities

- States decide goals for water quality
- States monitor to determine whether waters are meeting the goals
- States report on water quality and prioritize problems
- For waters not meeting the goal, states prepare a **T**otal **M**aximum **D**aily **L**oad

Ohio Environmental Protection Agency

What is a T-M-D-L?

Ohio | Environmental Protection Agency

T-M-D-what?

- Local focus
- *Definition:* The maximum amount of a pollutant a waterbody can contain and still maintain water quality standards (goals).
- Also known as…
  - Pollution budget
  - Clean-up plan

background load
+ point source load
+ nonpoint source load
+ margin of safety
+ allowance for future growth

TMDL

Ohio Environmental Protection Agency

Four Phases of the Process

Assess the situation

Develop a solution

Implement the solution

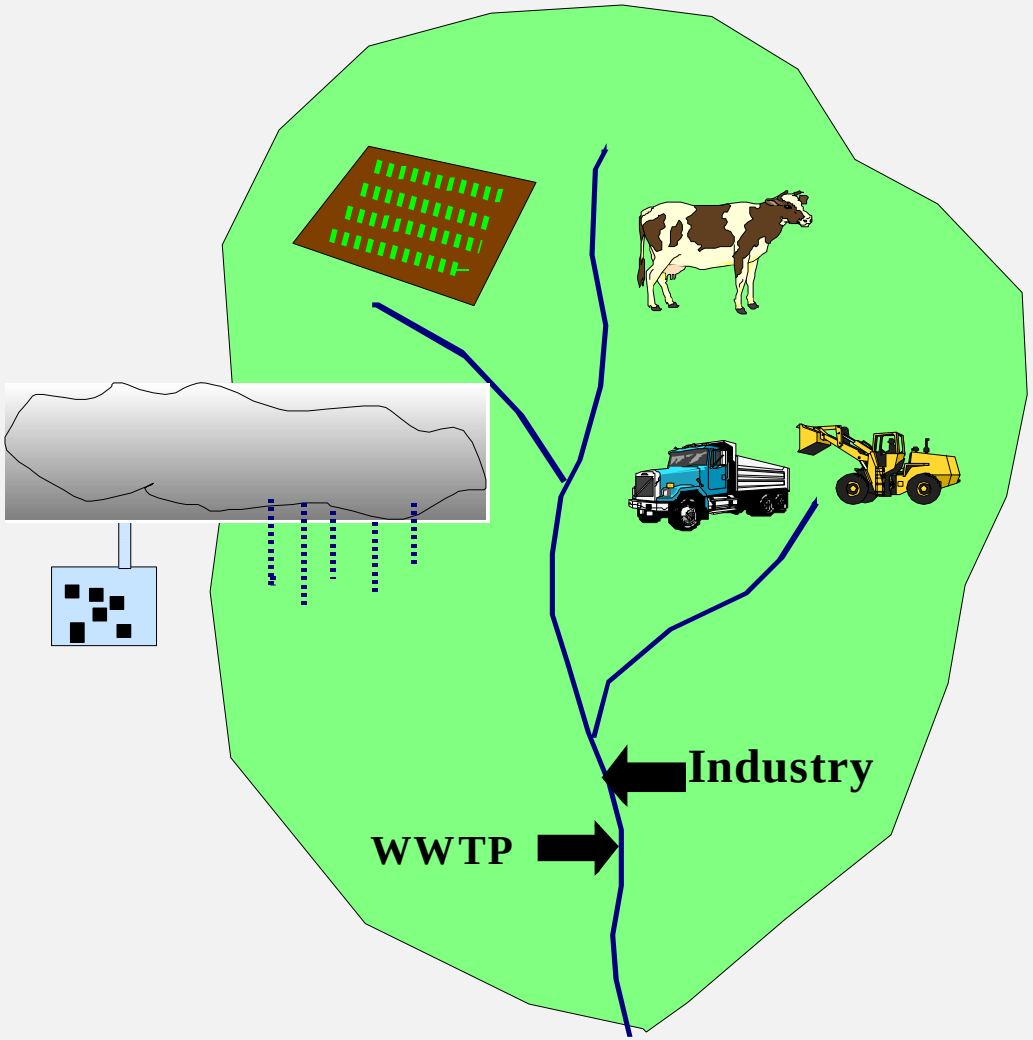
Evaluate success

Ohio Environmental Protection Agency

Assess the Situation

Ohio Environmental Protection Agency

Develop a Solution



- Cause/source examination
- Data vs. estimations
- Scenarios

Ohio Environmental Protection Agency

Lake Erie - Lower Maumee River Tributaries TMDL (part 2)

Maumee AOC Summit
May 2, 2012

OhioEPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

TETRA TECH

complex world | CLEAR SOLUTIONS™

LE-LM Tributaries TMDL

Discussion Overview

- **Background**
  - ***Applicable Standards***
  - ***Source Assessment***
  - ***Linkage Analysis***
- **Subwatershed Assessments**
  - ***TMDL Components & Allocations***
- **Implementation Plan**

LE-LM Tributaries TMDL

Phased Approach

- **Phase 1**
  - ***Characterization***
  - ***Source Assessment***
  - ***Linkage Analysis***
  - ***Draft TMDL***
- **Phase 2**
  - ***Final TMDL***
  - ***Implementation plan***

LE-LM Tributaries TMDL

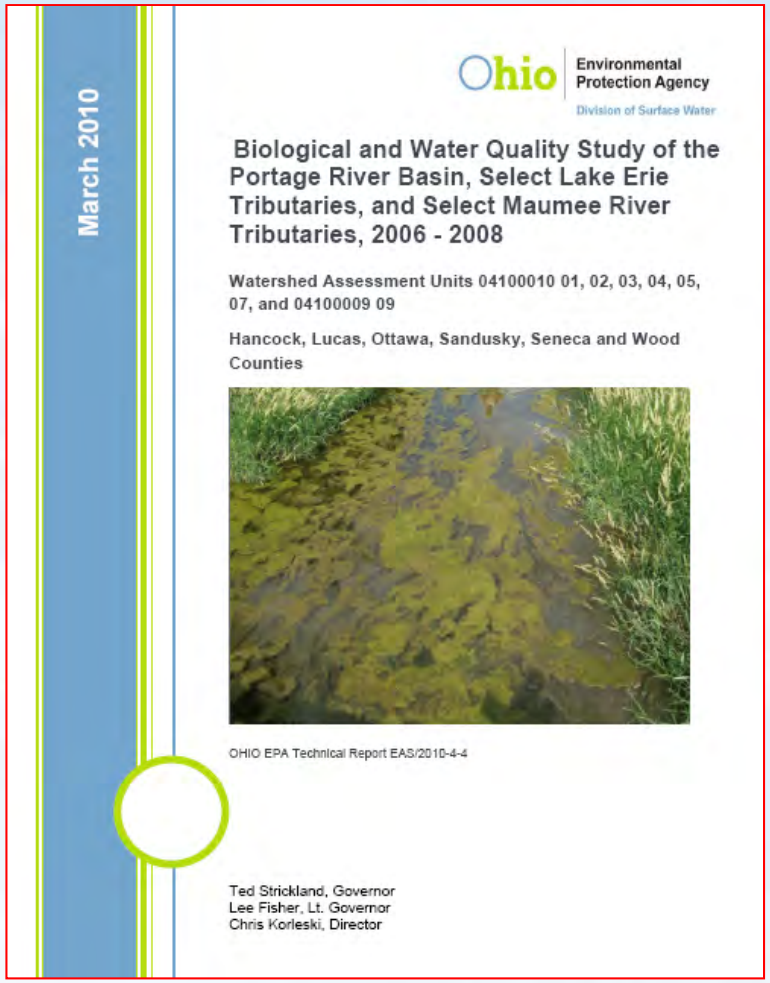
Phase 1

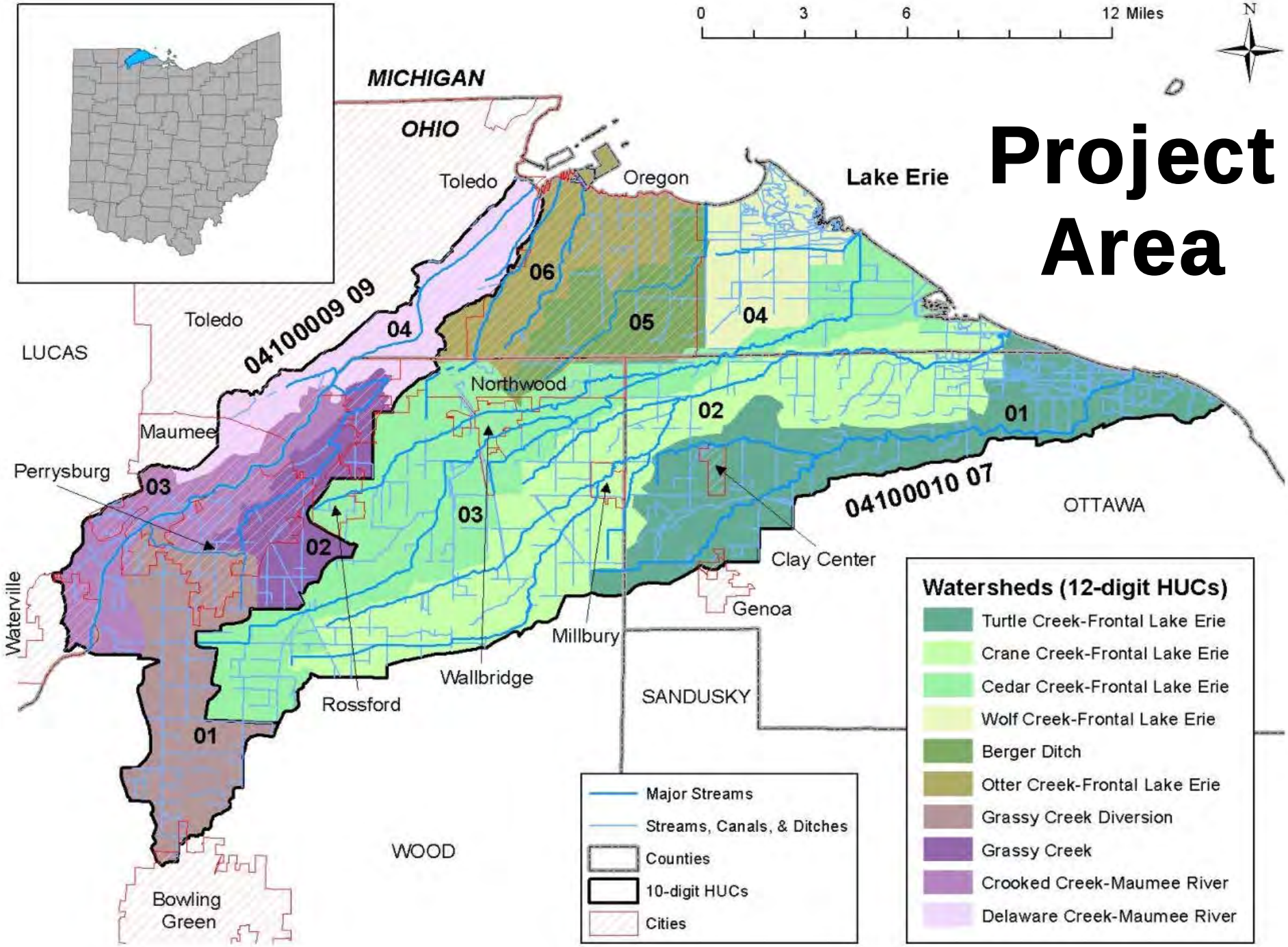
- **Watershed Characterization**
  - ***Background Information***
  - ***Water Quality Indicators & Potential Targets***
  - ***Data Summary***

LE-LM Tributaries TMDL

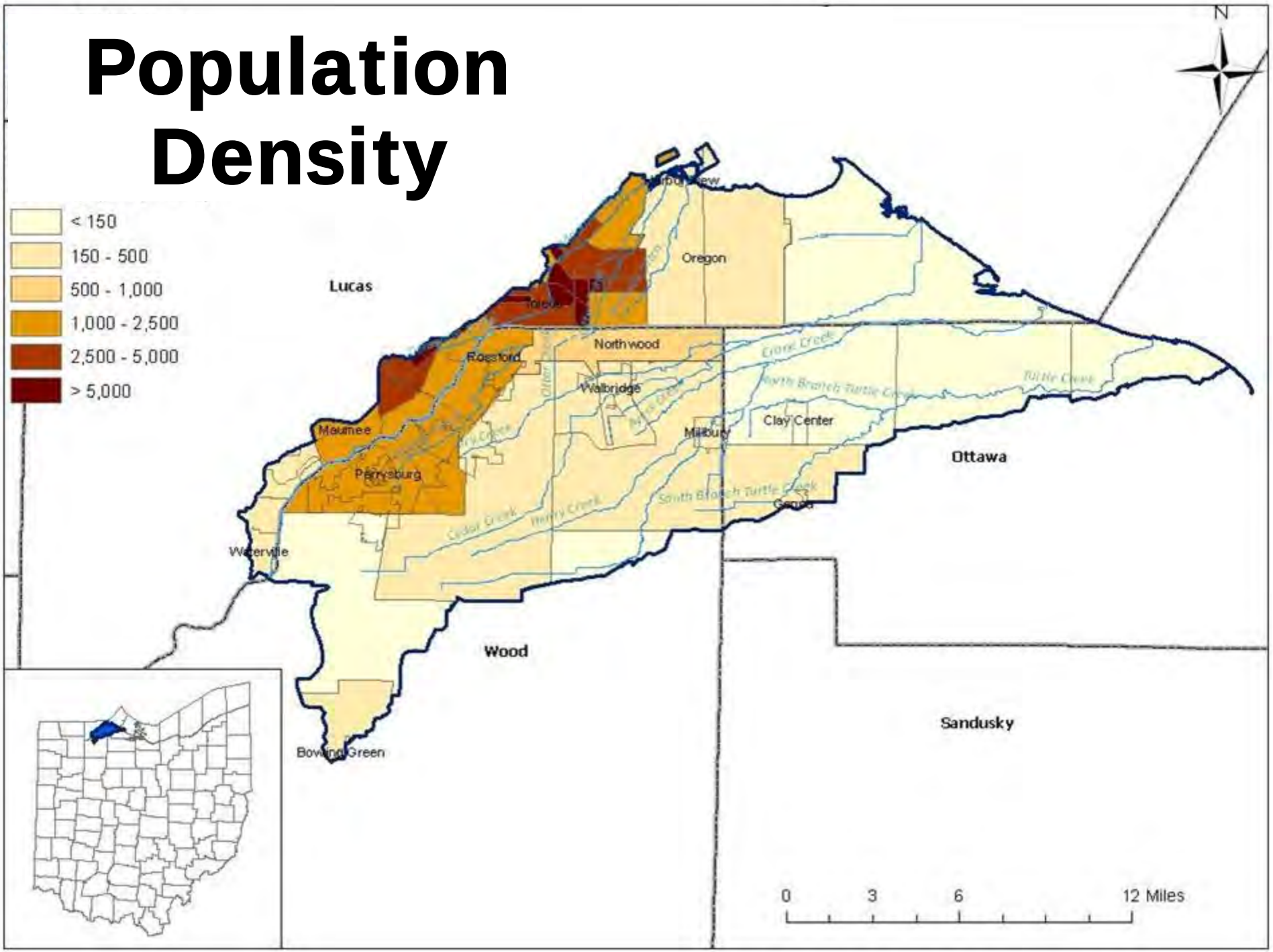
Watershed Characterization

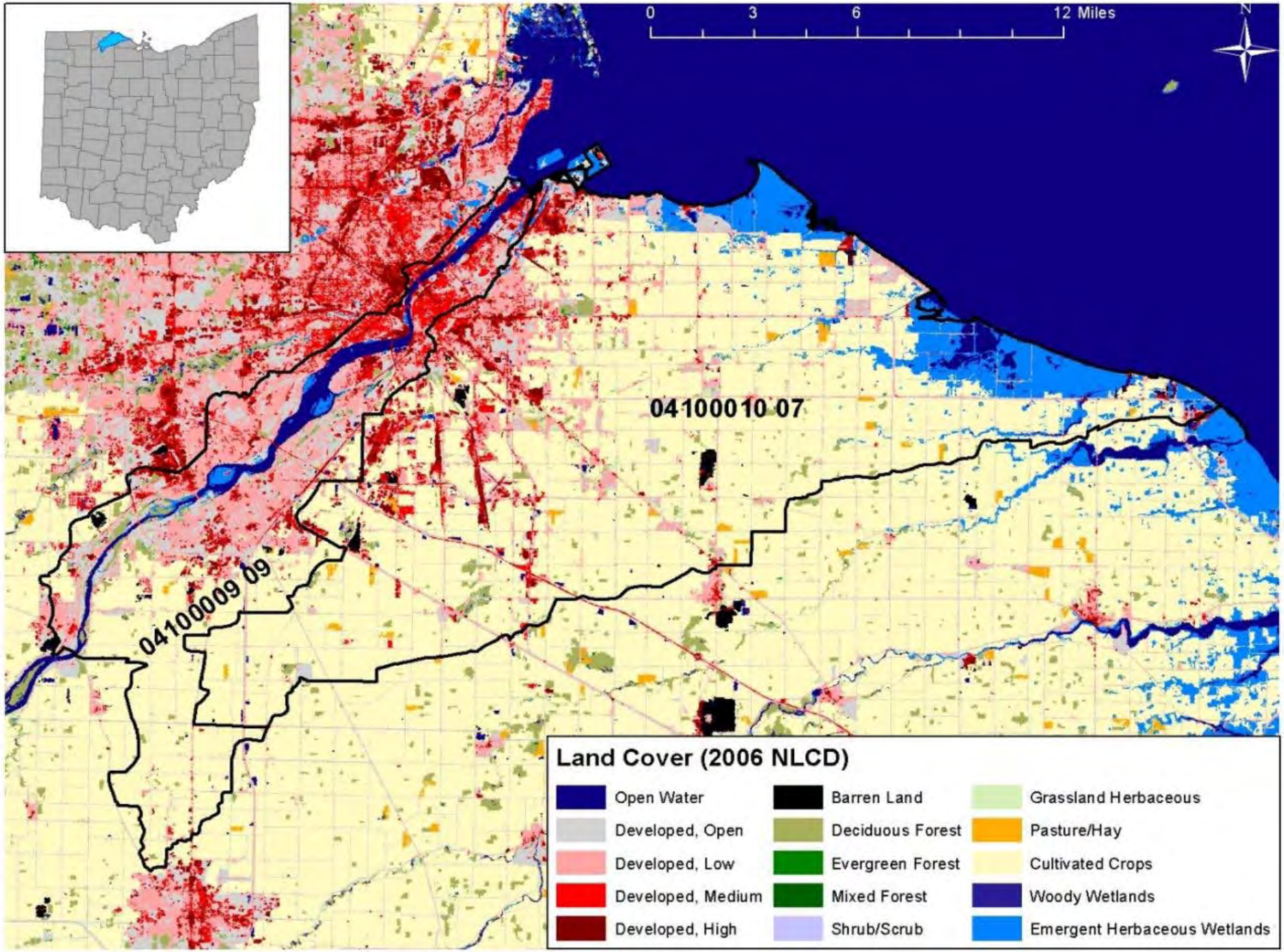
- **Background Information**
  - ***Setting***
  - ***Community Profile***
  - ***Climate***
  - ***Land Use / Land Cover***
  - ***Geology and Soils***
  - ***Hydrology***




Project Area
0 3 6 12 Miles
N
MICHIGAN
OHIO
Toledo
Oregon
Lake Erie
LUCAS
Toledo
04100009 09
04
06
05
04
Northwood
02
01
Maumee
Perrysburg
03
03
02
04100010 07
OTTAWA
Clay Center
Genoa
Waterville
Millbury
Wallbridge
Rossford
SANDUSKY
01
WOOD
Bowling Green
Major Streams
Streams, Canals, & Ditches
Counties
10-digit HUCs
Cities
Watersheds (12-digit HUCs)
Turtle Creek-Frontal Lake Erie
Crane Creek-Frontal Lake Erie
Cedar Creek-Frontal Lake Erie
Wolf Creek-Frontal Lake Erie
Berger Ditch
Otter Creek-Frontal Lake Erie
Grassy Creek Diversion
Grassy Creek
Crooked Creek-Maumee River
Delaware Creek-Maumee River

Population Density




0
3
6
12 Miles
N
04100010 07
04100009 09
Land Cover (2006 NLCD)
Open Water
Developed, Open
Developed, Low
Developed, Medium
Developed, High
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grassland Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands

TMDL Development

Regulatory Framework

TMDL Report -- Required Elements

- ☑ Applicable WQ Standards
- ☑ Loading Capacity
- ☑ Source Assessment
- ☑ Allocations
- ☑ Seasonal Variation
- ☑ Margin of Safety

$$TMDL = WLA_{\text{Point Sources}} + WLA_{MS4} + LA + MOS$$

TMDL Development

Problem Solving Framework

Practical approach using key questions …

- ***WHY* the concern**
- ***WHAT* reductions are needed**
- ***WHERE* are the sources**
- ***WHO* needs to be involved**
- ***WHEN* will actions occur**

LE-LM Tributaries TMDL

WHY the Concern

- ***Not meeting Recreation and Aquatic Life uses***

- ***Determined by:***
  - ***poor aquatic biology***
  - ***water chemistry sampling***

- ***Supported by exceedances of:***
  - ***water quality standards***

LE-LM Tributaries TMDL

WHY the Concern

Lower Maumee River tributaries

Assessment Unit (AU)	Area (mi^2)	Impairments
04100009 09 01 Grassy Creek Diversion	24.78	Bacteria
04100009 09 02 Grassy Creek	13.68	Bacteria, Sedimentation / Siltation
04100009 09 04 Delaware Creek	19.25	Bacteria, Sedimentation / Siltation, Nitrate+Nitrite, Phosphorus (total), Flow Regime Alterations

WHY the Concern

Assessment Unit (AU)	Area (mi^2)	Impairments
04100010 07 01 Turtle Creek	40.66	Bacteria, Sedimentation / Siltation, Direct Habitat Alterations, Phosphorus (total), Ammonia (total), Dissolved Oxygen
04100010 07 02 Crane Creek	56.48	Bacteria, Sedimentation / Siltation, Phosphorus (total),
04100010 07 03 Cedar Creek	58.05	Bacteria, Sedimentation / Siltation, Ammonia (total), Organic Enrichment (sewage) Biological Indicators, Dissolved Oxygen
04100010 07 05 Berger Ditch	16.06	Bacteria, Sedimentation / Siltation, Organic Enrichment (sewage) , Biological Indicators, Phosphorus (total)
04100010 07 06 Otter Creek	18.13	Bacteria, Sedimentation / Siltation, Contaminated Sediments

