Deep River-Portage Burns Waterway Initiative

EMPC

Thursday, June 4, 2015

Watershed Management Plan Tasks

- Watershed Community Initiative
- Watershed Inventory
- Identify Problems & Causes
- Identify Sources & Calculate Loads
- Set Goals & Identify Critical Areas
- Choose Measures/ Best Management Practices
- Action Register & Schedule
- Tracking Effectiveness

Why is Our Watershed Important?

- Recreational opportunities
- Aesthetics
- Large stretches of meandering channel
- Connects so many cities
- Drains to and affects Lake Michigan
- Natural areas
- Wildlife
- Quality of life
- Sense of place
- Parks and trails
- Economic and tourism
- Drinking water
- Beauty of Lake George
- Mix of urban and agriculture
- Agricultural production and local produce

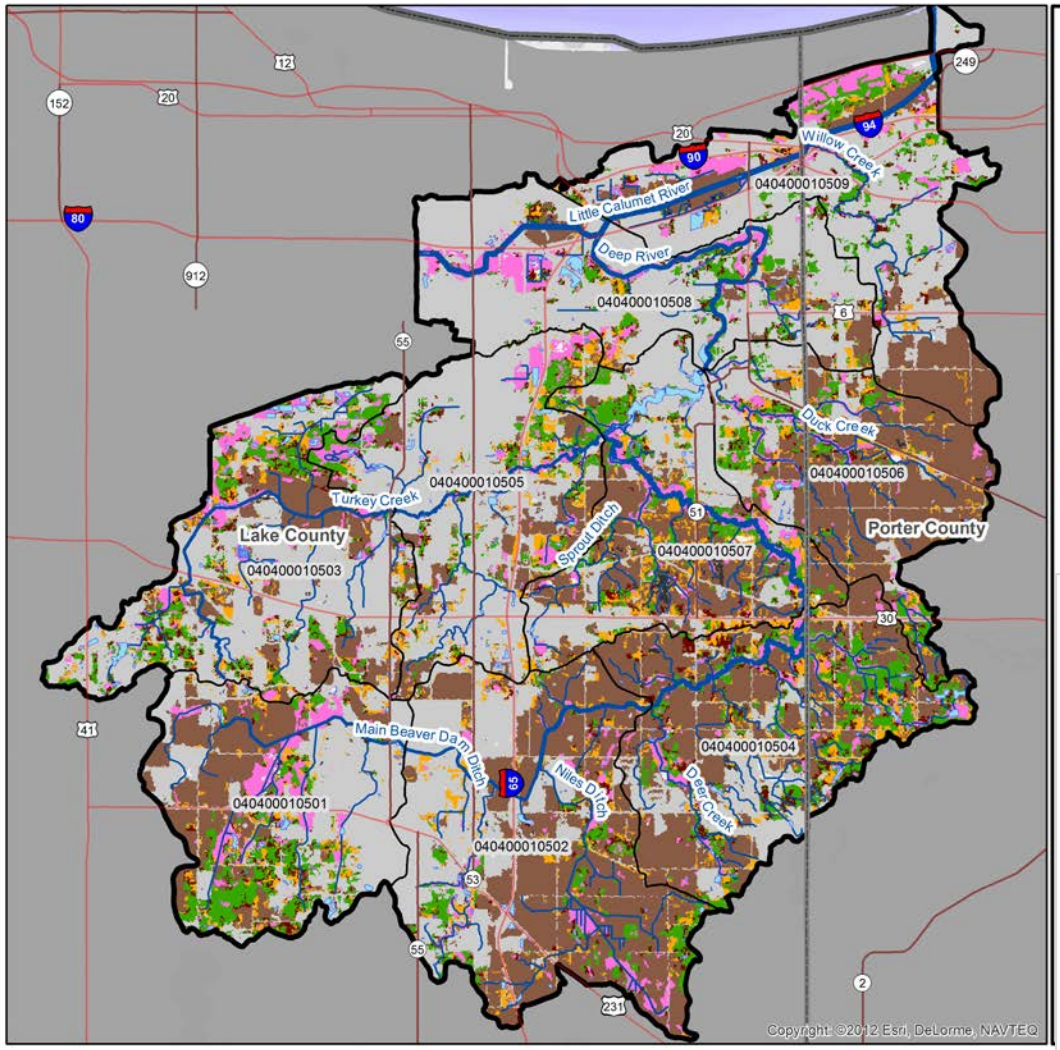
Stakeholder Concerns

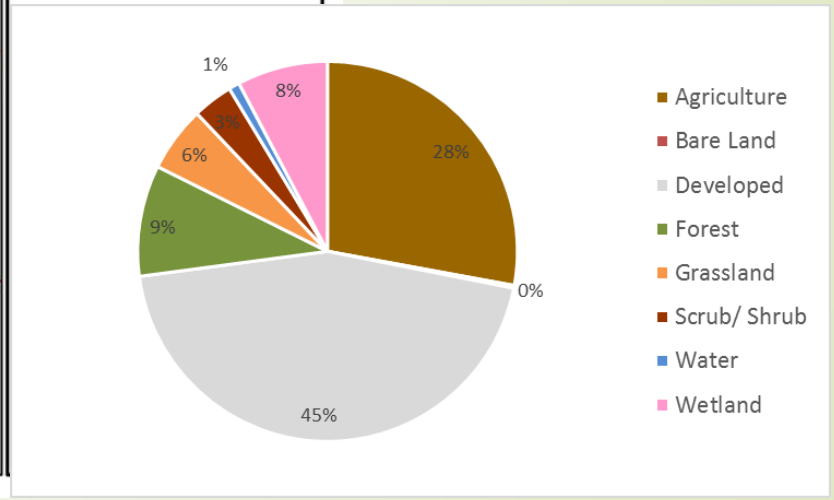
- Habitat
- Economic & Recreation
- Planning/Coordination/Management
- Watershed Processes
- Storm Water Runoff
- Groundwater & Drinking Water
- Floodplains/Flooding/Drainage
- Miscellaneous

Steering Committee Representatives

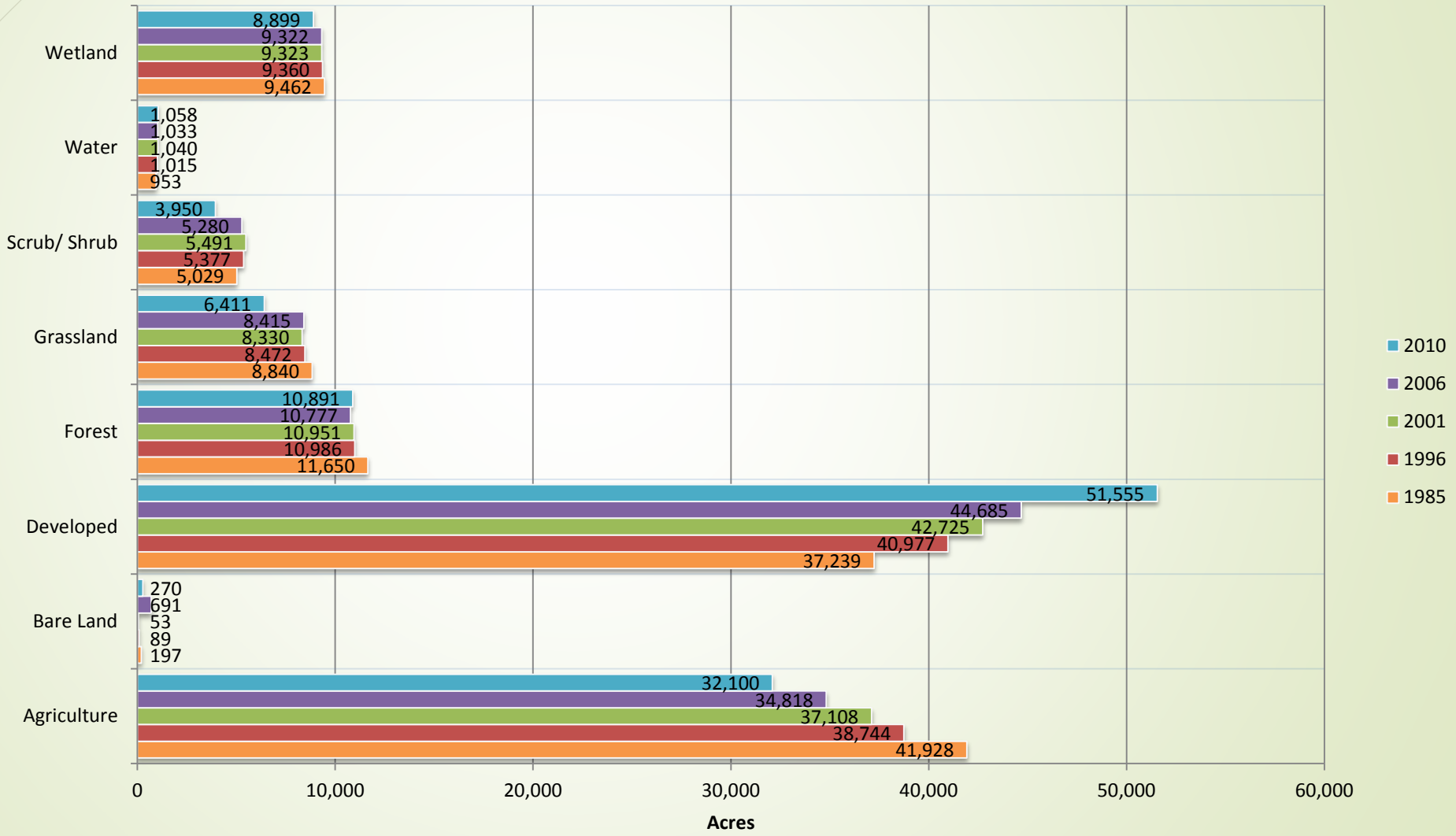
- Municipal
- County or Regional
- Environmental & Conservation
- Recreation
- Business & Industry
- Universities
- State & Federal

Watershed Overview