LE-LM Tributaries TMDL

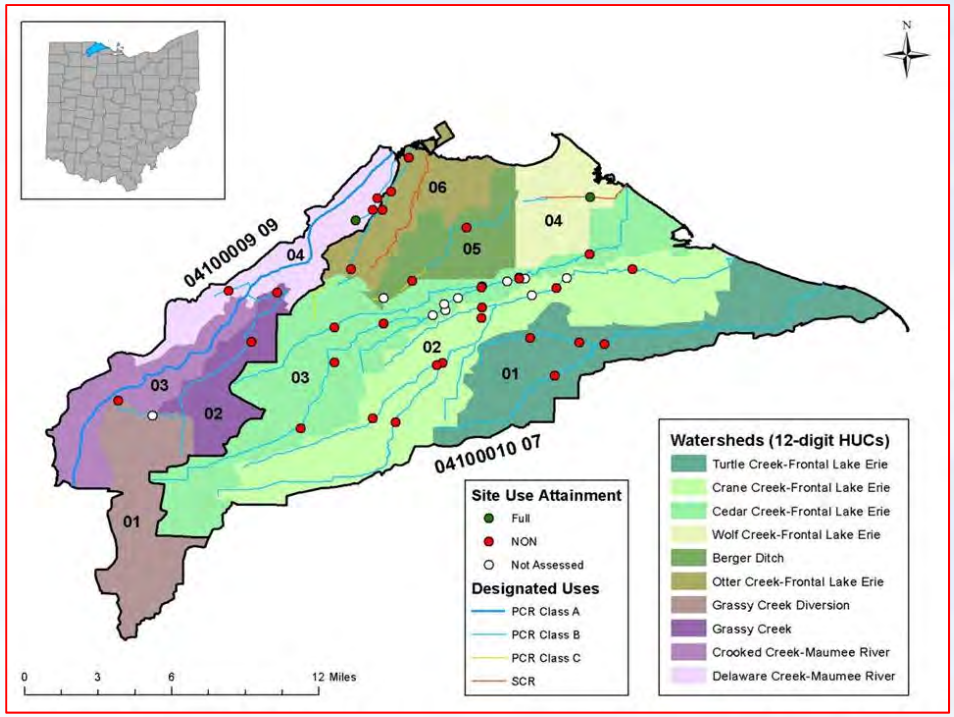
Water Quality Standards

Parameter	Units	Aquatic Life	Recreation
Ammonia	*mg/L*	See tables	
Dissolved Oxygen	*mg/L*	5.0 / 4.0 *(WWH)* 4.0 / 3.0 *(MWH)*	
E. coli	*#/100 mL*		126 / 235 *(Bathing waters)* 126 / 298 *(PCR – Class A)* 161 / 523 *(PCR – Class B)* 206 / 940 *(PCR – Class C)* 1,030 / 1,030 *(SCR)*
Phosphorus *(total)*	*µg/L*	80 *(WWH – Headwaters)* 100 *(WWH – Wadeable)* 340 *(MWH – Headwaters)* 280 *(MWH – Wadeable)*	
$NO_2 + NO_3$	*mg/L*	1.0 *(WWH – Headwaters)* 1.0 *(WWH – Wadeable)* 1.0 *(MWH – Headwaters)* 1.6 *(MWH – Wadeable)*	

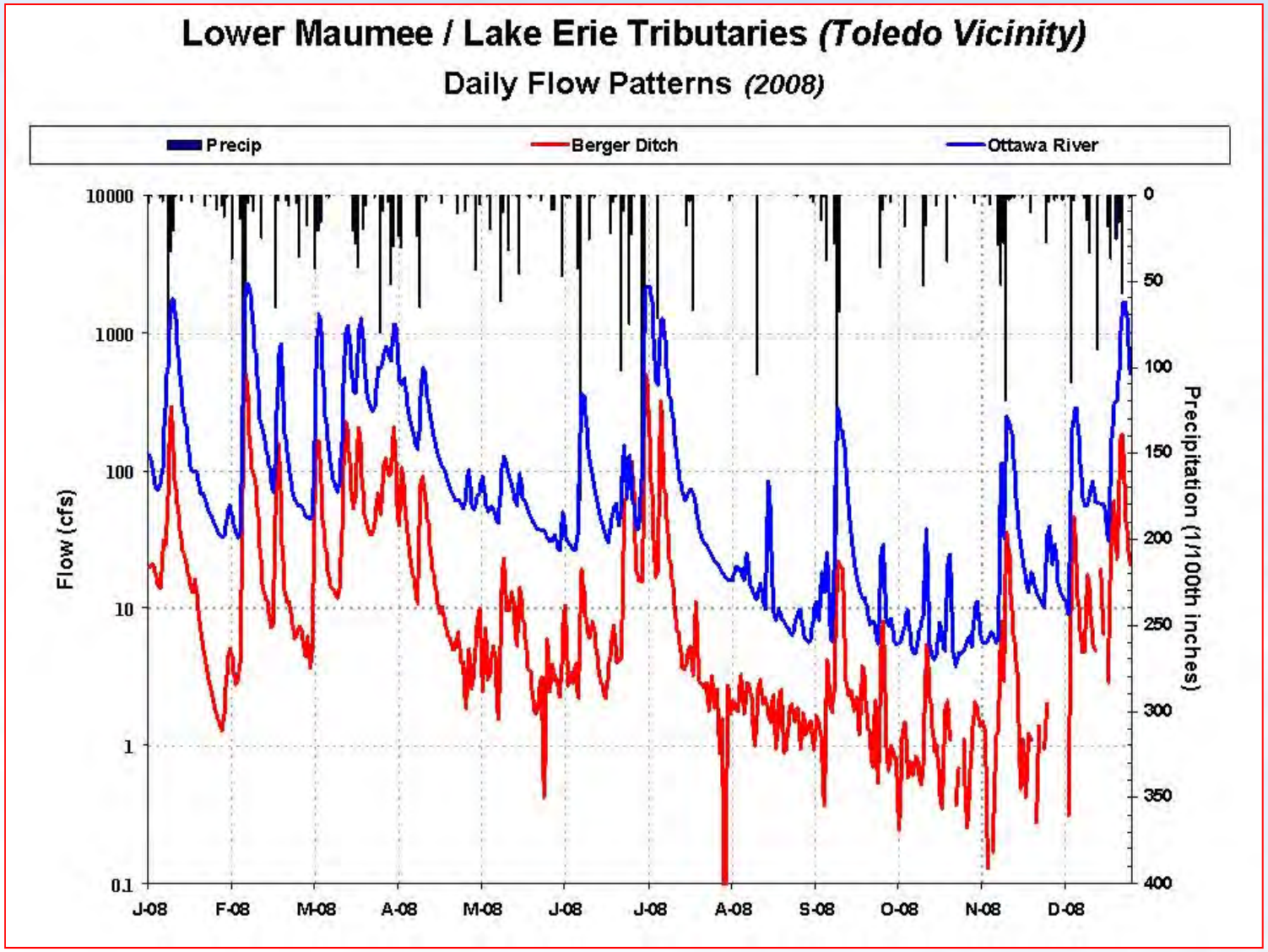
LE-LM Tributaries TMDL

Data Summary

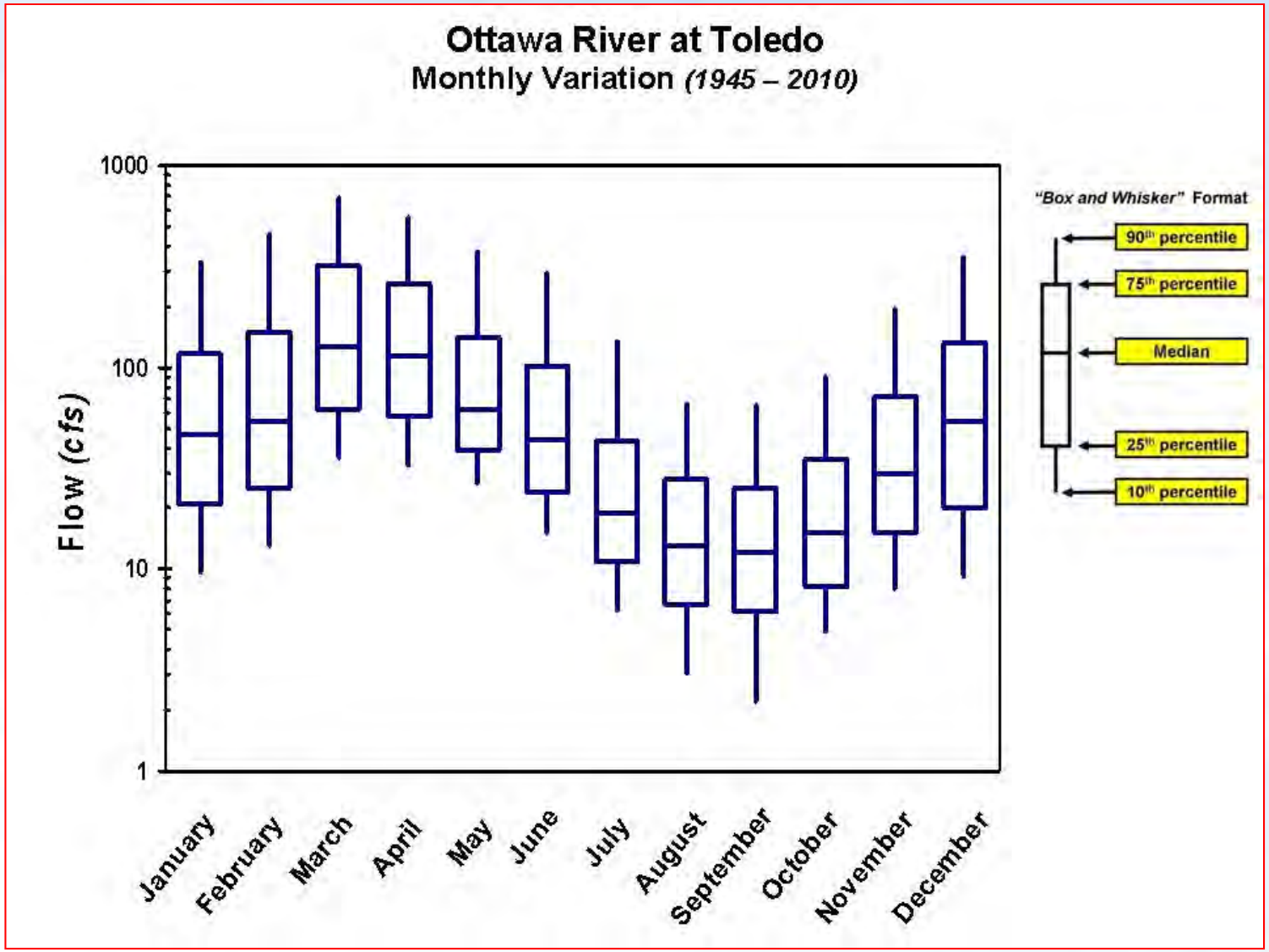
- ***Evaluate existing information***
  - ***Ohio EPA sampling (biology, habitat, water chemistry)***
  - ***USGS***
  - ***Other efforts***



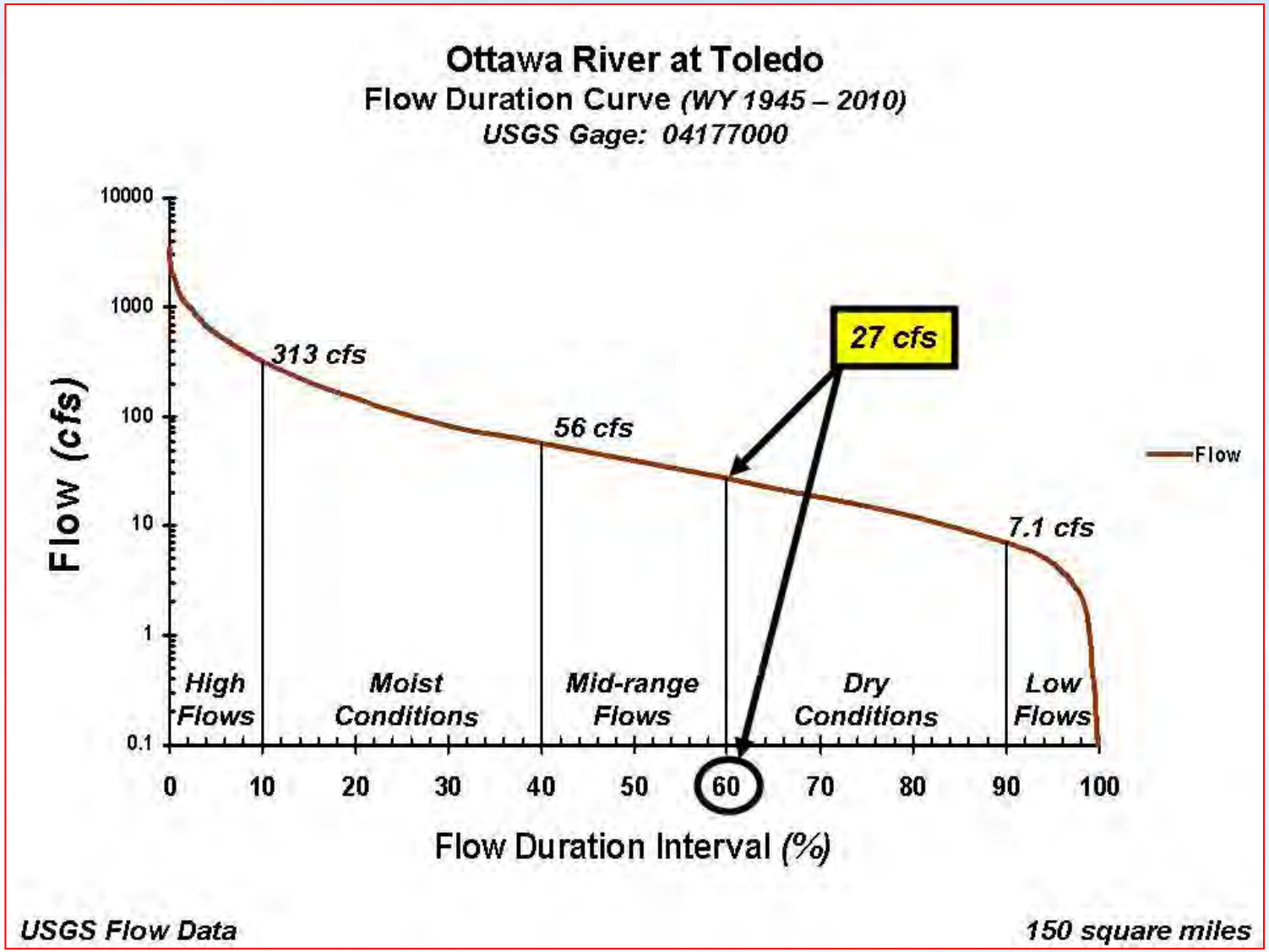
Hydrology


Lower Maumee / Lake Erie Tributaries (Toledo Vicinity)
Daily Flow Patterns (2008)
Precip
Berger Ditch
Ottawa River
Flow (cfs)
10000
1000
100
10
1
0.1
Precipitation (1/100th inches)
0
50
100
150
200
250
300
350
400
J-08
F-08
M-08
A-08
M-08
J-08
J-08
A-08
S-08
O-08
N-08
D-08

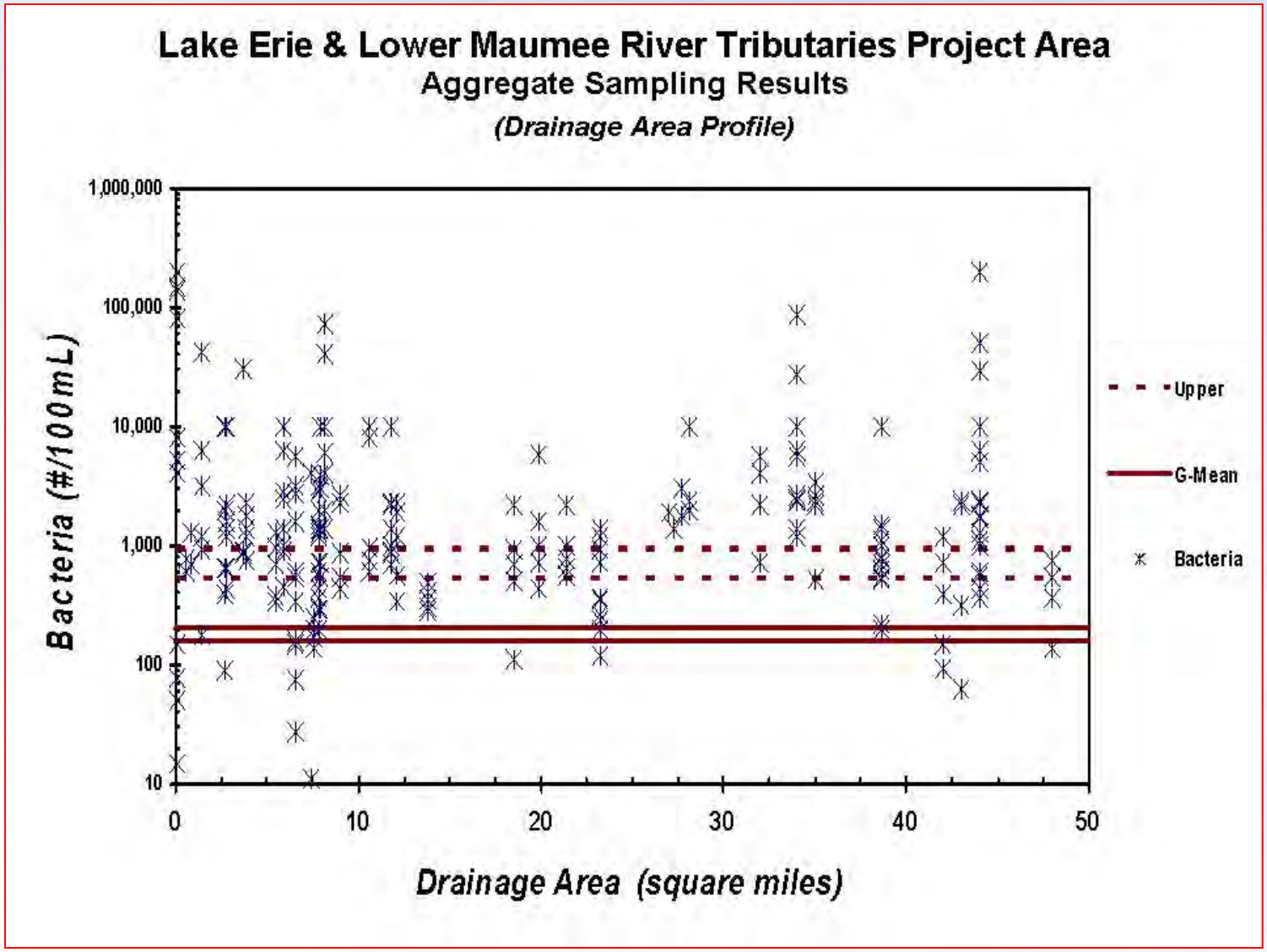
Hydrology


Ottawa River at Toledo
Monthly Variation (1945 – 2010)
Flow (cfs)
1000
100
10
1
January
February
March
April
May
June
July
August
September
October
November
December
"Box and Whisker" Format
90th percentile
75th percentile
Median
25th percentile
10th percentile

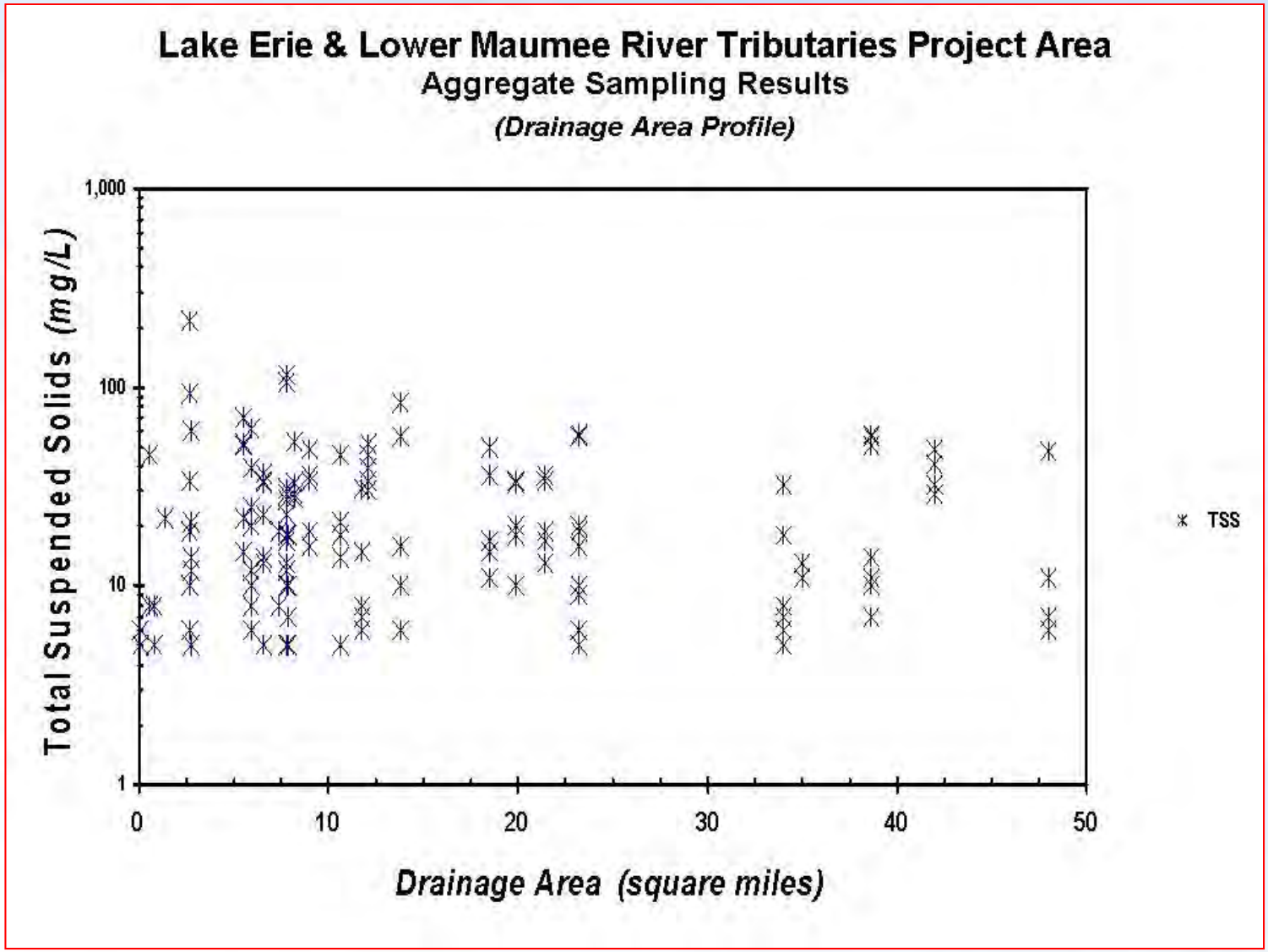
Hydrology


Ottawa River at Toledo
Flow Duration Curve (WY 1945 – 2010)
USGS Gage: 04177000
Flow (cfs)
10000
1000
100
10
1
0.1
313 cfs
56 cfs
27 cfs
7.1 cfs
Flow
High Flows
Moist Conditions
Mid-range Flows
Dry Conditions
Low Flows
0
10
20
30
40
50
60
70
80
90
100
Flow Duration Interval (%)
USGS Flow Data
150 square miles

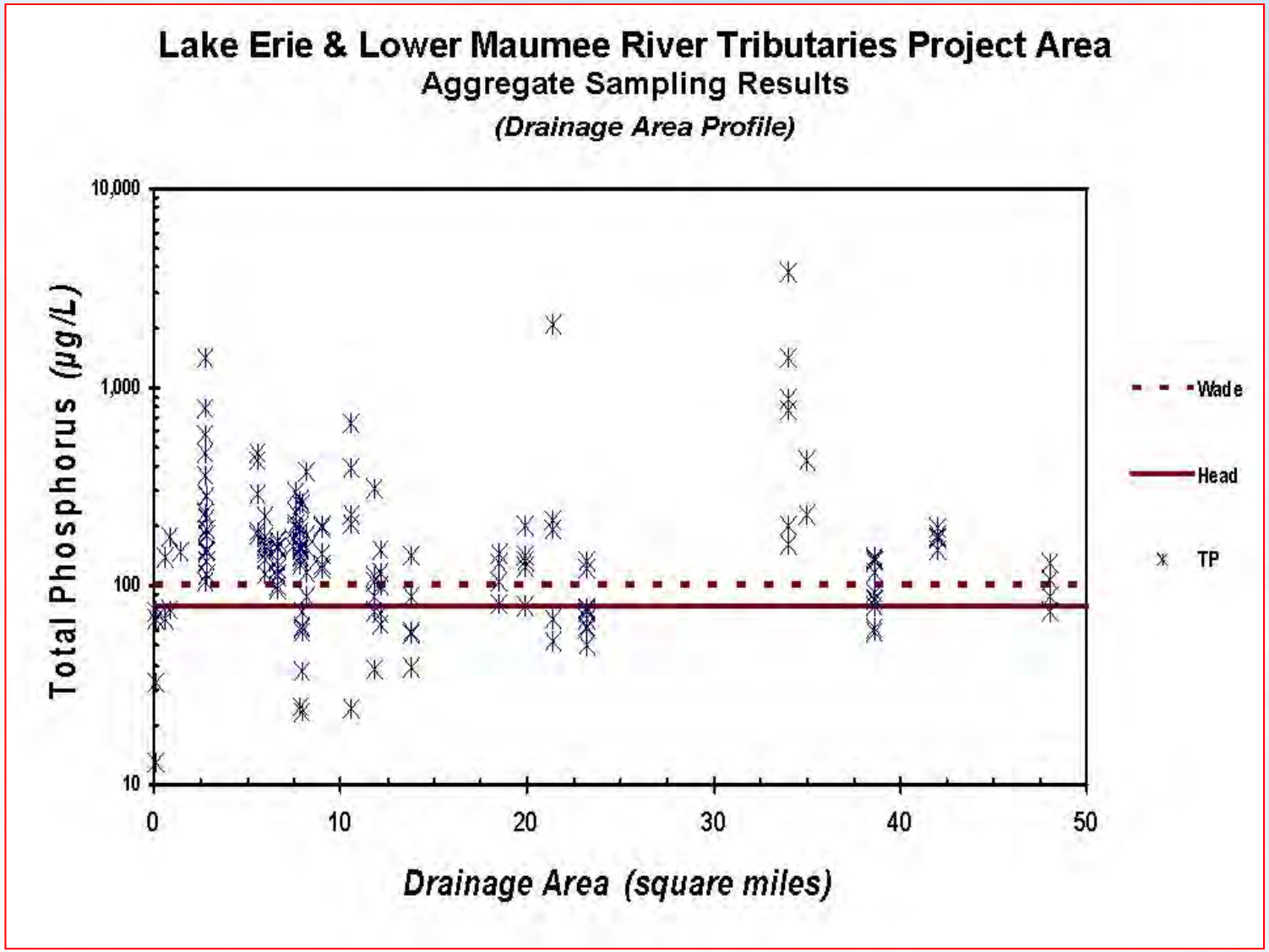
Area Patterns



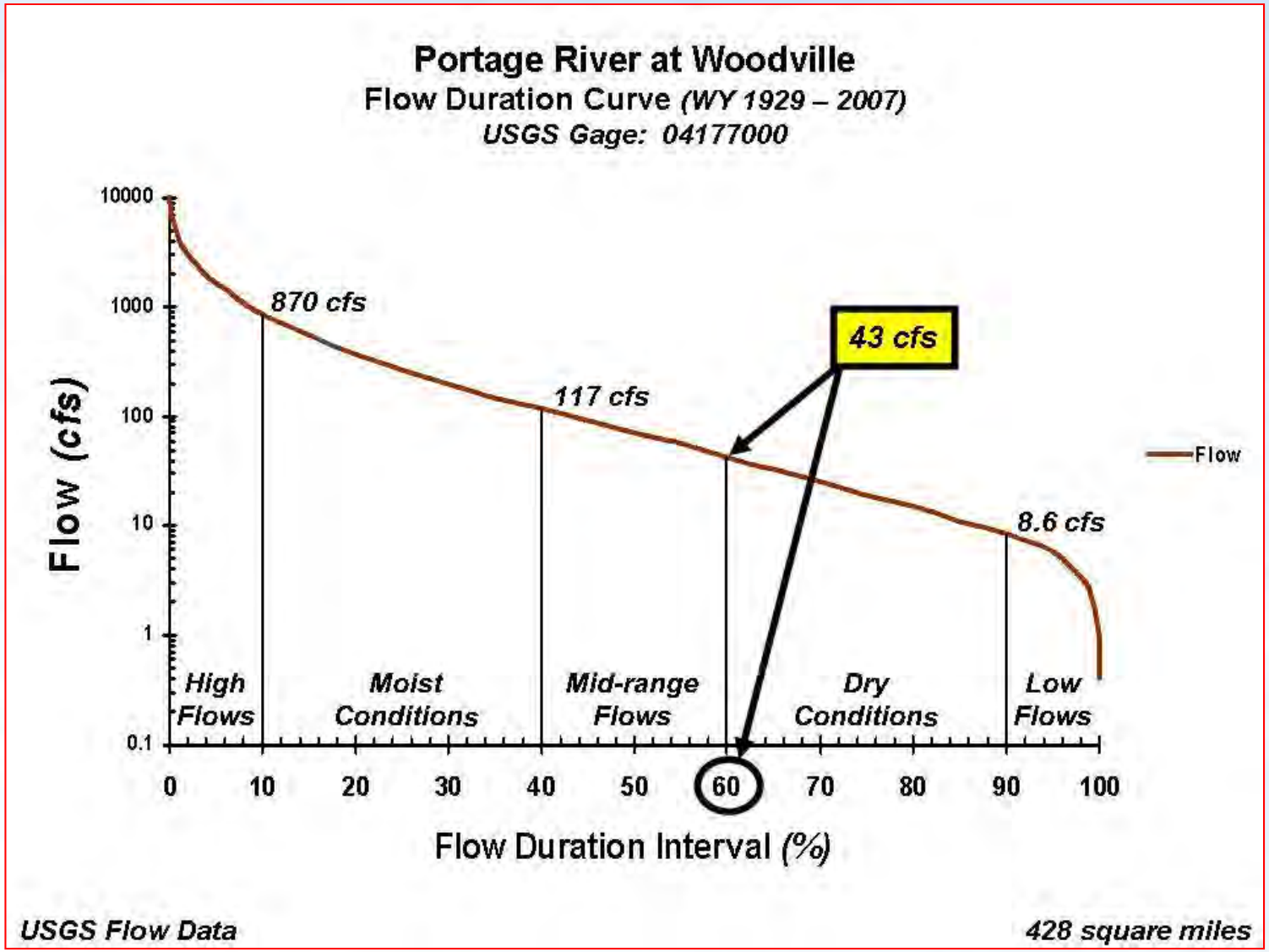
Area Patterns



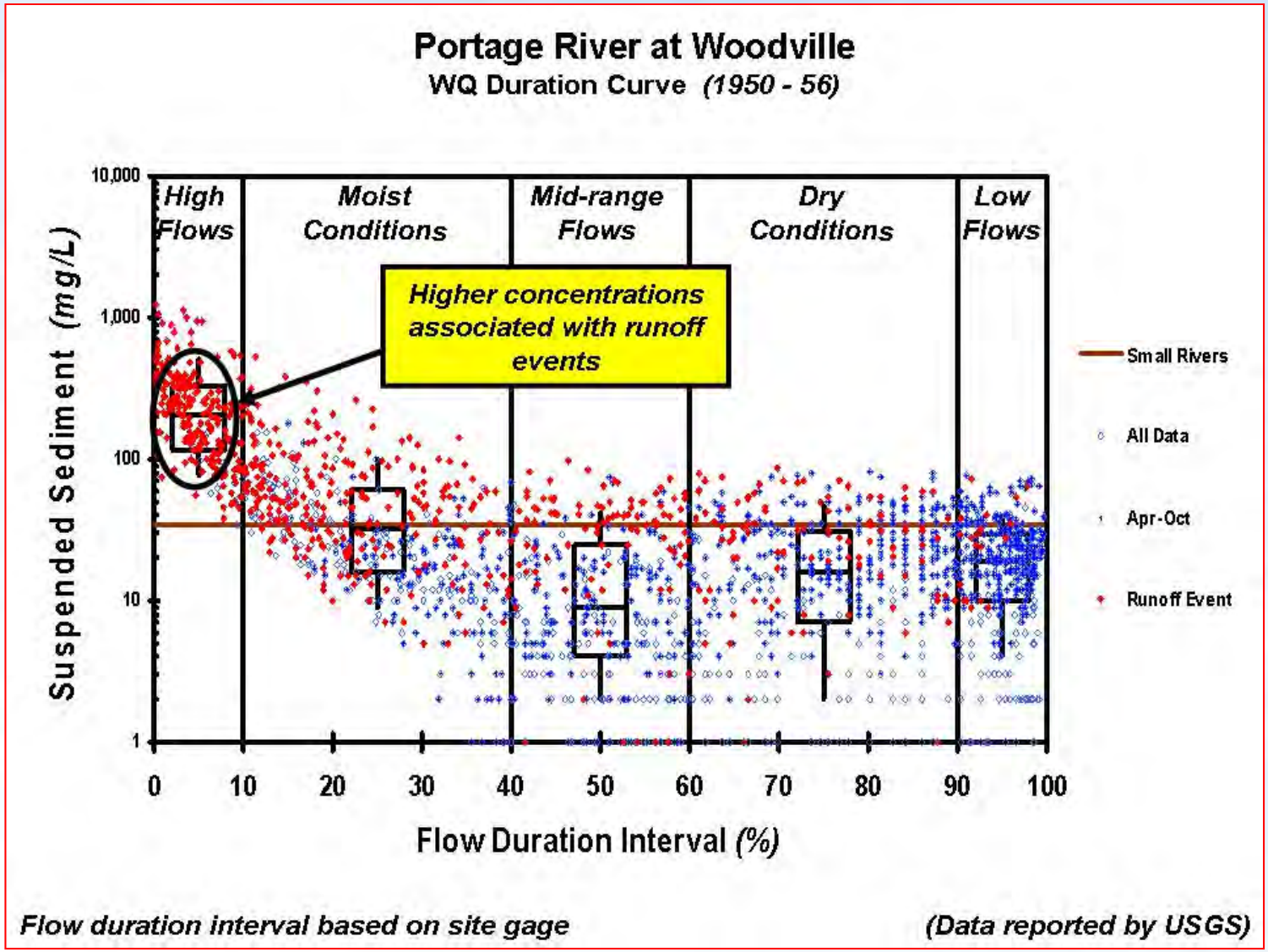
Area Patterns



Flow & WQ Relationships



Flow & WQ Relationships



Source Assessment

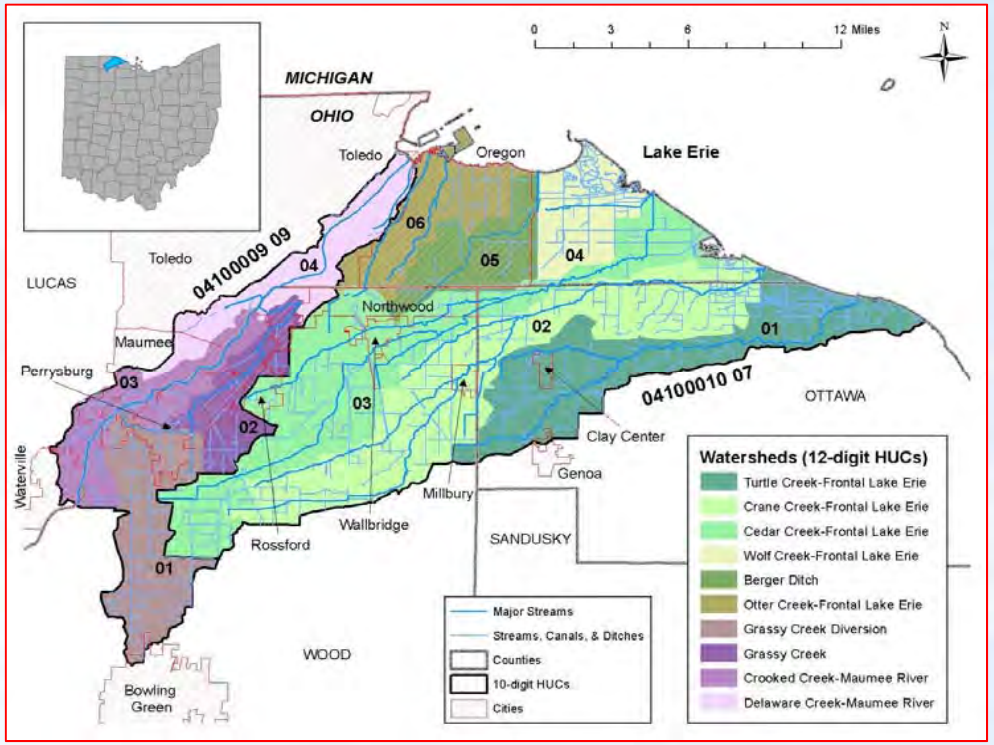
Subwatershed Approach

- **Source Data Review**
  - ***NPDES Facilities***
  - ***Storm Water (MS4 & CSO)***
  - ***Land Use***
- **Integrated Summary**

LE-LM Tributaries TMDL

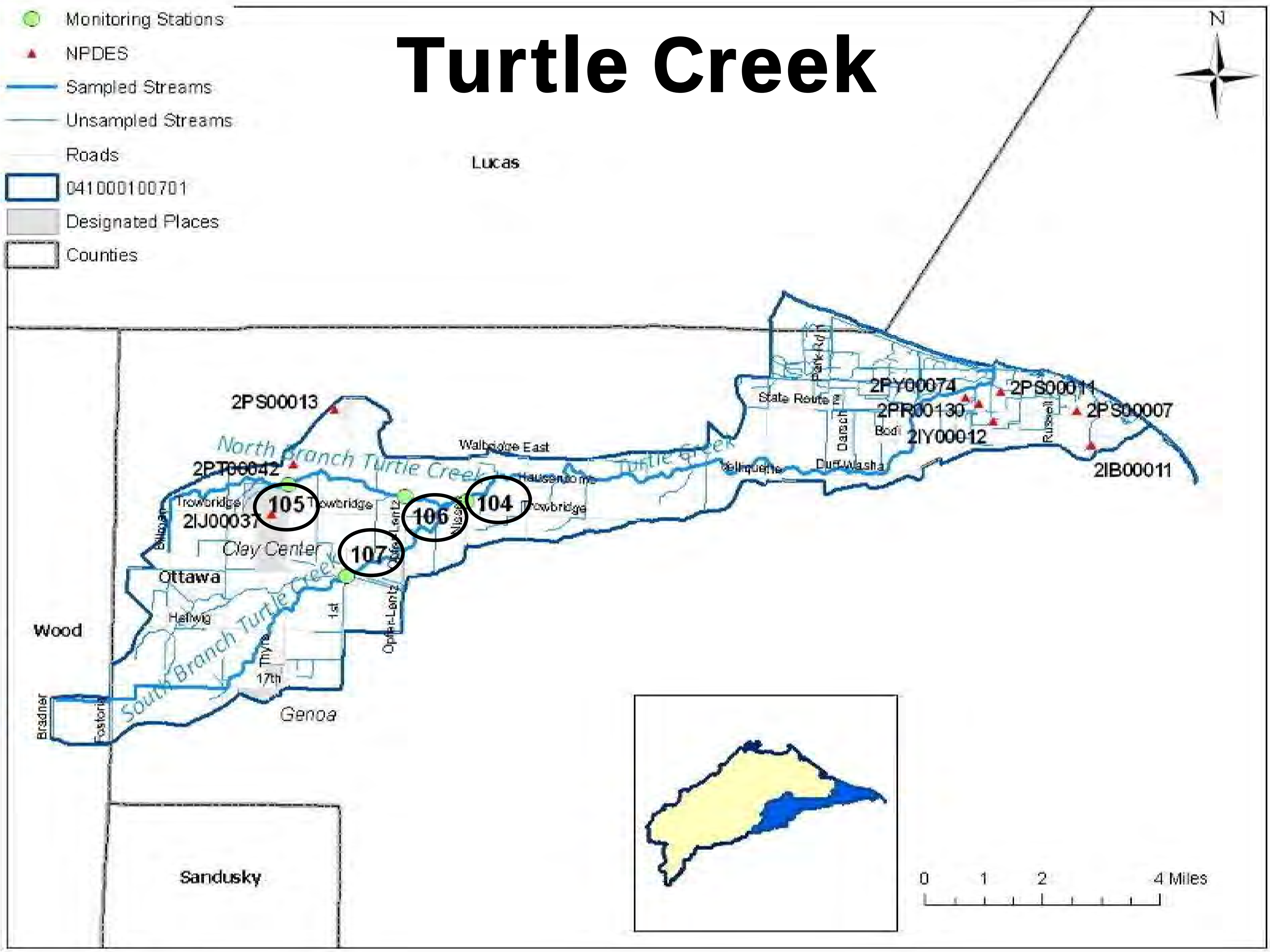
Subwatershed Approach

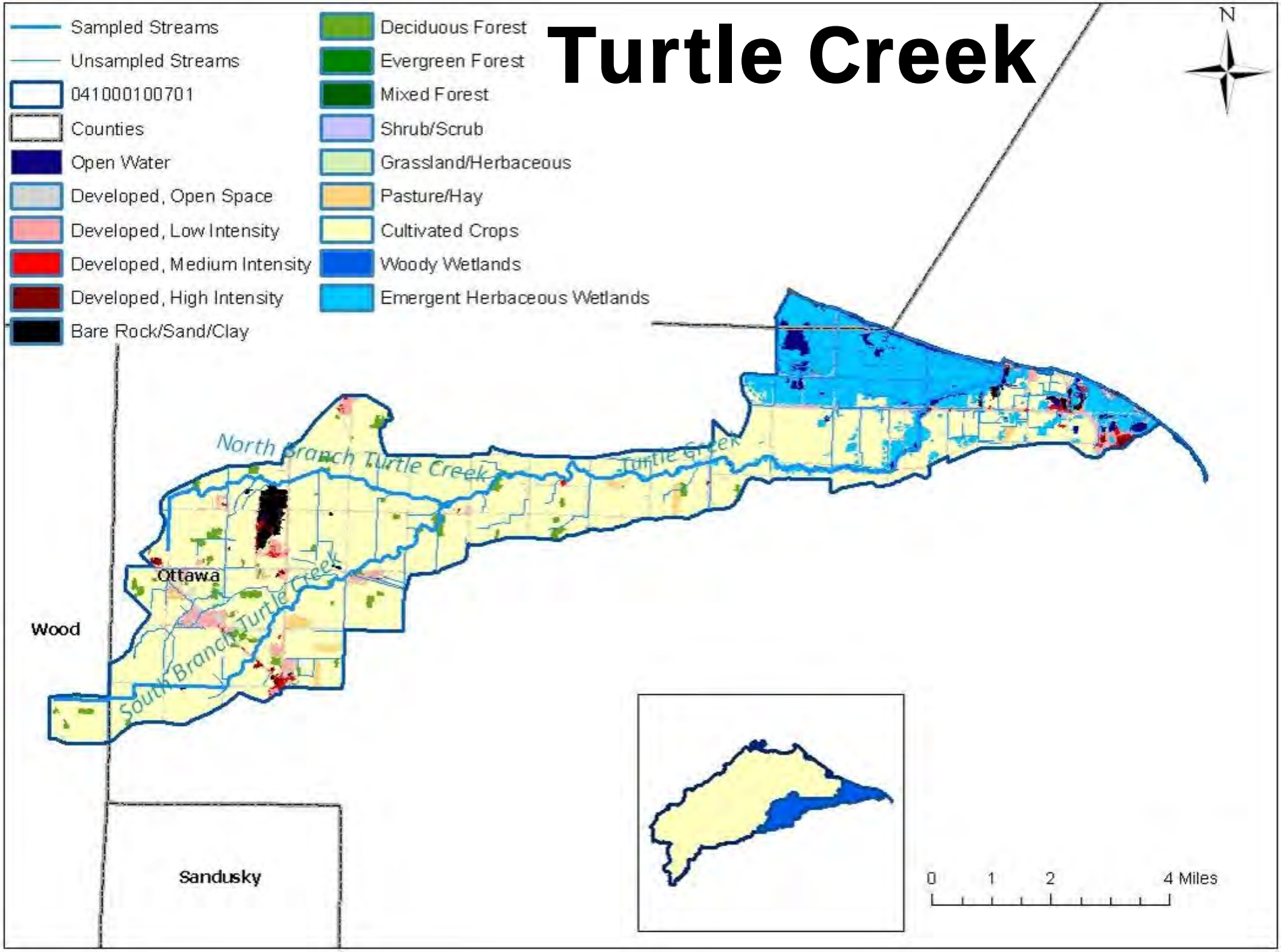
Subwatersheds	Area (sq. mi.)
Turtle Creek	40.6
Crane Creek	56.4
Cedar Creek	58.0
Wolf Creek	15.1
Berger Ditch	16.0
Otter Creek	17.9
Grassy Creek / Grassy Creek Diversion	38.4
Delaware Creek / Crooked Creek	38.1
TOTAL	280.5



Integrated Summary

Turtle Creek


Turtle Creek
Monitoring Stations
NPDES
Sampled Streams
Unsampled Streams
Roads
041000100701
Designated Places
Counties
Lucas
Wood
Sandusky
Ottawa
Clay Center
Genoa
North Branch Turtle Creek
South Branch Turtle Creek
Turtle Creek
2PS00013
2PT00042
2IJ00037
2PY00074
2PS00011
2PR00130
2PS00007
2IY00012
2IB00011
105
106
104
107
Trowbridge
Walbridge East
State Route 2
Hellwig
Thyre
17th
1st
Opfer-Lentz
Lentz
Bradner
Fostoria
Park Rd 1
Darsch
Bodi
Russell
Duff Washa
N
0 1 2 4 Miles


Turtle Creek
Sampled Streams
Unsampled Streams
041000100701
Counties
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Bare Rock/Sand/Clay
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grassland/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands
N
North Branch Turtle Creek
Turtle Creek
South Branch Turtle Creek
Ottawa
Wood
Sandusky
0 1 2 4 Miles

Integrated Summary

Turtle Creek

Impairments	Sources of Aquatic Life Use Impairment
Bacteria, Sedimentation / Siltation, Direct Habitat Alterations, Phosphorus (total), Ammonia (total), Dissolved Oxygen	Channelization, Nonirrigated Crop Production, On-site treatment systems (septic systems and similar decentralized systems)

Integrated Summary

Turtle Creek

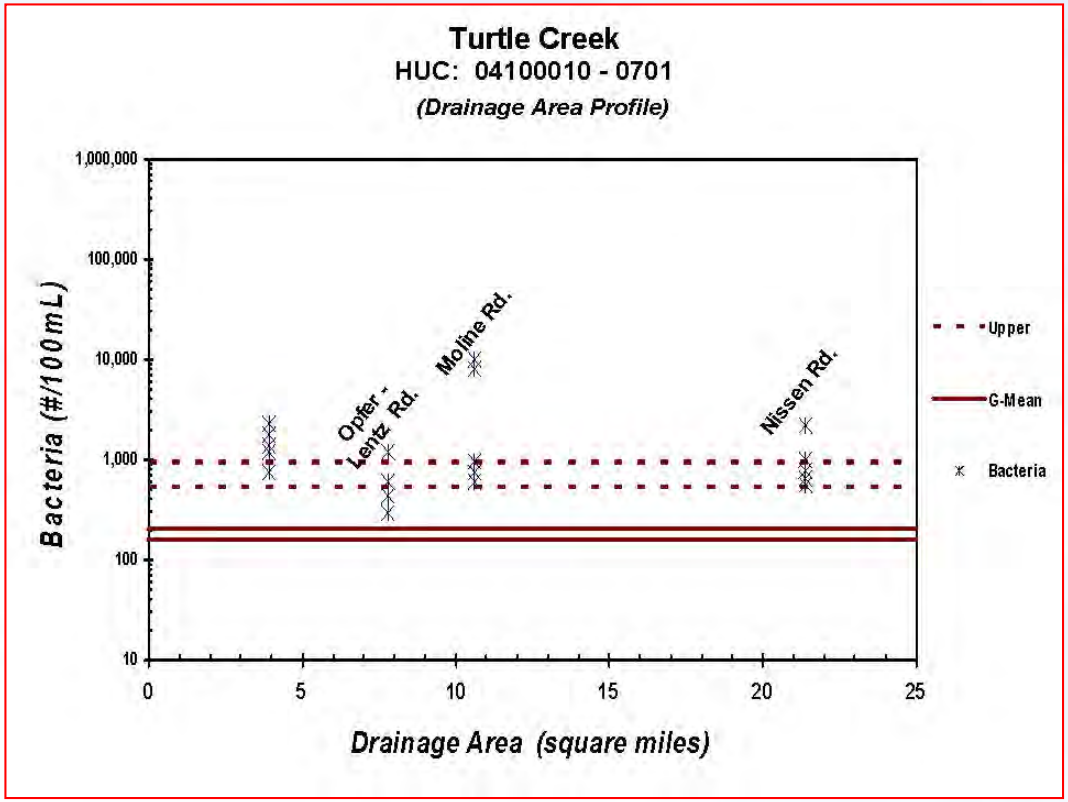
NPDES Facilities

Ohio EPA #	Type		Name
2PT00042	Municipal		Genoa Area Local Schools
2IY00012	Industrial		Carroll Water & Sewer
2PR00130	Municipal		Fenwick Marina
2PY00074	Municipal		Inland Marina & Campground
2PS00011	Municipal		Turtle Creek Marina & Campground
2IJ00037	Industrial		White Rock Quarry LP

Linkage Analysis

Turtle Creek

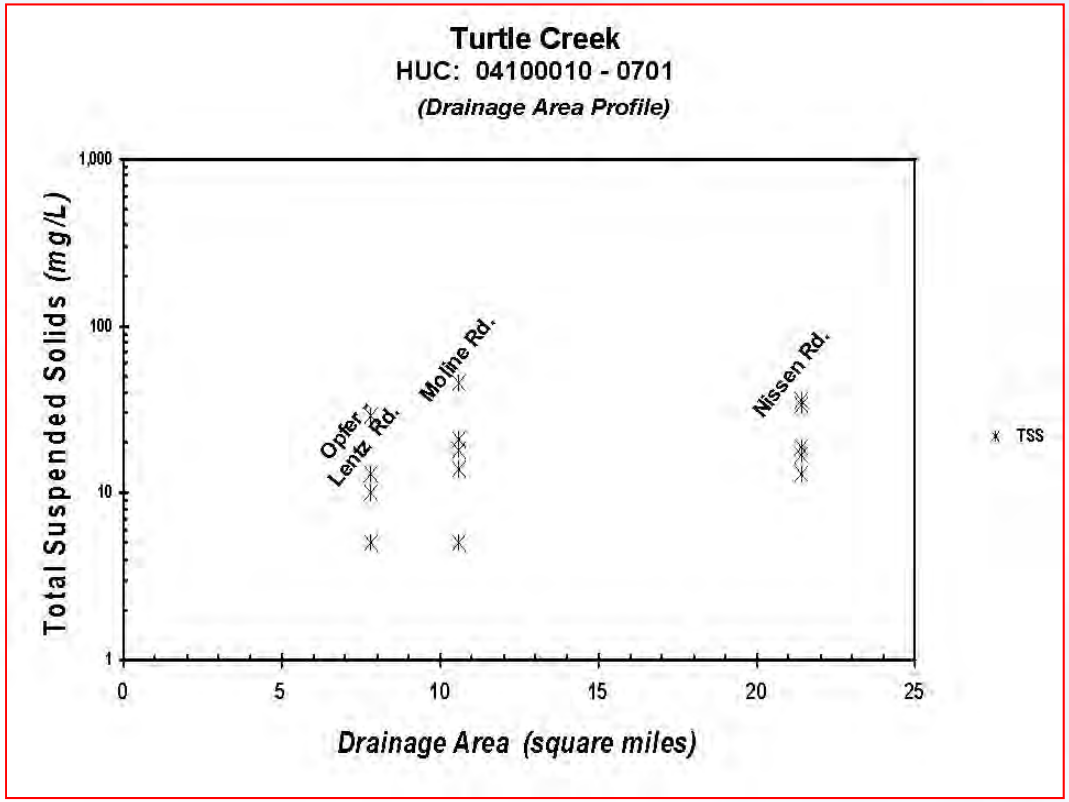
WQ Patterns *(Bacteria)*



Linkage Analysis

Turtle Creek

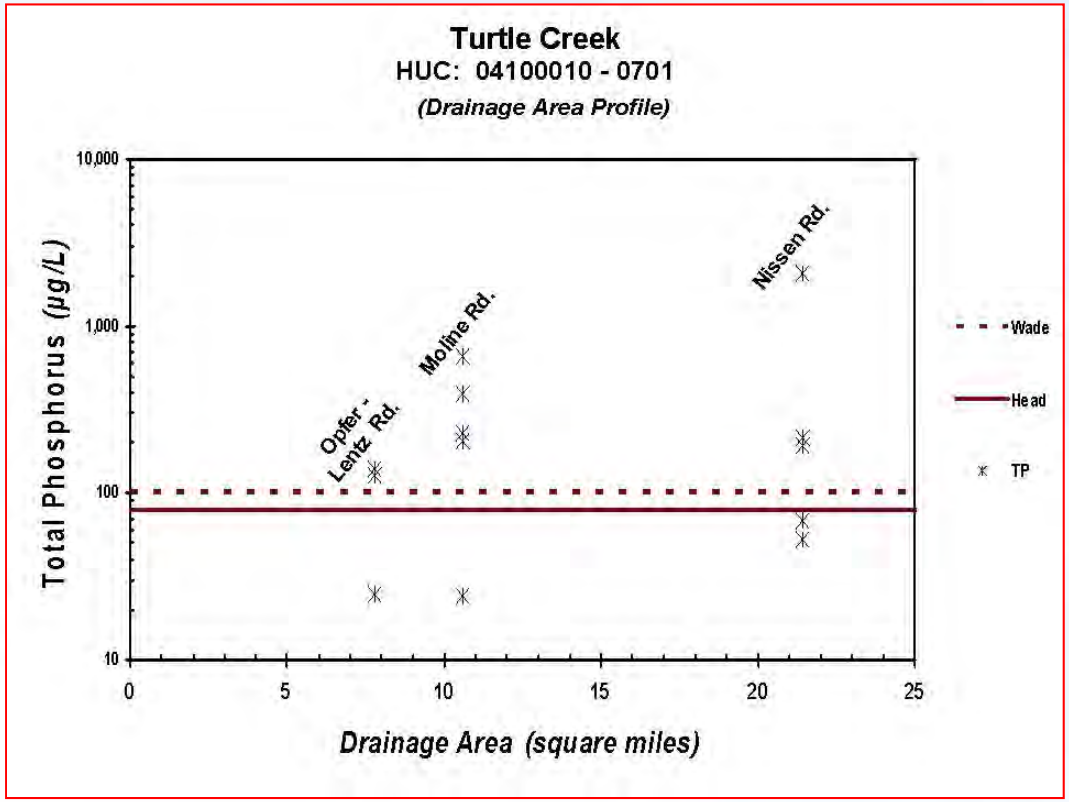
WQ Patterns *(TSS)*



Linkage Analysis

Turtle Creek

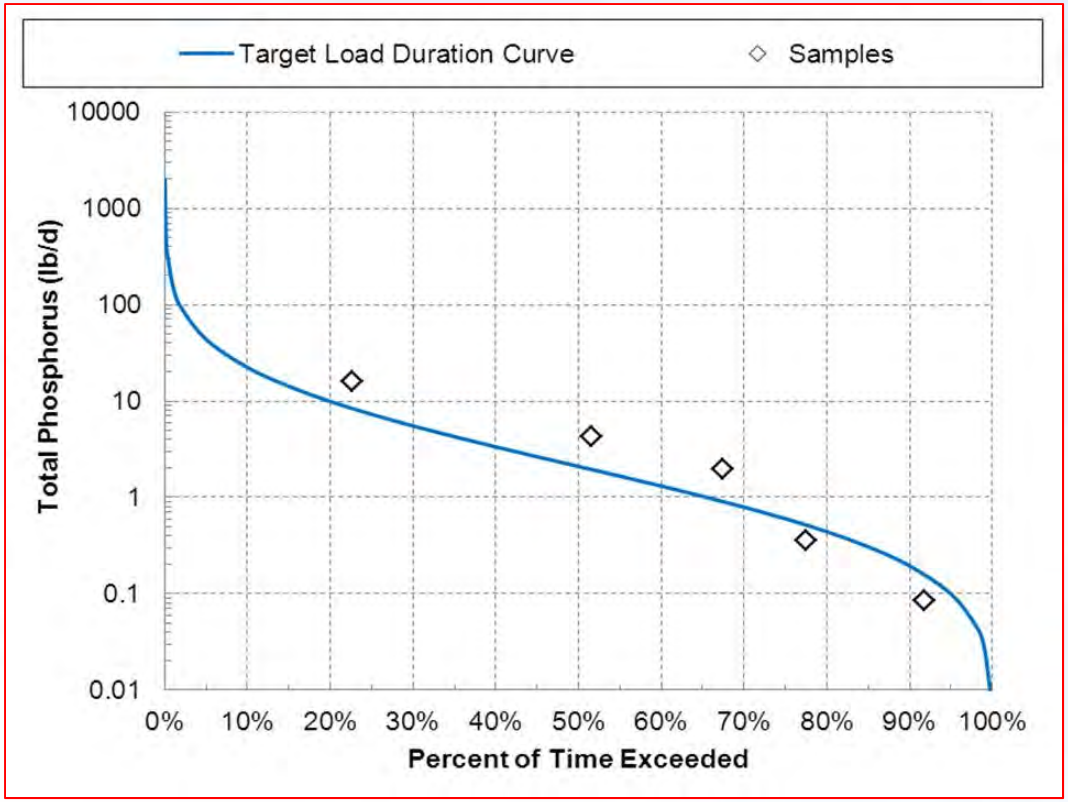
WQ Patterns *(Phosphorus)*



Linkage Analysis

Water Quality Patterns

Duration Curve Framework



TMDL Allocations

Regulatory Framework

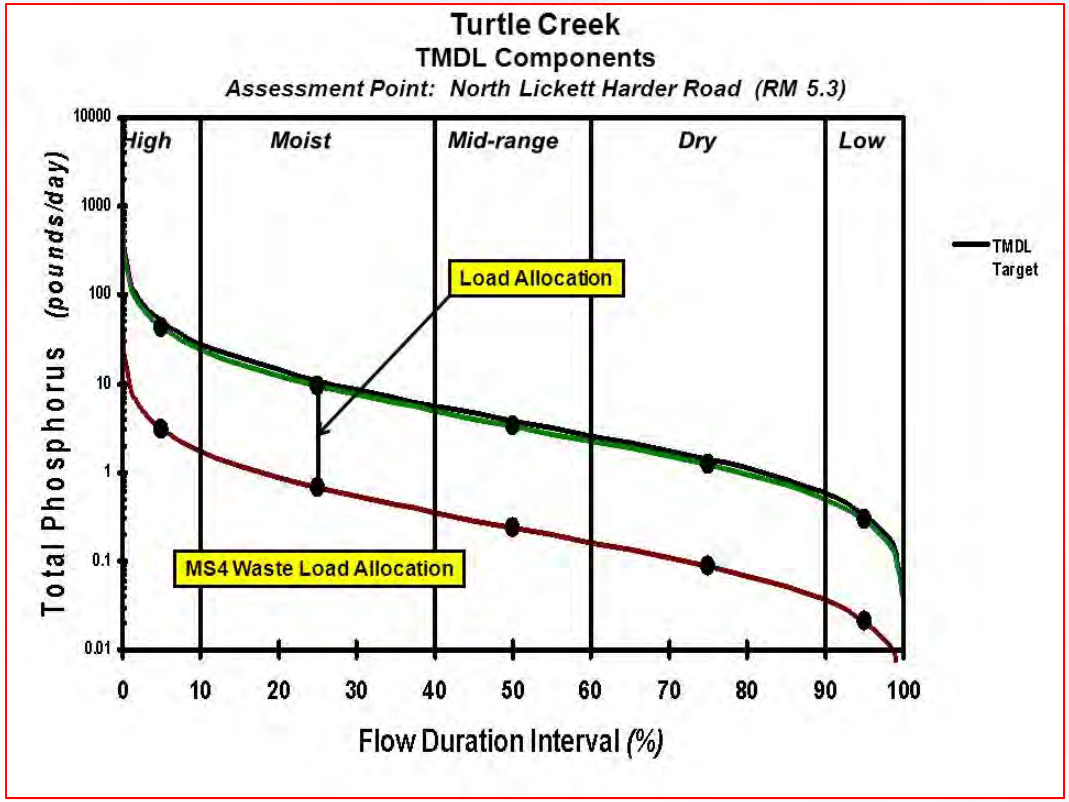
TMDL = $WLA_{Point\ Sources}$ + WLA_{MS4} + LA + MOS

Turtle Creek at North Lickett Harder Road						
Pollutant	**Allocation Category**	**High Flows**	**Moist Conditions**	**Mid-Range**	**Dry Conditions**	**Low Flows**
Total Phosphorus (lbs/day)	**LA**	**40.0**	**8.70**	**3.00**	**1.100**	**0.270**
	WLA	**3.1**	**0.67**	**0.23**	**0.086**	**0.021**
	MOS + FG	**6.9**	**1.53**	**0.55**	**0.224**	**0.050**
	TMDL = LA+WLA+MOS	**50.0**	**10.9**	**3.78**	**1.41**	**0.341**

TMDL Allocations

Regulatory Framework

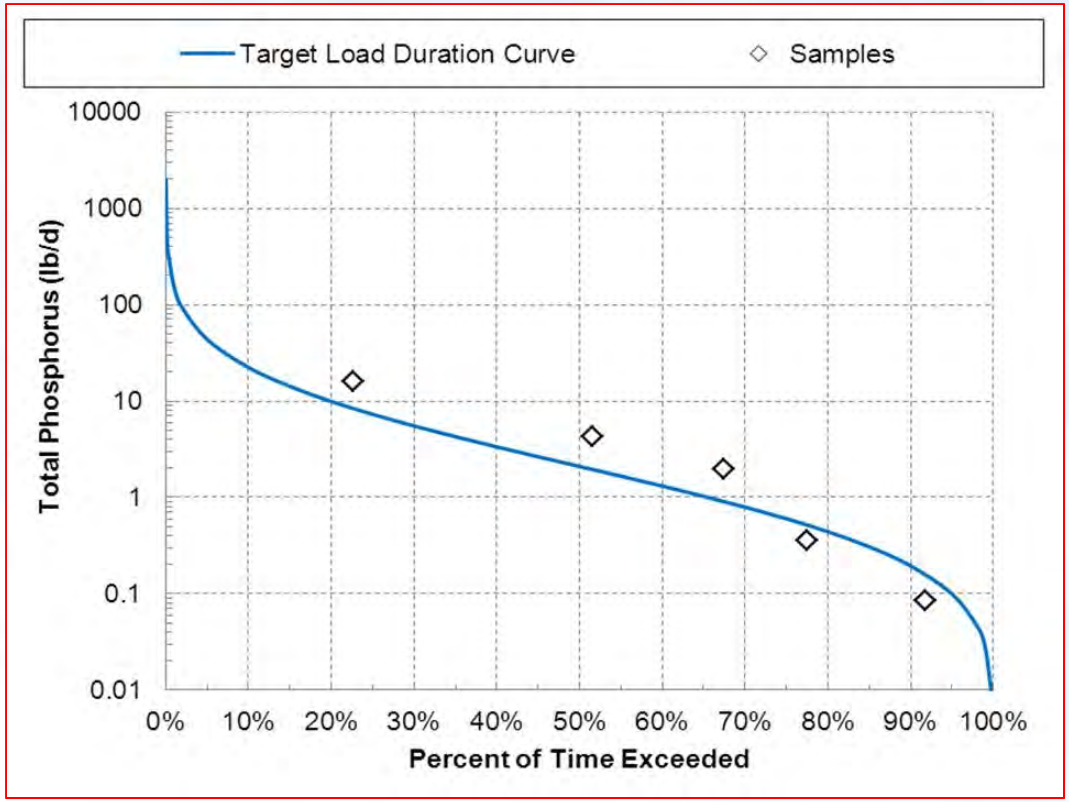
Components



Transition to Implementation

Water Quality Patterns

Guide Reduction Needs



LE-LM Tributaries TMDL

Goal of Project

- **Driving Principles**
  - ***Technically-based (logic path)***
  - ***Meaningful (easily understood)***
  - ***Value-added (connect to implementation efforts designed to solve problem)***

Implement the Solution

We want to hear your feedback!

Ohio Environmental Protection Agency

Evaluate Success

Ohio Environmental Protection Agency

Maumee River (lower) Tributaries and Lake Erie Tributaries TMDLs

Completed TMDLs for:

- Total phosphorus
- *E. coli* bacteria
- Total suspended solids
- Nitrate/nitrite
- Ammonia

Delaware Creek near Rohr Drive

Ohio Environmental Protection Agency

Implementation: What to do…

- Point sources: total phosphorus
  - Recommend some facilities receive TP limits
  - Some being tied in (TMACOG 208 plan)
- Nonpoint sources: What will reduce nutrients and sediment?
  - Storm water best management practices
  - Vegetated buffers?
  - Grassed waterways?
  - No-till farming?

Ohio Environmental Protection Agency

Contact Information

Beth Risley
Division of Surface Water, Central Office
P.O. Box 1049
Columbus, OH 43216
(614) 728-2384
beth.risley@epa.state.oh.us

Cherie Blair
Division of Surface Water, Northwest District Office
347 N. Dunbridge Rd.
Bowling Green, OH 43402
(419) 352-3010
cherie.blair@epa.state.oh.us

Public review period:

May 9 through June 11

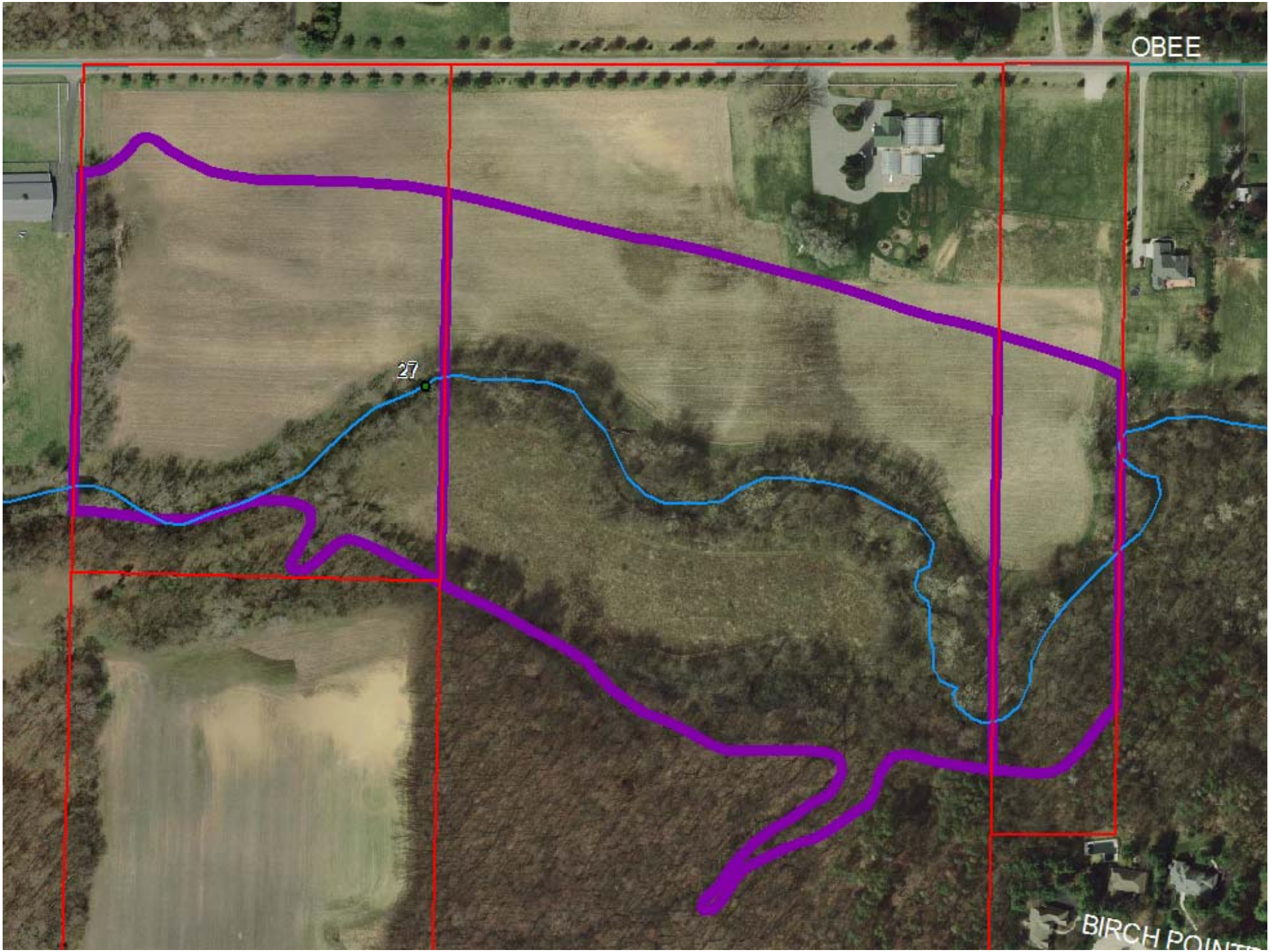
Send comments to Cherie

http://www.epa.ohio.gov/dsw/tmdl/MaumeeLowerLakeErieTributariesTMDL.aspx

Ohio Environmental Protection Agency

Swan Creek
OEPA Section 319(h) grant

- Swan Creek watershed
- Waterville Township
- Approximately 10 acres


OBEE
27
BIRCH POINT

Swan Creek
OEPA Section 319(h) grant

- Stream stabilization
  - Increased buffer
  - Habitat improvement
  - Stabilization

Swan Creek
OEPA Section 319(h) grant

- Stream stabilization
  - Increased buffer
  - Habitat improvement
  - Stabilization

Swan Creek
OEPA Section 319(h) grant

- Floodplain
  - Vernal pools
  - prairie

Swan Creek
OEPA Section 319(h) grant

- Project partners
  - TMACOG
  - Lucas SWCD
  - Wheeler farms
- Timeline
  - Design – fall/winter 2012/2013
  - Construction – Summer 2013
- Funding
  - $80,000 federal grant funds
  - $54,000 local match
    - $134,000 total

Interactions Between Human Decisions, Biophysical Processes, & Ecosystem Services in the Maumee Watershed & Bay

Jay Martin, FABE
Elena Irwin, AEDE
Stuart Ludsin, EEOB
Erik Nisbet, COMM.
Seyoum Gebremariam, FABE-EEOB
Brian Roe, AEDE
Eric Toman, SENR
Robyn Wilson, SENR
Carlo DeMarchi, CWRU

http://ohioseagrant.osu.edu/maumeebay/

THE OHIO STATE UNIVERSITY

NSF

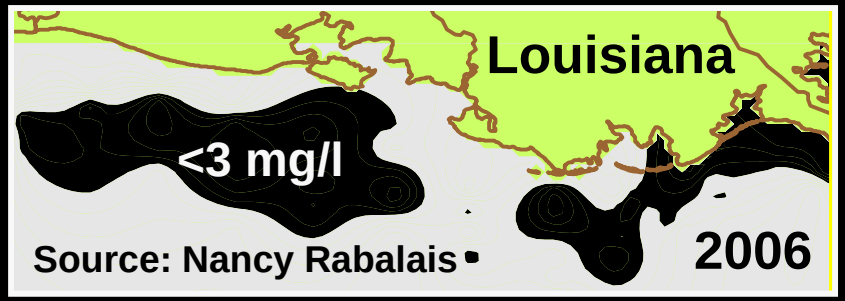
WESTERN RESERVE UNIVERSITY · CASE · 1826

Today's Presentation

- Conceptual Foundation
- Research Questions
- Maumee River Watershed as a Model Ecosystem
- Project Expectations & Methods

Conceptual Foundation

- Non-point source inputs of nutrients & sediments can:
  - Reduce water clarity
  - Increase harmful algal blooms (HABs)
  - Reduce habitat quality (e.g., dead zones)



Conceptual Foundation

- Threat to ecosystem services expected to worsen with continued climate change:
  - Expected increases in sediment & nutrient runoff
    - Wetter winters & springs
    - Increased storm frequency
  - Expected increases in temperature
    - Longer growing seasons
    - Stronger thermal stratification
  - Reduced downstream habitat quality
    - Increased HAB production
    - Reduced water clarity
    - Increased “dead zone” formation

Conceptual Foundation

- Can we stop this progression toward eutrophication?
  - Best management practices offer potential
    - Conservation tillage, controlled drainage, riparian buffers
  - Policymakers have been reluctant to mandate them & voluntary farmer adoption has been limited
    - Secchi et al. (2008)
  - Understanding of the exact sources of P is lacking
    - hence, the name “non-point” source pollution
  - Understanding of human behavior also lacking
    - farmers, policymakers, & general public

Today's Presentation

- Conceptual Foundation
- Research Questions
- Maumee River Watershed as a Model Ecosystem
- Project Expectations & Methods

Central Research Questions

Can changes in upstream public attitudes, policies, & farmer behavior offset the anticipated negative impacts of climate change on downstream ecosystem services?

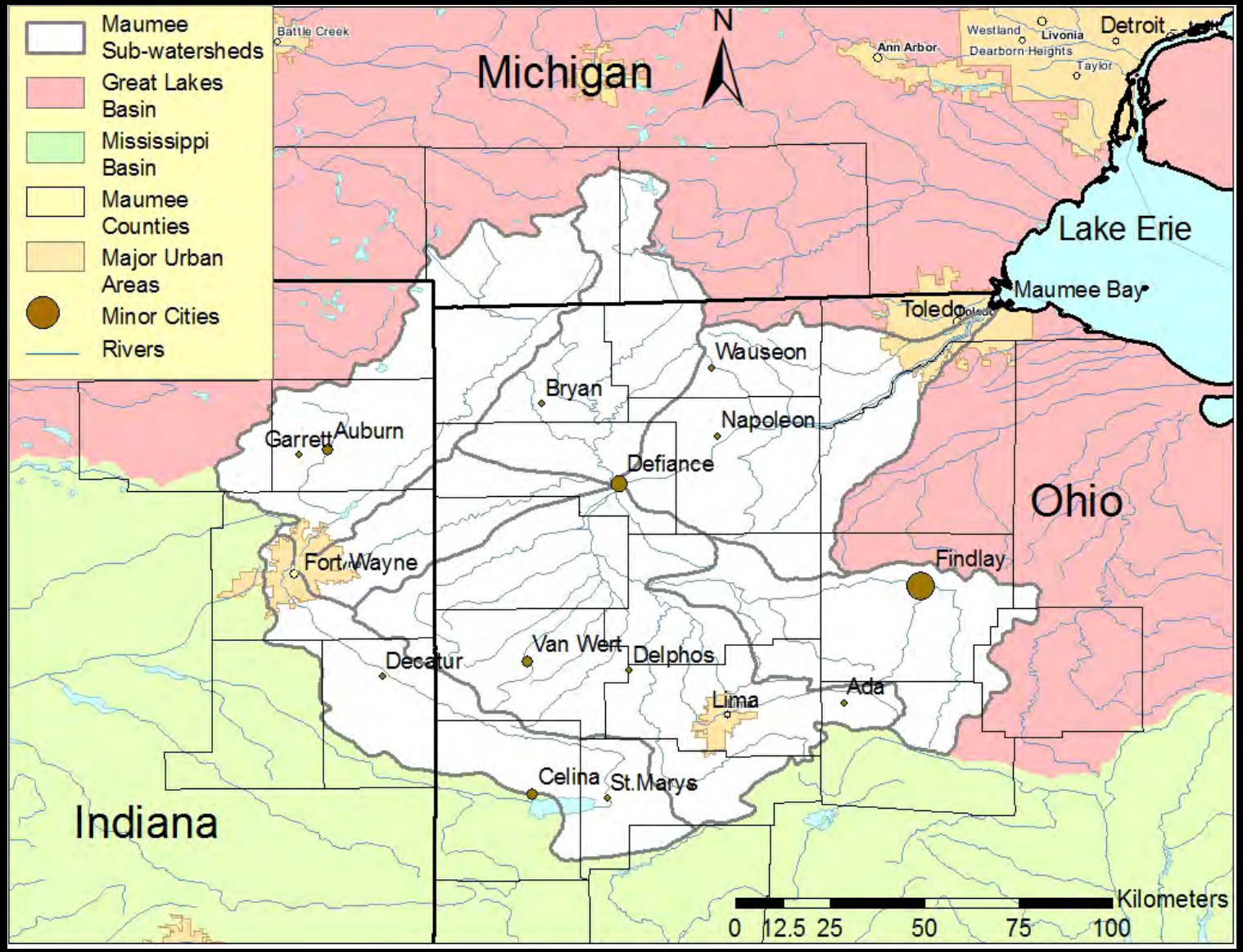
- Human behavior in the upstream watershed can drive downstream ecosystem conditions, but how do downstream conditions feed back to influence attitudes & behaviors of those living upstream?
- To what extent do policies, public opinion, & changing ecological conditions influence farmer land-use & how will this feed back to influence management decision-making?
- Will human behavior across the watershed or external climate forces have a larger impact on future watershed-water body interactions?

Today's Presentation

- Conceptual Foundation
- Research Questions
- Maumee River Watershed as a Model Ecosystem
- Project Expectations & Methods

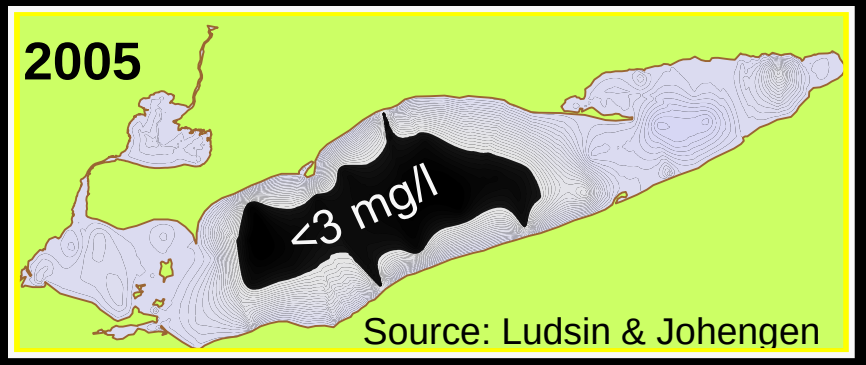
Model Ecosystem

- Maumee River watershed



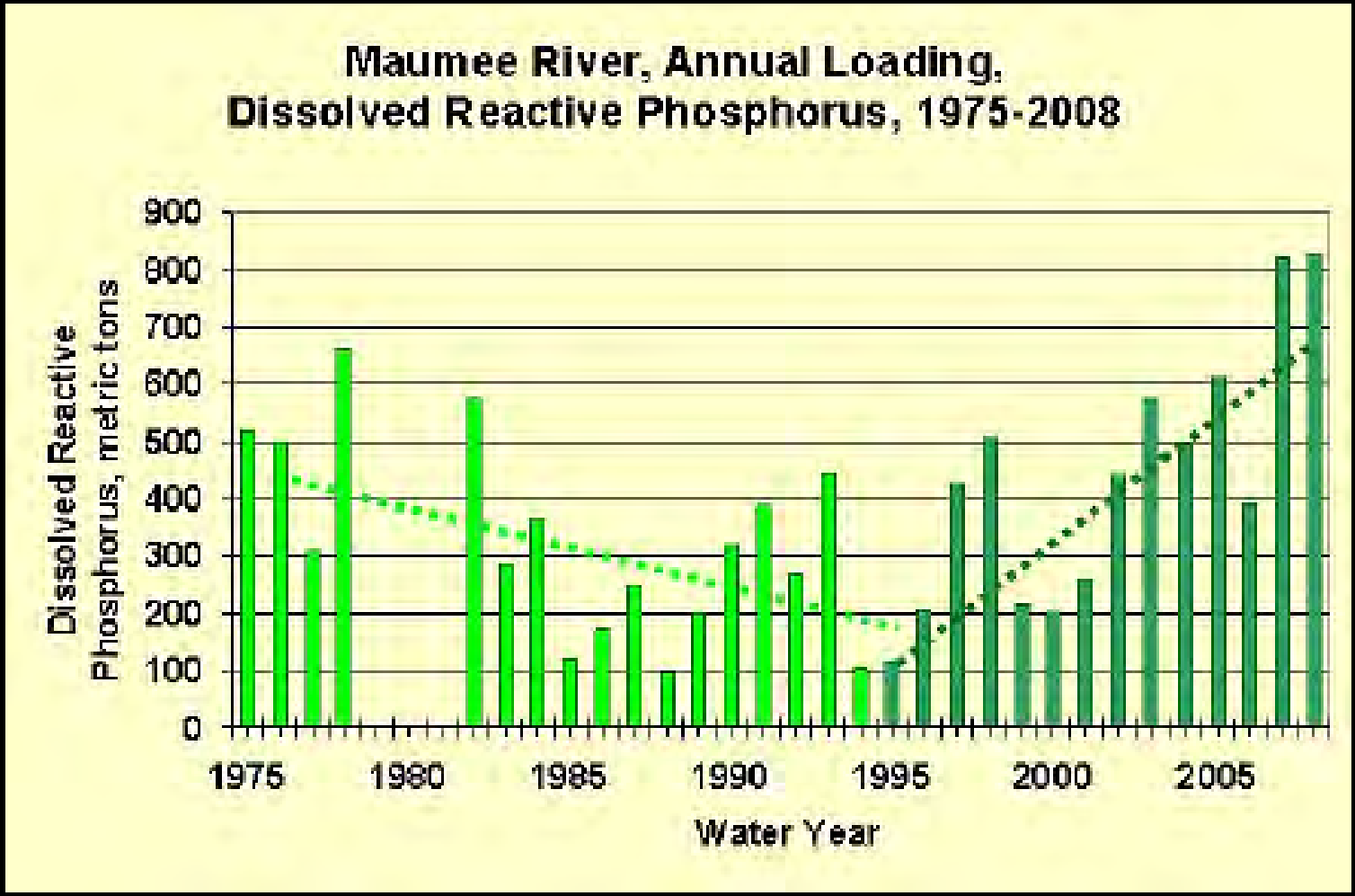
Model Ecosystem

- Showing symptoms of eutrophication



Model Ecosystem

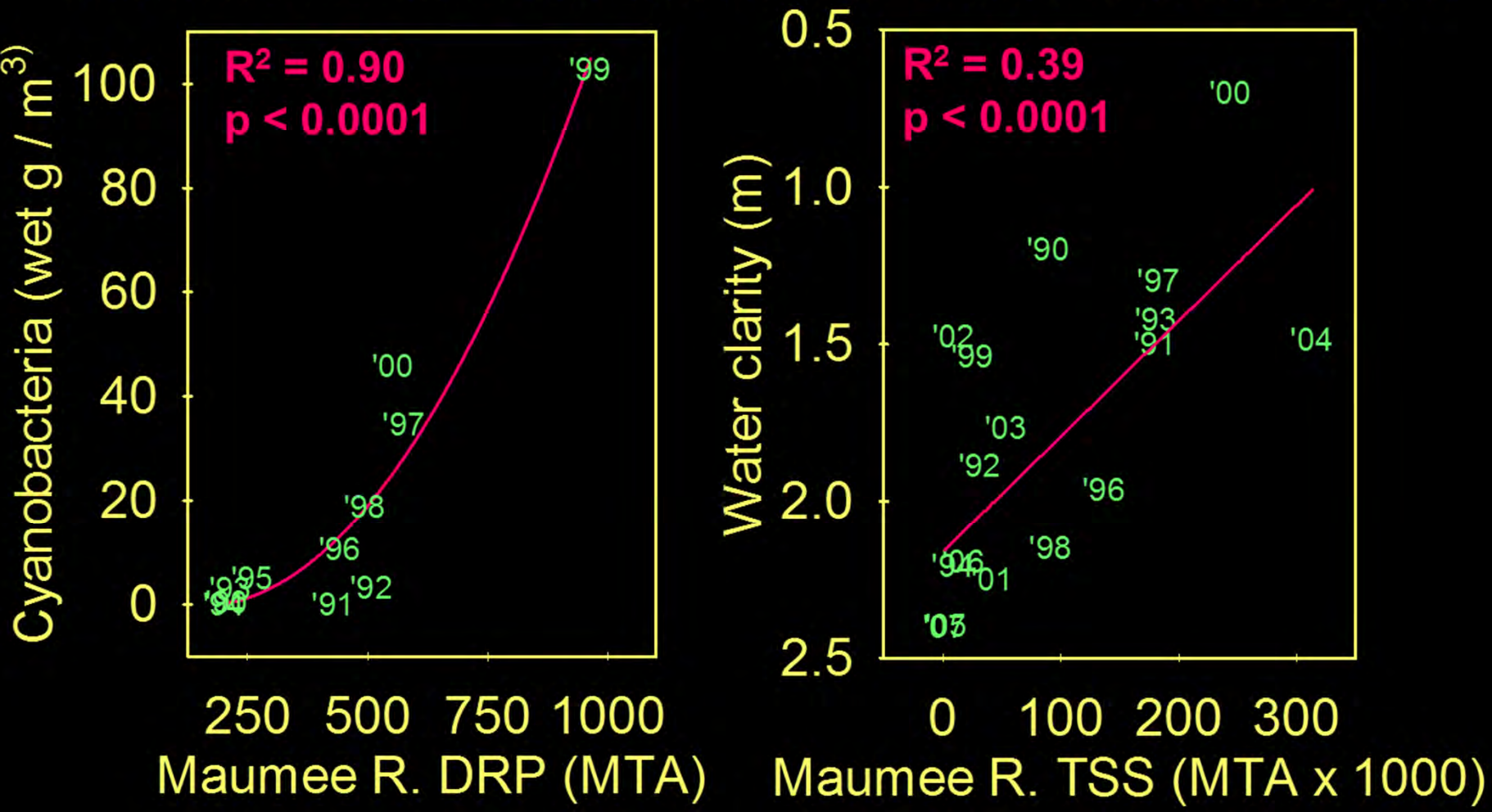
- Increase in bioavailable P (dissolved reactive P)
  - Agricultural is thought to be significant contributor



Ohio Lake Erie Phosphorus Task Force Final Report (2010)

Model Ecosystem

- Precipitation-driven, non-point source inputs from Maumee R. drive downstream Lake Erie conditions

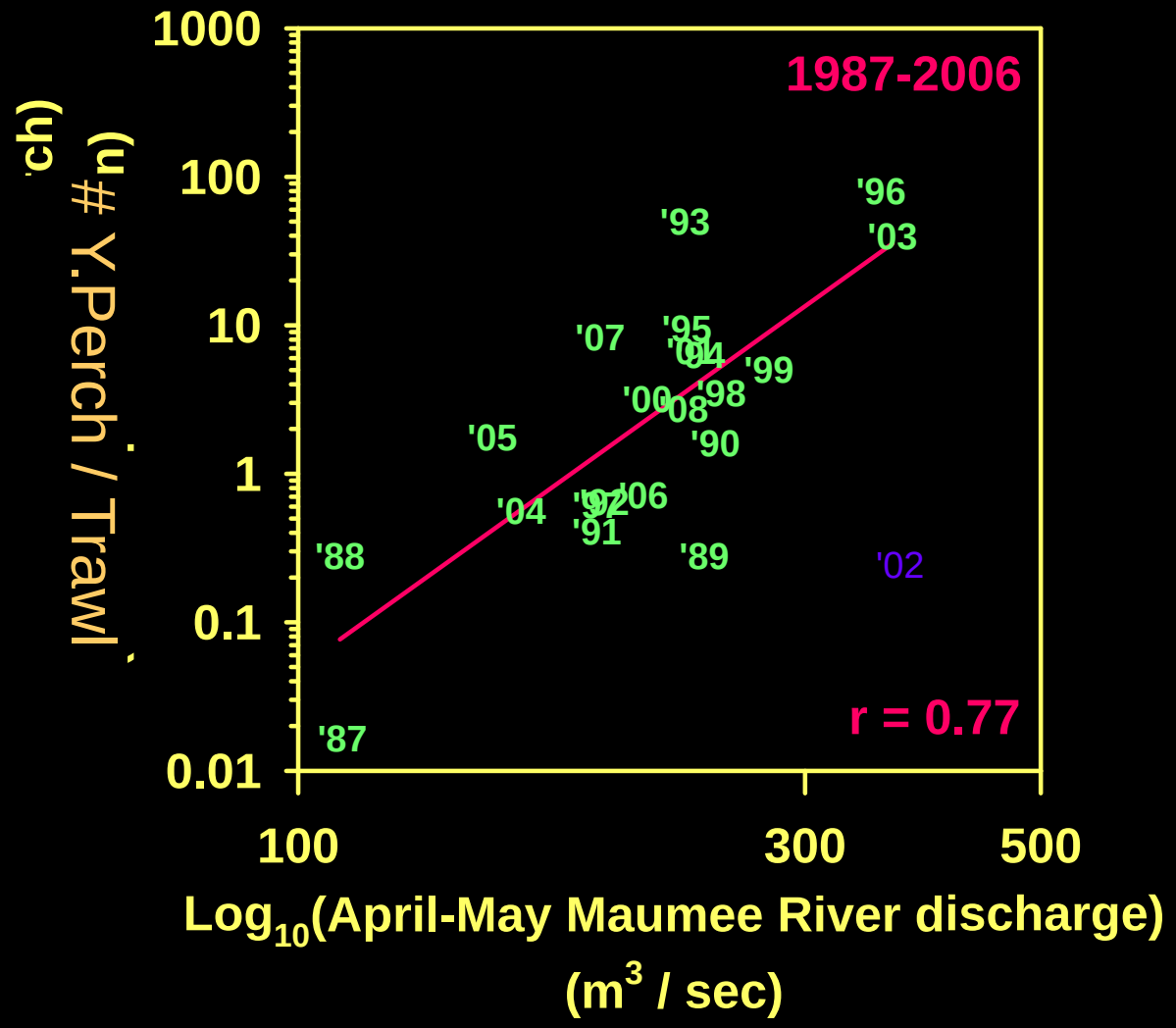


Ohio Lake Erie P Task Force (2010)

K. Pangle & S. Ludsin, unpub. data

Model Ecosystem

- Maumee River inputs drive fishery dynamics



Ludsin et al. (2011)

Model Ecosystem

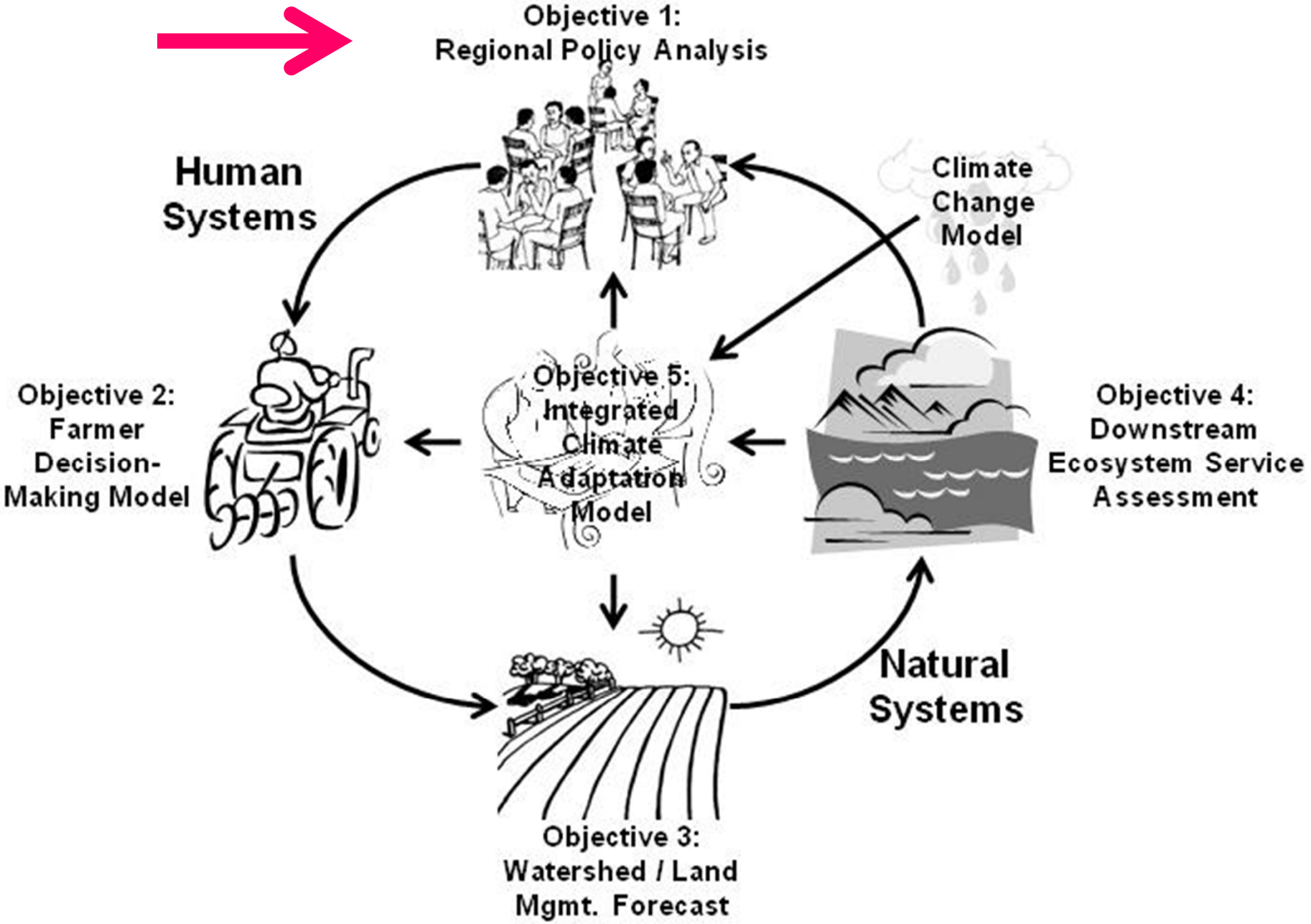
- Continued changes in meteorology are expected
  - Precipitation increases expected to continue
    - During winter (fallow period) & spring (planting period)
    - Doubling of single & multi-day storm events
  - Warming expected to continue
    - Summer: 3 – 11ºC; Winter: 3 – 7ºC
    - Longer growing season (33-88 days)

Kling et al. (2003)

Today's Presentation

- Conceptual Foundation
- Research Questions
- Maumee River Watershed as a Model Ecosystem
- Project Expectations & Methods

Project Methods



Project Methods

- Obj. 1: Regional Policy Assessment

  - Toman, Nisbet, Ludsin, Martin

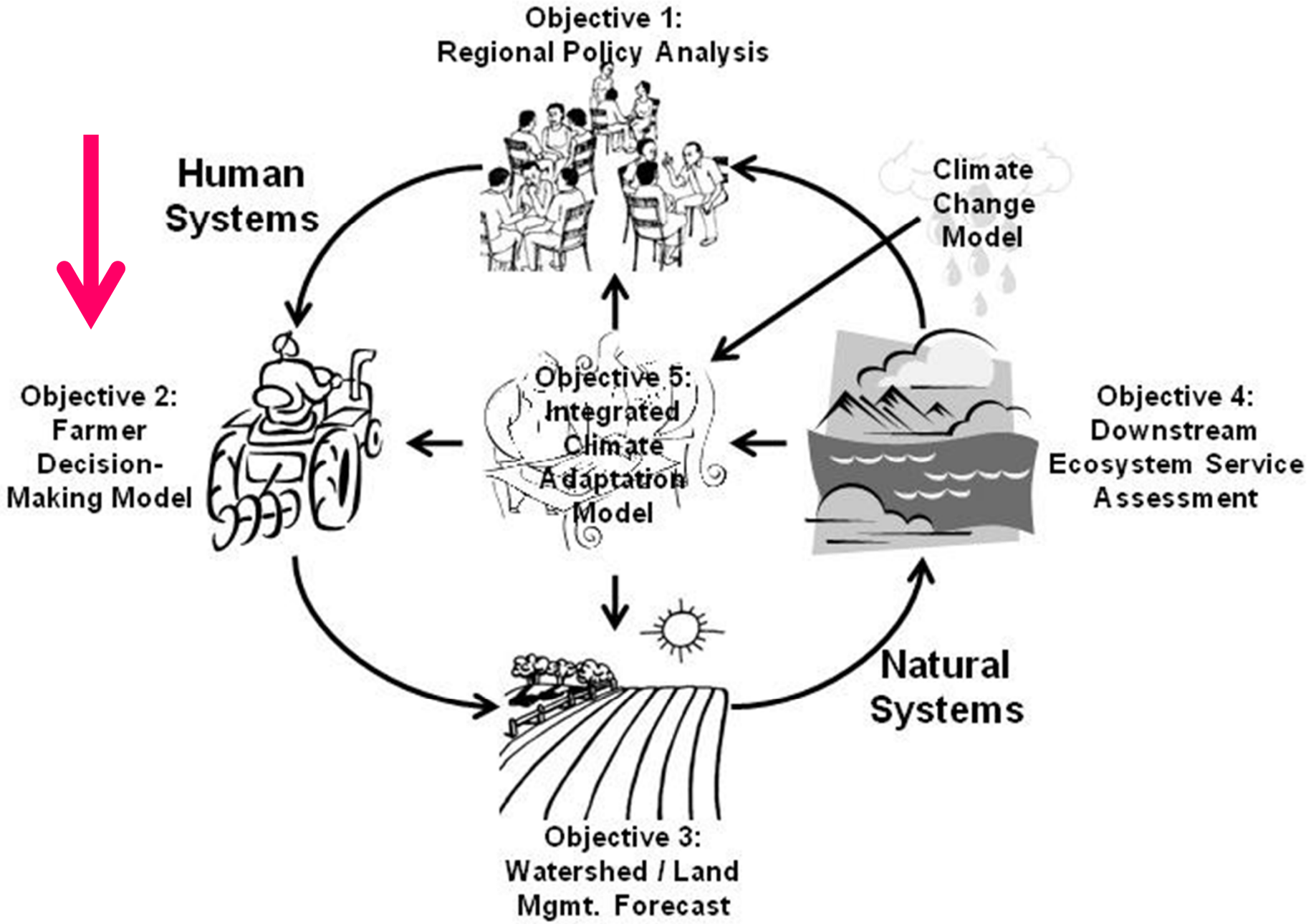
Primary Goal

A model that predicts the influence of individual attributes, local conditions, & downstream ecological conditions on farmer & policy-maker attitudes towards land-use practices and policies (BMPs)

Methods

(1) 16 focus groups with key stakeholder(s)
(2) In-depth interviews with managers & policy-makers
(3) Mail survey

Project Methods



Project Methods

- Obj. 2: Farmer Decision-Making Model
  - Wilson, Irwin, Roe

Primary Goal

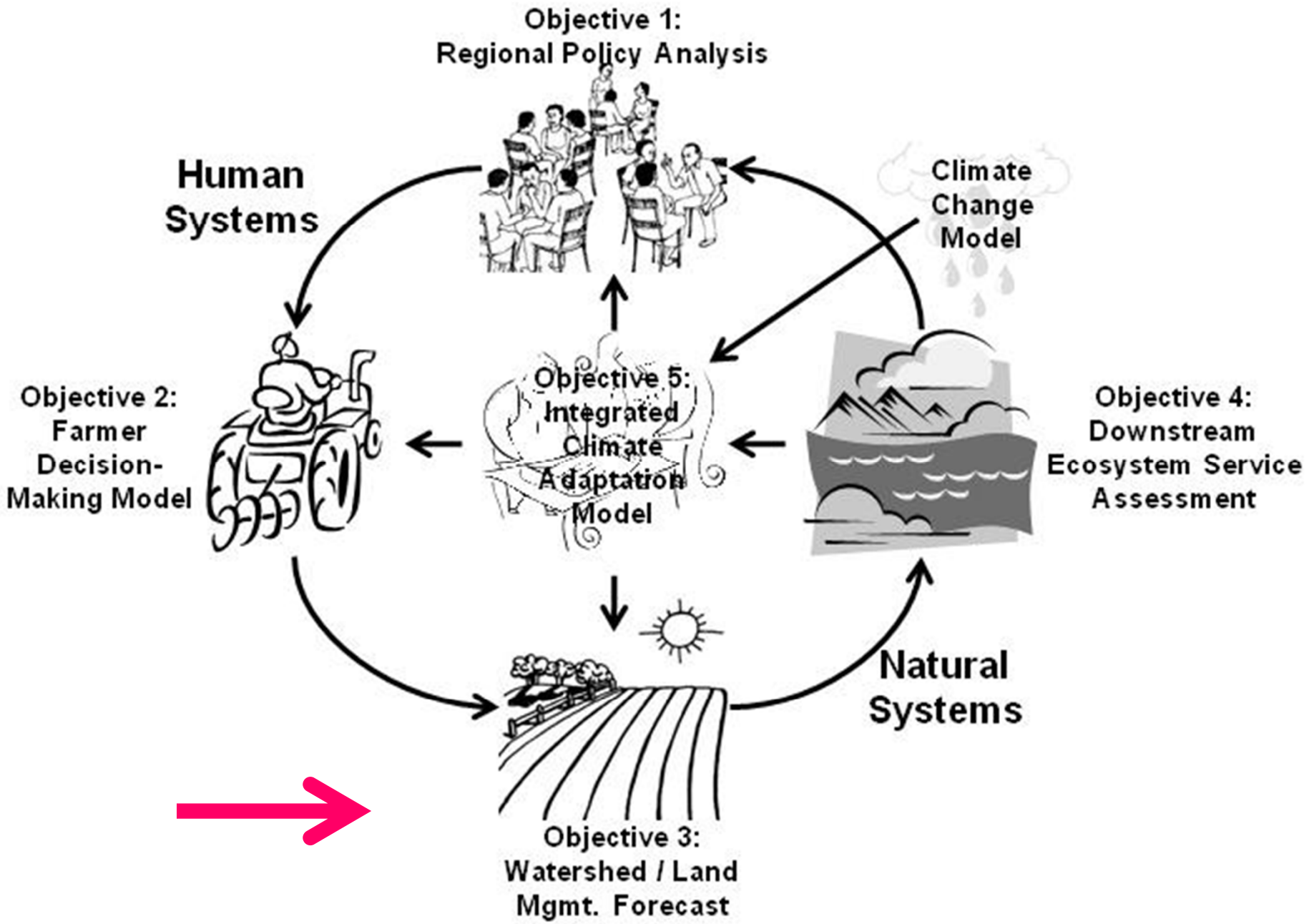
A quantitative model that predicts farmer land-use & policy decision-making from socio-demographic & environmental contextual factors

Methods

Farmer mail survey

- Identify factors that influence farmer decision-making
  Develop decision-making rules
  - Given policy change x, how will farmer decision-making change?

Project Methods



Project Methods

- Obj. 3: Spatially-explicit Behavioral Model
  - Irwin, Wilson, Roe

Primary Goal

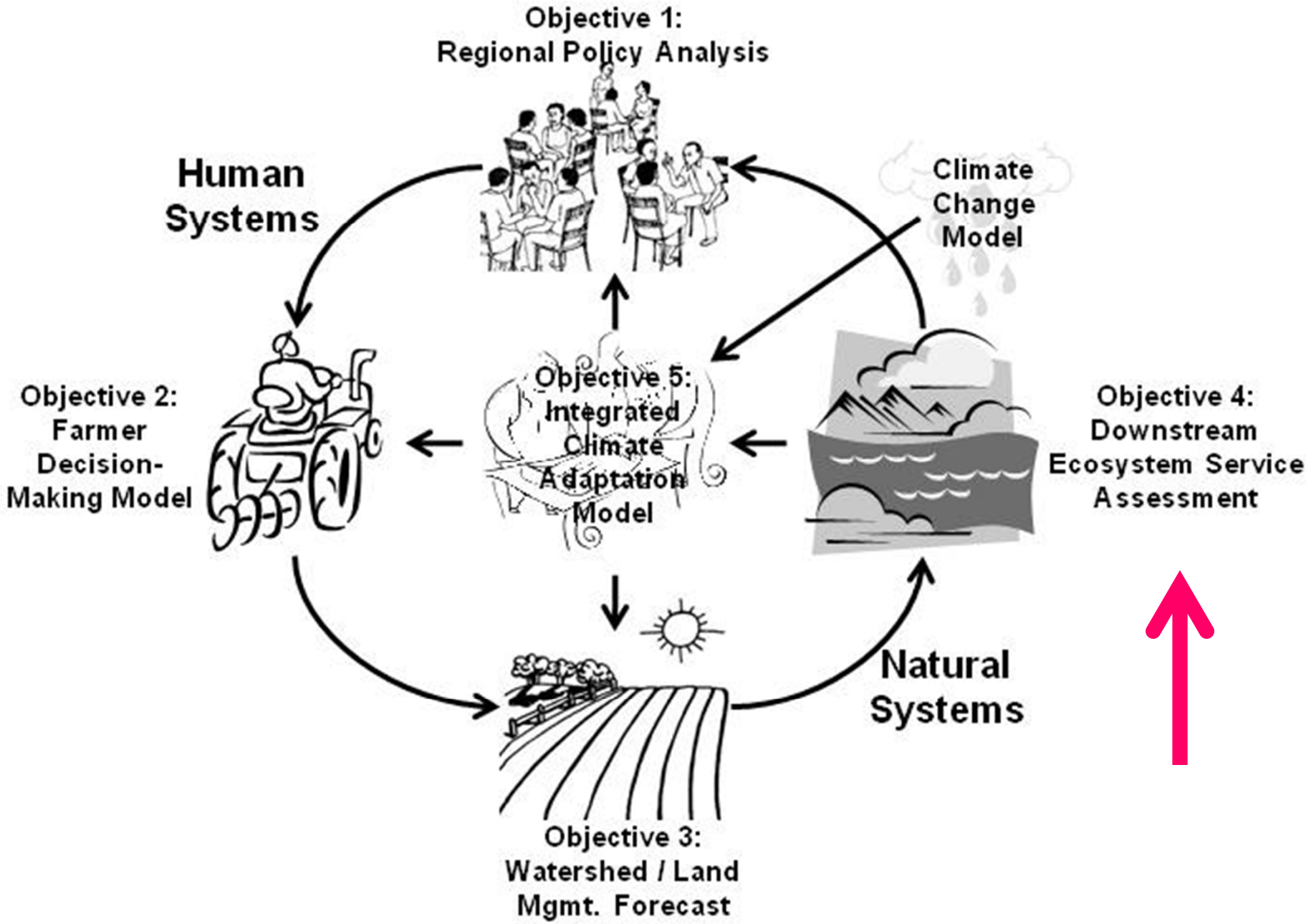
Spatial model that can forecast agricultural land-use outcomes across the watershed based on behavioral, other individual, local, & downstream environmental attributes

Methods

Develop spatially-explicit land-cover models

- predict land-use & management outcomes as a continuation of past spatial trends & behavior

Project Methods



Project Methods

- Obj. 4: Biophysical Model (DeMarchi, Ludsin, Martin)

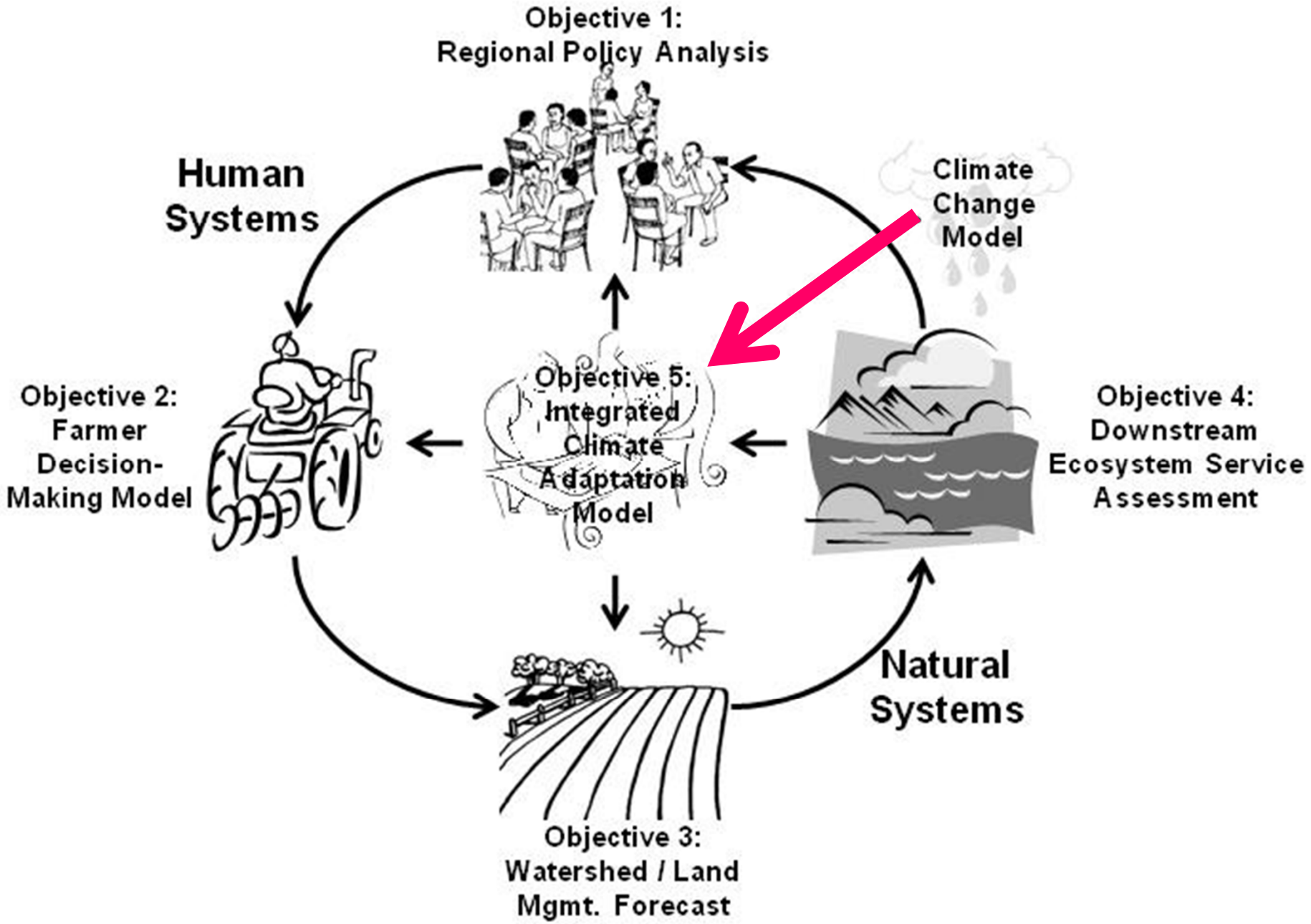
  Primary Goals

  1. A biophysical model to predict downstream ecosystem change as a function of climate & agricultural land management
  2. Identify “hot spots” in the watershed that have a disproportionate effect on the downstream ecosystem conditions (sources of sediment & nutrients)

  Methods

  1. Modify a Maumee River watershed/hydrology model to simulate transport of sediments & nutrients
  2. Refine statistical models that predict western Lake Erie water clarity, HABs, and fish production from Maumee River discharge & TSS/nutrient loading

Project Methods



Project Methods

- Obj. 5: Integrated Climate Adaptation Model

  - Martin, Ludsin, DeMarchi, Nisbet, Irwin, Wilson, Toman

Primary Goals

1. Discern the relative roles of farmer behavior, policy implementation, & climate change in driving downstream Lake Erie ecosystem services

   - Water clarity, HABS, & fish production

2. Learn if managers can offset expected climate change consequences through policies & behavioral modification

Thanks for your attention!

Project Website

http://ohioseagrant.osu.edu/maumeebay/

Teaching & Learning Collaborative

NSF

OHIO DIVISION OF WILDLIFE

Michigan Dept. of Natural Resources

NATIONAL WILDLIFE FEDERATION

Partners for Clean Streams

Sea Grant
Ohio Sea Grant College Program

Ontario

Pennsylvania Fish and Boat Commission

Eastern Maumee AOC Wetland & Riparian Inventory and Restoration Plans

Timothy L. Walters, EnviroScience

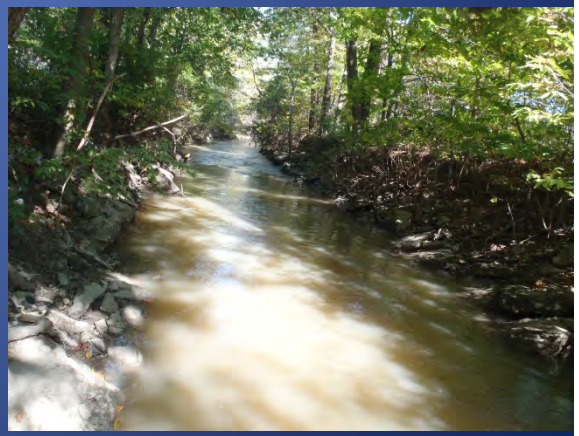
The Inventory

- Summary of potential riparian and wetland restoration projects for the Eastern portion of the Maumee AOC

- Focused on improving 3 BUI's
  - BUI #3 - Degraded fish and wildlife populations
  - BUI #6 - Degradation of benthos
  - BUI #14 - Loss of fish and wildlife habitat

- Companion volume to the Swan & Ottawa River Inventory (2008).
  - Prepared for Partners for Clean Streams
  - 2 projects from inventory are going forward

… so far.



Funding

- Provided by U.S. EPA and the Great Lakes Restoration Initiative, this through the US Environmental Protection Agency as requested by the Ohio Environmental Protection Agency.

Great Lakes RESTORATION

Prepared by

Tetra Tech Inc., The Mannik & Smith Group and EnviroScience, Inc.

Data Sources	Lucas	Ottawa	Wood	Sandusky
2006 OSIP Aerials	X	X	X	X
Elevation				
1/3 Arc USGS DEM (10m)	X	X	X	X
2006 OSIP LIDAR	X	X	X	X
County Data				
Parcels	X	X	X	X
Street Centerlines	X	X	X	X
Soils 05'	X	X	X	X
Streams	X	X	X	X
Land Use	X	X	X	X
Park Lands	Metroparks			X
OWI	X	X	X	X
NWI (Ducks Unlimited)	X	X	X	X
Local	X			
Biodiversity Database				
Plant	X	X	X	X
Animal	X	X	X	X
Managed Areas	X	X	X	X
Ecological Information				
NWI Wetlands w/OEPA attributes	X	X	X	X
Potential Vernal Pool Restoration Areas	X	X	X	X
National LandCover Data - Canopy	X	X	X	X
National LandCover Data - Impervious	X	X	X	X
National LandCover Data - Landcover	X	X	X	X
Great Lakes CARL 08	X	X	X	X
BSC Easements	X	X	X	X
Migratory Bird Stopover Sites	X	X	X	X
Hydrology				
Flood Zones	X	X	X	X
Watersheds	X	X	X	X
National Hydrologic Dataset	X	X	X	X

Project Team

- Comprised of:
  - Conservation agencies
  - Local government, county soil & water agencies
  - Ohio EPA
- Provided:
  - Knowledge of current techniques within the watershed
  - First hand knowledge of current activities
  - Knowledge of current policies/ local concerns

Two Weighted Models

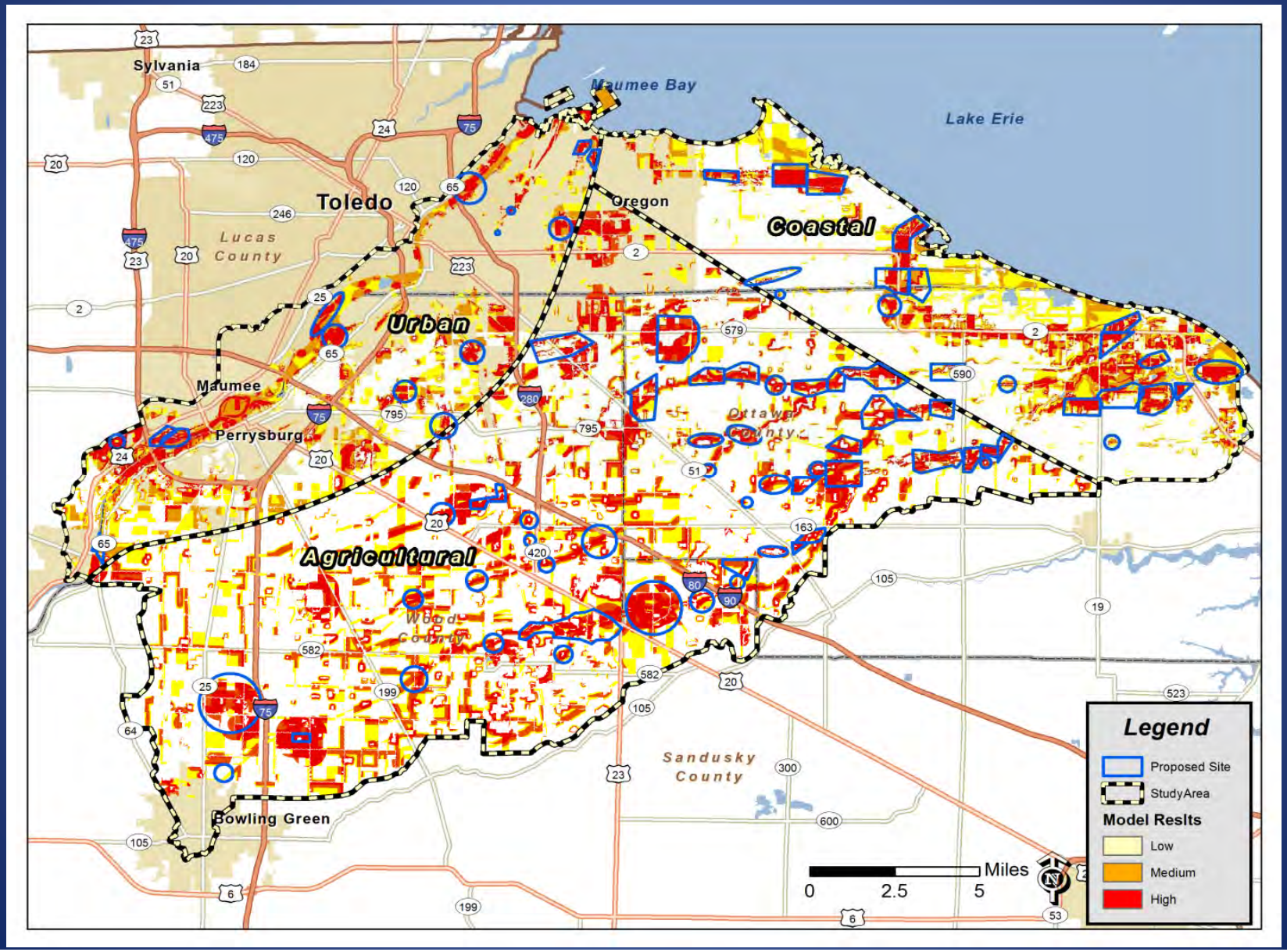
Riparian

Category	% Influence	Field	Scale Value
River/Ditch	35	Distance Ft.	Scale
		0	0
		0-250	5
		250-500	3
		500-750	2
		No Data	0
Flood	22	Distance Ft.	Scale
		0	0
		On-Site	5
		0-250	3
		250-500	2
		No Data	t2-6
Woodlots	9	Distance Ft.	Scale
		0	0
		On-Site	0
		0-150	5
		150-300	3
		300-450	2
		No Data	0
Land Cover	13	Landcover	Scale
		Open Water	2
		Developed, Open	2
		Developed Low	0
		Developed Medium	0
		Developed High	0
		Barren Land	0
		Deciduous Forest	2
		Evergreen Forest	2
		Grassland/Herbaceuous	5
		Hay/Pasture	5
		Cultivated Crops	5
		Woody Wetland	2
		Emergent Herbaceous Wetland	4
		No Data	0
Canopy	9	Density %	Scale
		0-20	5
		20-40	4
		40-60	2
		60-80	1
		80-100	0
		100-101	0
		No Data	0
Managed	4	Distance Ft.	Scale
		0	0
		On-Site	2
		0-1320	5
		1320-2640	3
		No Data	0
Parcels	4	Size Ac.	Scale
		0- 30	0
		30-60	3
		60-90	4
		90-150	5
		150-1000	5
		No Data	0
Soils	4	% Hydric	Scale
		0-20	1
		20-40	2
		40-60	3
		60-80	4
		80-100	5
		No Data	0
Total	100		

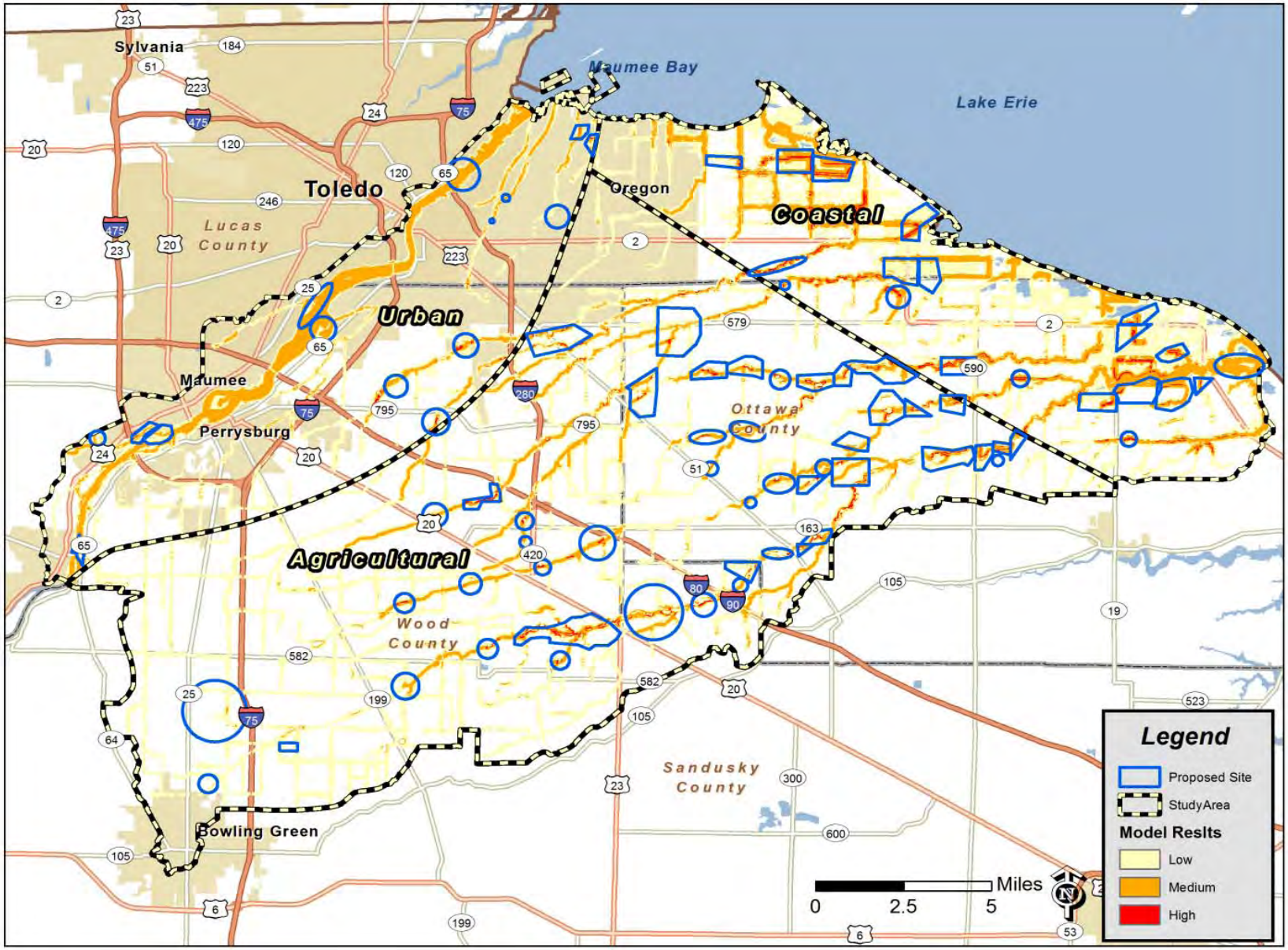
Large Habitat

Category	% Influence	Field	Scale Value
Impervious	20	Yes/No	Scale
		Yes	0
		No	5
		No Data	0
Land Cover	20	Landcover	Scale
		Open Water	2
		Developed, Open	2
		Developed Low	0
		Developed Medium	0
		Developed High	0
		Barren Land	0
		Deciduous Forest	2
		Evergreen Forest	2
		Grassland/Herbaceuous	5
		Hay/Pasture	5
		Cultivated Crops	5
		Woody Wetland	2
		Emergent Herbaceous Wetland	4
		No Data	0
Managed	17	Distance Ft.	Scale
		0	0
		On-Site	2
		0-1320	5
		1320-2640	3
		No Data	0
Parcels	15	Size Ac.	
		0-30	0
		30-60	3
		60-90	4
		90-150	5
		150-1000	5
		No Data	0
Flood	6	Distance Ft.	Scale
		0	0
		On-Site	5
		0-250	3
		250-500	2
		No Data	0
River	6	Distance Ft.	Scale
		0	0
		0-250	5
		250-500	4
		500-750	3
		No Data	0
Rare Species	6	Distance Ft.	Scale
		0	0
		0-1320	5
		1320-2640	3
		No Data	0
Woodlots	10	Distance Ft.	Scale
		0	0
		On Site	0
		0-150	5
		150-300	3
		300-450	2
		No Data	0
Total	100		

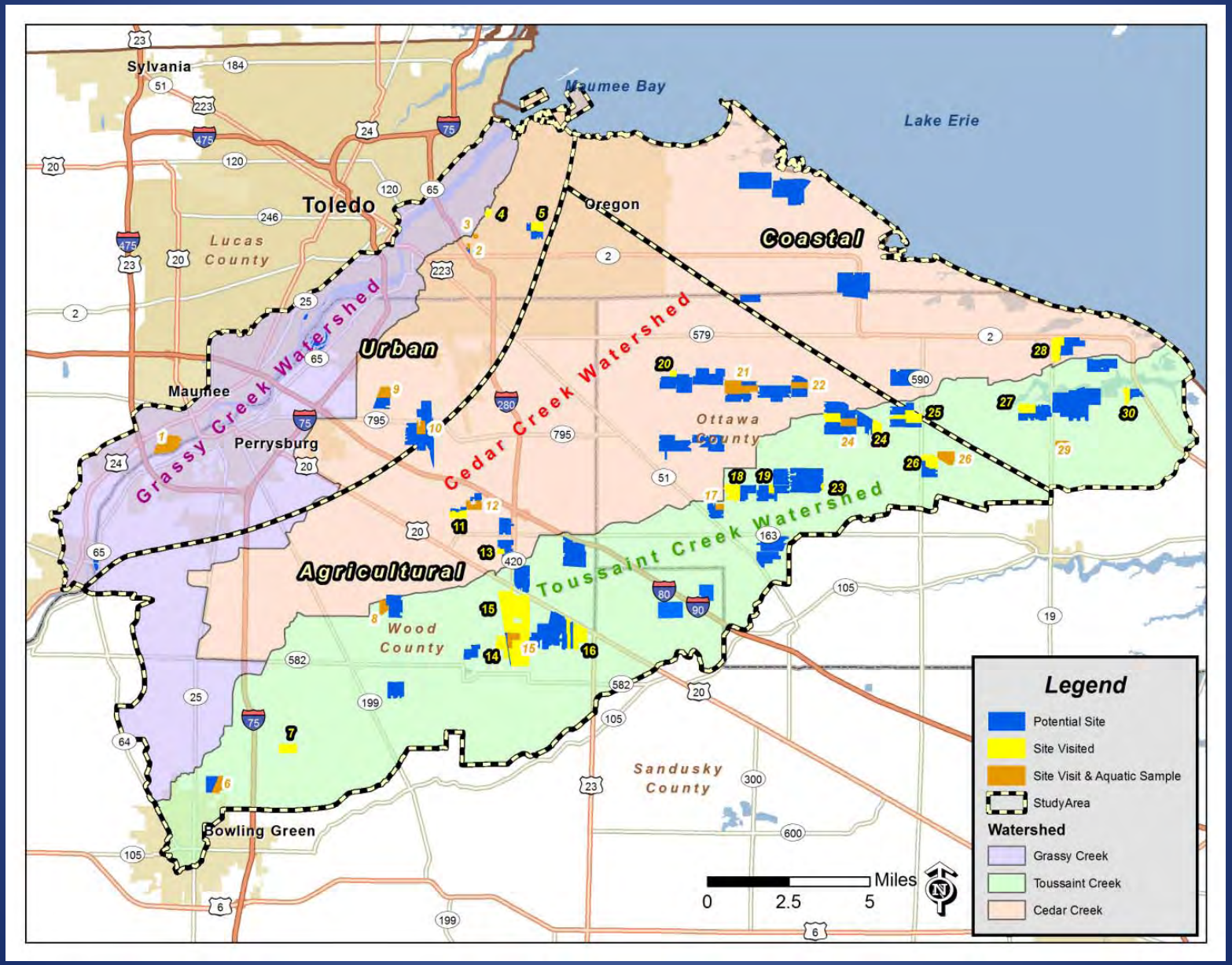
Large Habitat Model Results and Original 84 Proposed Sites



Riparian Model Results and Original 84 Proposed Sites



53 Potential & 30 visited sites



Visited 30 sites

- Wetlands – ORAM
  - Hydric soils
- Large Streams - QHEI
- Headwater Streams - HHEI
- Buffer/Upland areas - FQAI

Fish & Bugs

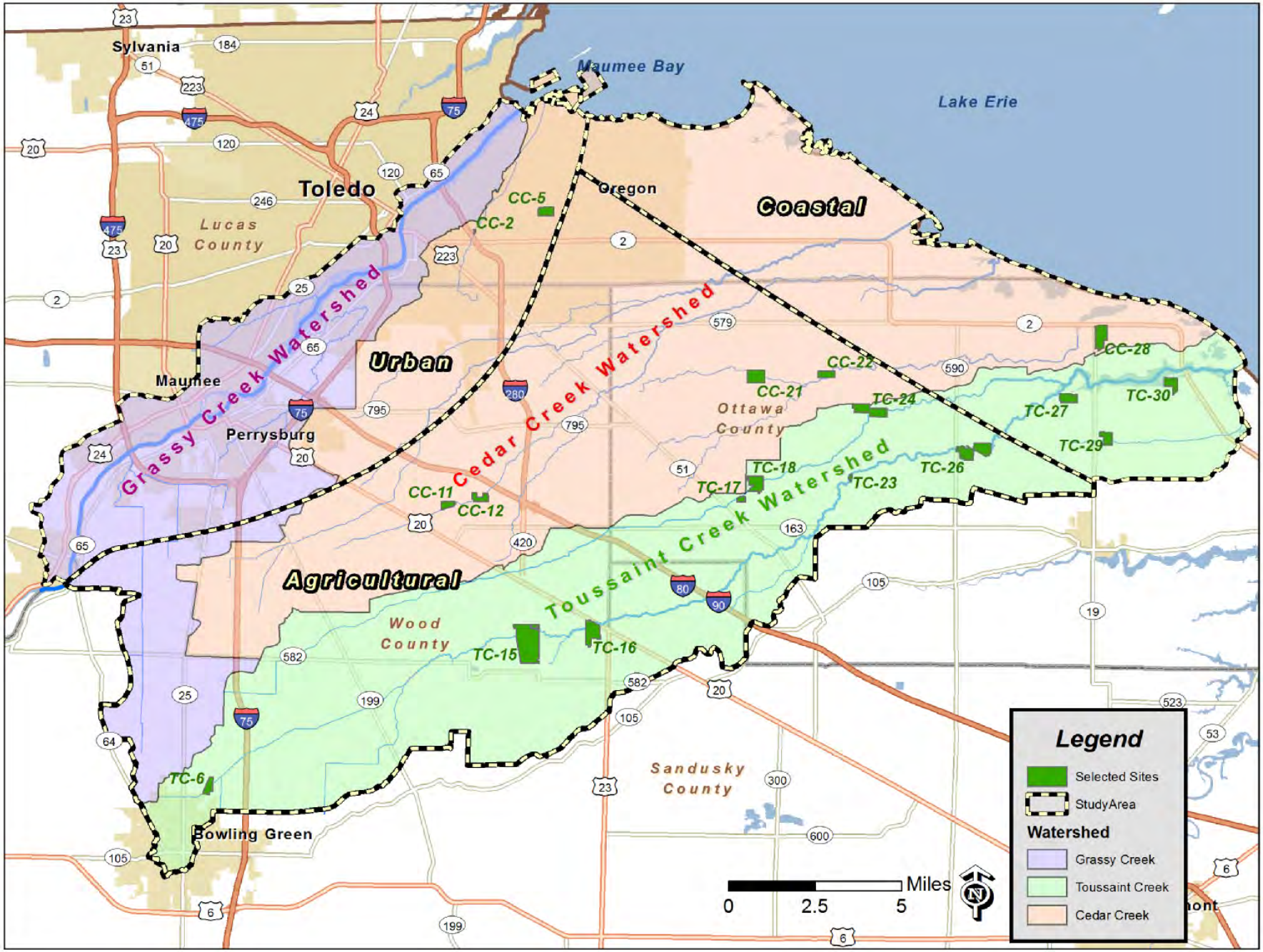
- Of those 30 sites:

  15 were also for evaluated Fish and Macroinvertebrates

  - IBI - Index of Biotic Integrity (Fish assemblages)
  - List of Macro invertebrates
  - MIwb - Modified Index of Well-Being

18 Selected Sites

- Of the 30 sites visited, 18 were selected by the Project Management Team for plans to be developed


Sylvania
Maumee Bay
Lake Erie
Toledo
Oregon
Coastal
Lucas County
CC-5
CC-2
Urban
Maumee
Perrysburg
Grassy Creek Watershed
Cedar Creek Watershed
Toussaint Creek Watershed
CC-22
CC-21
CC-28
TC-30
TC-24
TC-27
Ottawa County
TC-29
TC-18
TC-26
TC-17
TC-23
CC-11
CC-12
Agricultural
Wood County
TC-15
TC-16
Sandusky County
TC-6
Bowling Green
Legend
Selected Sites
StudyArea
Watershed
Grassy Creek
Toussaint Creek
Cedar Creek
Miles
0
2.5
5

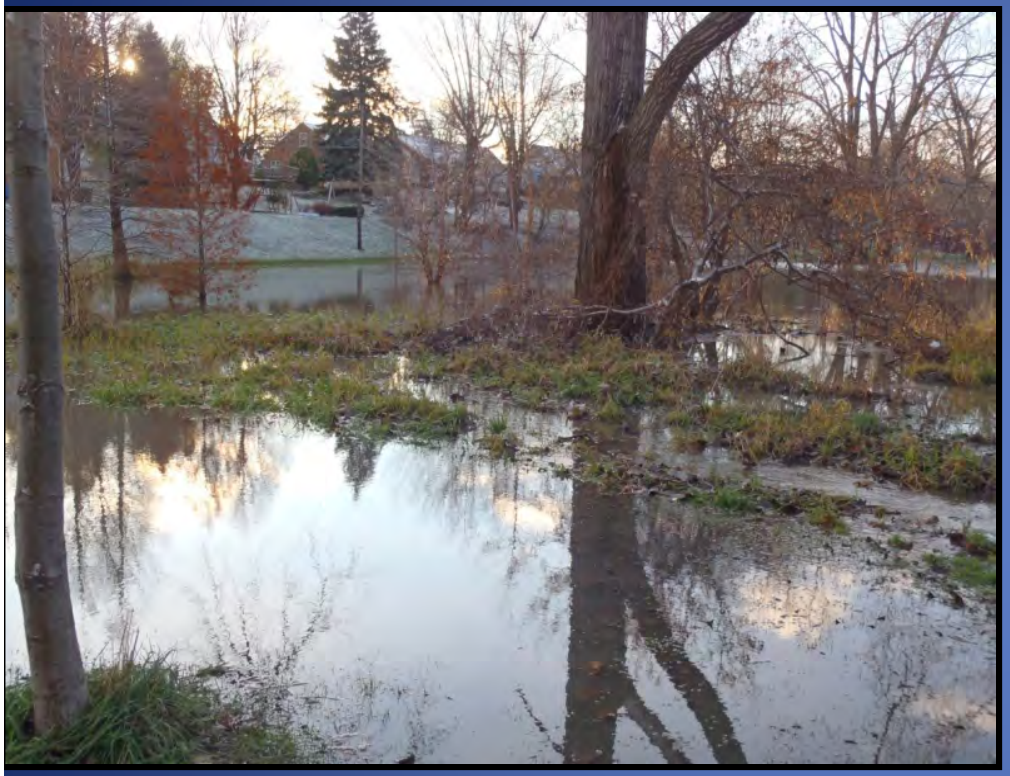
18 Site Specific Plans

- Each Plan includes:
  - Site description and existing site conditions
  - Recommended restoration and enhancement strategy
  - Challenges and Reminders
  - Measurable improvements
  - Preliminary cost estimate

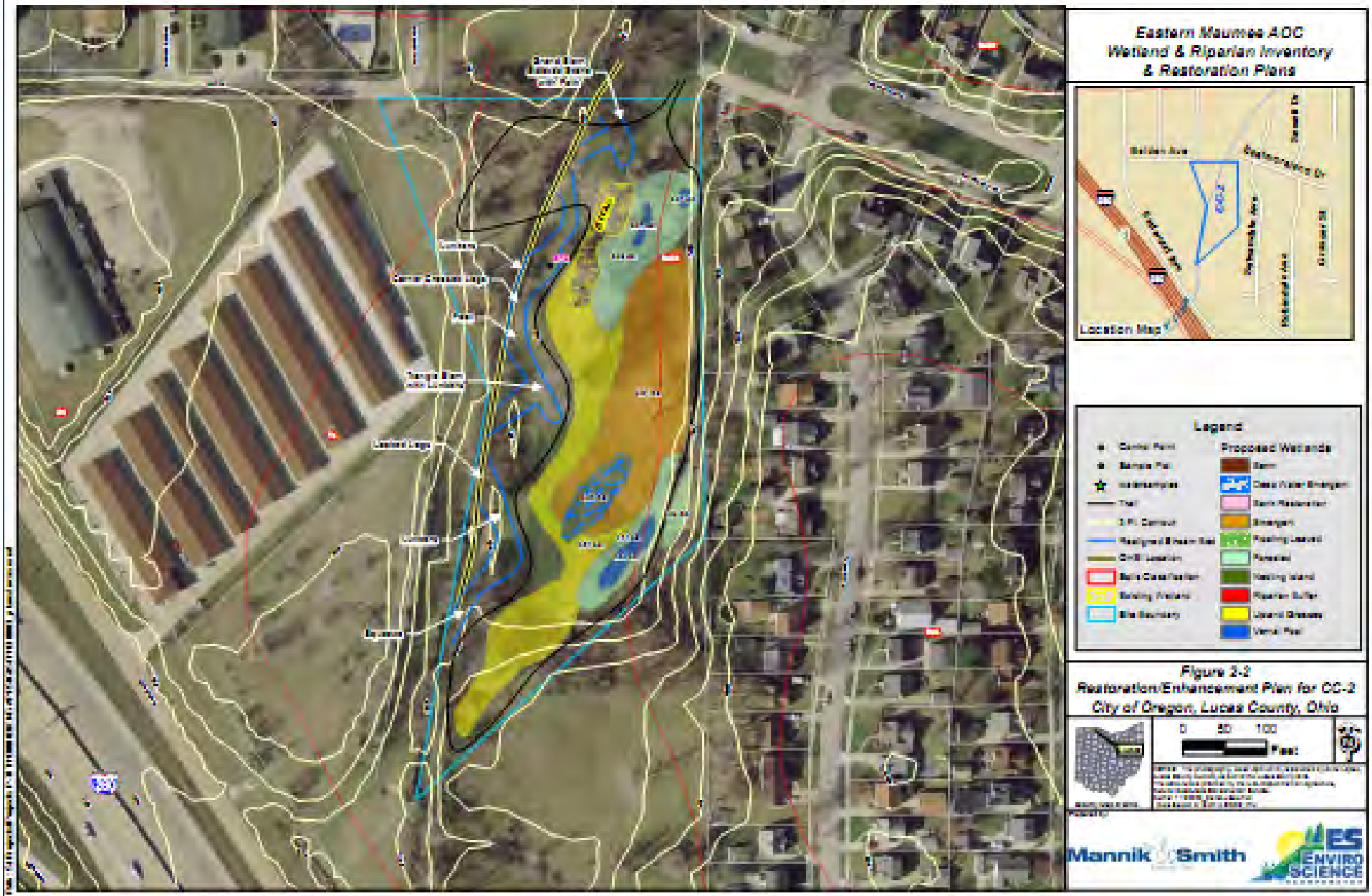
General Concepts

- Restoration and Enhancement of:
  - Historically Channelized Waterways
  - Medium to Large Streams
  - Riparian Areas
  - Non-Coastal Emergent Wetlands
  - Coastal Emergent Wetlands
  - Forested Wetlands

Otter Creek

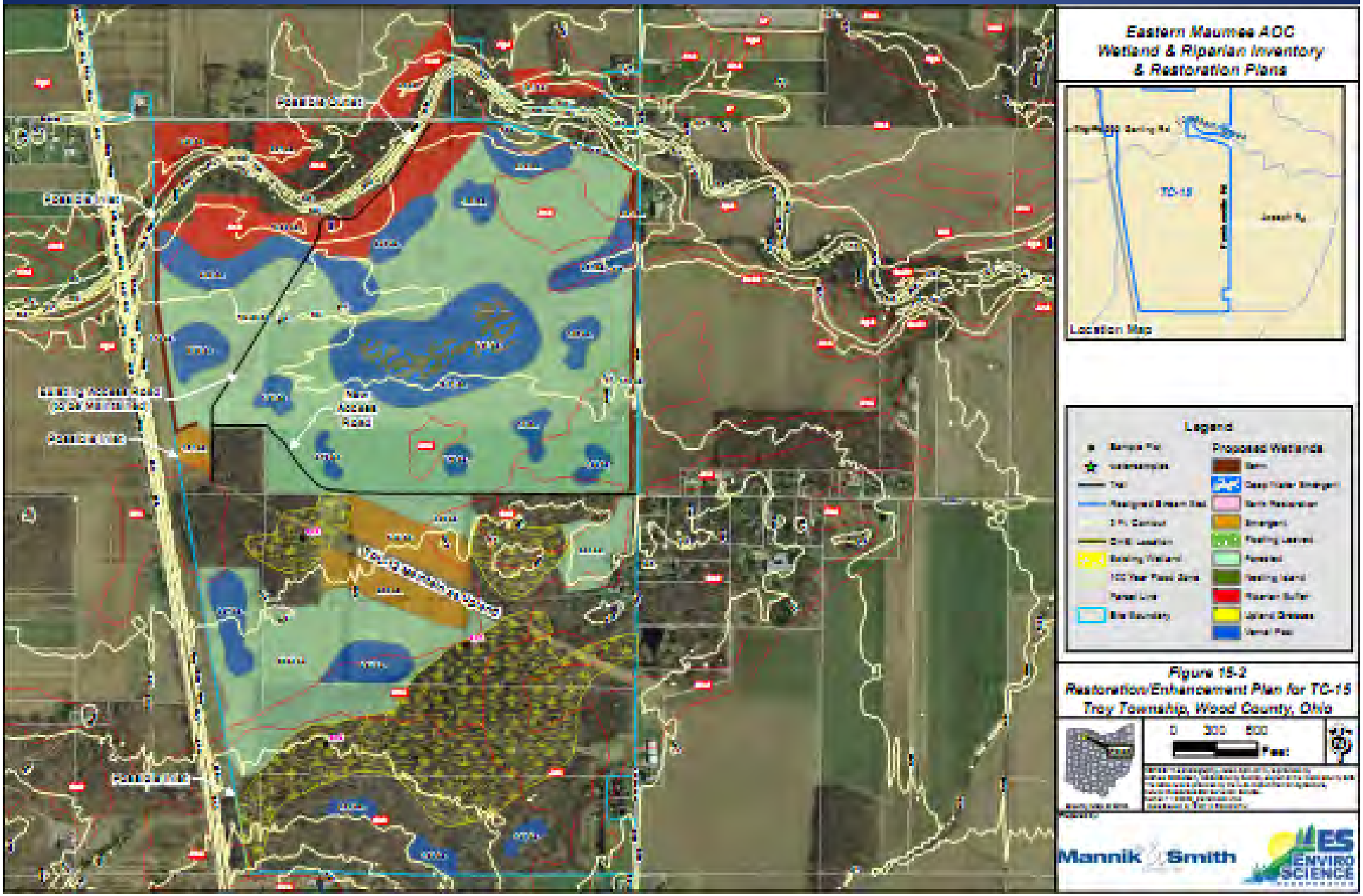


Otter Creek


Eastern Maumee AOC
Wetland & Riparian Inventory
& Restoration Plans
Location Map
Legend
Proposed Wetlands
Figure 2-2
Restoration/Enhancement Plan for CC-2
City of Oregon, Lucas County, Ohio
Feet
Mannik Smith
ES
ENVIRO SCIENCE

Toussaint Creek near Luckey

Toussaint Creek near Luckey



Next Steps

- Report will be on RAP webpage in August, 2012
- Available for public use

Maumee RAP

PARTNERING FOR CLEAN STREAMS

Special Thanks to the Project Team

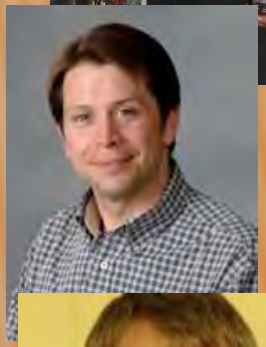
Kevin Kratt	Tetra Tech, Inc. (Project Manager)
Cherie Blair	Ohio EPA (Project Management Team Leader)

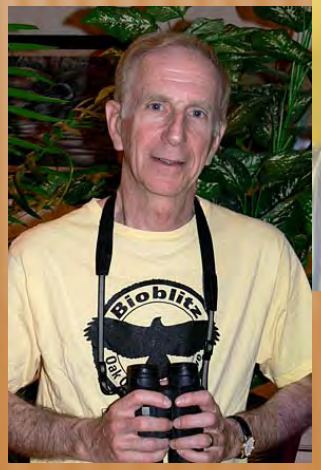
Katie Rousseau	American Rivers & RGI	Joe Uhinck	Ottawa Soil & Water Conservation District
Rob Krain	Black Swamp Conservancy	Kris Patterson	Partners for Clean Streams (PCS)
Andrea Beard	City of Oregon	Kyle Spicer	Partners for Clean Streams (PCS)
Dane Cramer	Ducks Unlimited	Bryan Agosti	The Mannik & Smith Group, Inc.
Roy Kroll	Ducks Unlimited	Keith Carr	The Mannik & Smith Group, Inc.
Tim Walters	EnviroScience, Inc.	James Cole	The Nature Conservancy
Jeff Grabarkiewicz	Lucas SWCD	Steve Woods	The Nature Conservancy
Cheryl Rice	National Resource Conservation Service	Matt Horvat	TMACOG
Mark Witt	ODNR – Magee Marsh Wildlife Area	Tim Schetter	Toledo Area Metroparks
Dana Bollin	ODNR – Maumee Bay State Park	Molly Maguire	Toledo/Lucas County Plan Commission
Ben Smith	Ohio EPA - 401 Wetland Program	David Dean	University of Toledo
Brian Gara	Ohio EPA - Division of Surface Water	Patrick Lawrence	University of Toledo & PCS
Trinka Mount	Ohio EPA - Division of Surface Water	Paul Thomas	US EPA - Division of Water
Eddy Pausch	Ottawa National Wildlife Refuge	Sue Eston	US EPA - Division of Water
Jason Lewis	Ottawa National Wildlife Refuge	Dave Steiner	Wood County Plan Commission
Ron Huffman	Ottawa National Wildlife Refuge	Kelly Hemminger	Wood County Plan Commission
Carol Benner	Ottawa Soil & Water Conservation District	Jim Carter	Wood Soil & Water Conservation District

Partners for Clean Streams

PARTNERS FOR CLEAN STREAMS

2012 PCS BOARD OF DIRECTORS & EXECUTIVE DIRECTOR





Patrick Lawrence, Ph.D.: President

Tim Schetter: VP & Secretary

Colleen Dooley: Treasurer

Andrew Curran: Board member

Shawn Reinhart: Board member

Phil Blosser: Board member

Terry Shankland: Board member

Elliot Tramer: Board member

Kristina Patterson: Executive Director

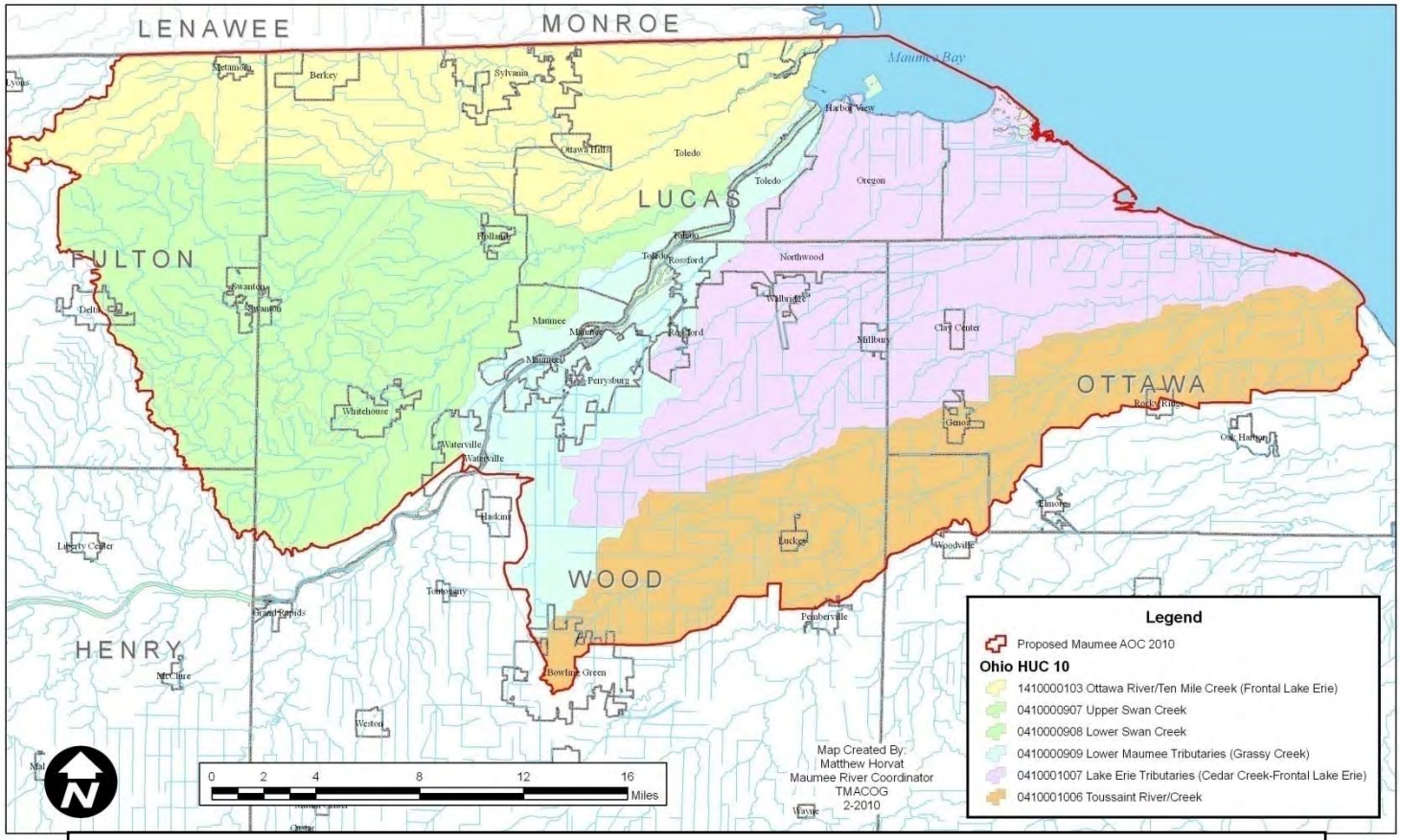
ABOUT THE ORGANIZATION

By Kris Patterson, Executive Director

PCS AND MAUMEE RAP COMMITTEE

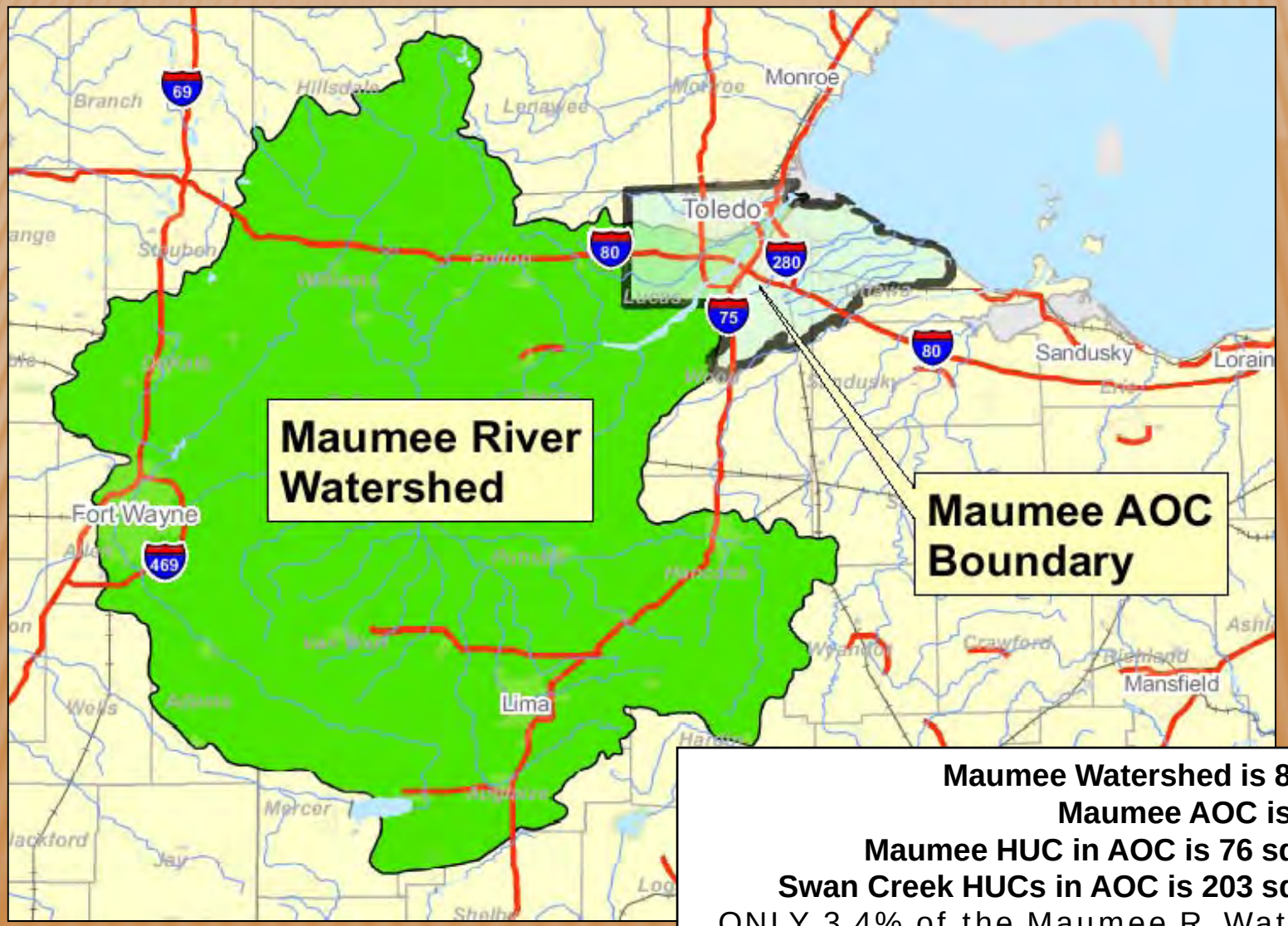
- Formed in 2007 - grew out of the Maumee RAP Program
- A 501(c)3 non-profit community organization
- Supports local and regional water quality improvements
- Maumee RAP Committee is nestled in PCS organization and works side-by-side with State and Federal RAP program

MAUMEE AREA OF CONCERN VS WATERSHEDS



Boundary was changed to shift from 11/14 HUCs to 10/12 HUCs.
Maumee AOC is six 10-digit HUCs totaling 11 independent watersheds.
Maumee AOC is 787 sq miles.

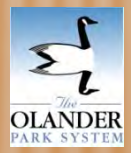
MAUMEE WATERSHED VS AREA OF CONCERN



Maumee Watershed is 8,316 sq miles
Maumee AOC is 787 sq miles
Maumee HUC in AOC is 76 sq miles (.91%)
Swan Creek HUCs in AOC is 203 sq miles (2.4%)
ONLY 3.4% of the Maumee R. Watershed is in Maumee AOC

LOCAL INVOLVEMENT - LOTS OF PARTNERS

- Project Planning, development and implementation
- Diversified funding sources (grants, foundations, private donations)
- Legislative updates/support
- Lead for partnership building, planning, and implementation
- Local umbrella for all to collaborate under
- Here's a sample of our partners (list not all inclusive)…



WHAT DO WE DO?

By Kris Patterson, Executive Director

10TH ANNUAL PARTNERING FOR CLEAN STREAMS YOUTH/SCOUT PATCH PROGRAM

Sunday , March 4, 2012

- PCS Workshop
- 81 total participants
- Attendants earned *Maumee RAP Patch*
- Activities based on land management, conservation, and environmental restoration

Saturday, April 21, 2012

- Global Youth Service Day
  - Over 100 volunteers
  - Over 200 drains stenciled
  - Over 500 educational flyers throughout neighborhoods
- 10 Jurisdictions & Municipalities

8TH ANNUAL
GET THE LEAD OUT! CLEAN UP

Mid May to Mid August 2012

- June, July, and August when the water levels are lower
- Multiple Maumee River sites after the fishing runs
- Do-it-yourself kits provided, giving groups flexibility
- Great for adult and youth service organizations

15TH ANNUAL CLEAN YOUR STREAMS DAY

September 17, 2011

- 726 Total Participants
- 50 land sites and 1 boat site cleaned
- 22,840 lbs (18,700 lbs garbage + 276 tires)
- Peculiar Items Found: gun safe, prom dress, koala statue, 18' boat w/motor, pipe organ, 1988 hunting license, antique ringer washing machine, parking tickets (5), Employee of the Month award, 1973 Pepsi can, book bag w/anatomy & biology books

WHAT ELSE?

- Watershed-planning (Stage 2 Watershed Plan)
- Research (like the Wetland Inventory)
- Secure grants (like the Miakonda grant)
- Collaborate with other environmental partners
- Host workshops and field days
- Fundraising

OTTAWA RIVER WETLAND AND HABITAT RESTORATION PROJECT

at Camp Miakonda

CAMP MIAKONDA AND OTTAWA RIVER RESTORATION

- $1.36 Million GLRI grant from US EPA
  - 3 year duration Sept 2010-Dec 2013
- Goals of restoration project
  - Restore/enhance approx. 10 acres & approx 30 acres associated
  - Reduce erosion & stream bank restoration from 1200' of adjacent Ottawa River
  - Increase in-stream habitat for fish and macro invertebrates
  - Increase diversity of in-water habitat for Lake Sawyer, allowing fish to winter over and allowing more active use of Lake Sawyer by Scouts
  - Encourage educational use of wetland, lake, river, and upland habitat
  - Project contributes to BUI (Beneficial Use Impairment) goals and improvements for BUI 14 - Loss of Fish and Wildlife Habitat & BUI 3 - Degradation of Fish and Wildlife Habitat

OUTCOMES

Ecologically

- Stable stream bank, less sediment in river
- In stream fish habitat
- Maintain connected floodplain
- Diversify habitat
- Increased wildlife use

Camp

- Multi-uses, return active use of Lake, wetland
- Renewed programming
- Signage/Education
- Paths, trails, and access points
- Broaden use/partnership opportunities

MIAKONDA UPDATE

- Received 401/404 permit
- Received updated/corrected plans and specs
- Performed selective tree removal to be sensitive to Indiana bat exclusion areas and times
- Updated website with info on Miakonda
- Many presentations to area groups
- Putting consolidated bid request out for stream restoration, lake restoration, habitat management, plantings, and wetland creation
- Construction to occur in Sept/Oct 2012

ANTICIPATED TIMELINE

- Now - Sept: Final plan set, permits secured, bid process and award contracts
- August - Sept: harvest and re-locate plants
- Early Sept - Mid Oct: overall construction period
  - Early Sept: prep site (grub, maybe drain Lake)
  - After Sept. 7: work begins in earnest
  - Mid/Late Sept: stream restoration
  - Sept-Oct: Lake work in phases, overlap with stream
- 2013: Remaining work is follow up for planting, repairing site conditions, monitoring and adaption
- 2016 and beyond- Educational and hands on interaction with the restored areas (Lake, wetlands, trails, signs, etc)

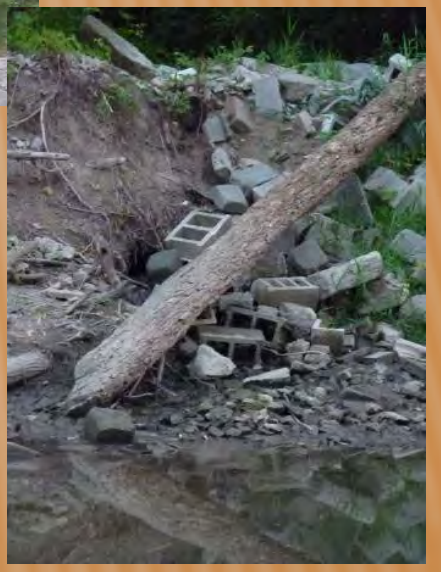
JOB'S CHALLENGE PROGRAM

- NOAA cooperative agreement to implement and oversee "Maumee Corps" in the AOC
- Habitat restoration while putting people to work
- Outcomes: >1000 acres of habitat improved, >15,840 linear feet of streambank improved, and more
- Outcomes: 26 seasonal, part-time, temporary and/or full time positions over the next 18+ months
- PCS will have small team floating from project to project
- Metroparks will have a large dedicated team for their management areas
- Partners: Metroparks, The Nature Conservancy, City of Toledo, UT, and Boy Scouts

CAMP MIAKONDA AND OTTAWA RIVER RESTORATION

Enhance wetlands

Rubble piles between River & Lake Sawyer



Address severe stream bank erosion

CONTACT US

- PCS Staff
- 419.874.0727 office
- Executive.Director@PartnersForCleanStreams.org

- www.PartnersForCleanStreams.org
- Like us on Facebook to stay up-to-date
- Check out our new 2011 Annual Report
- Donate online to support our activities

Working towards fishable, swimmable, and drinkable waters for all the people (and wildlife) that live, work, and play in Northwest Ohio.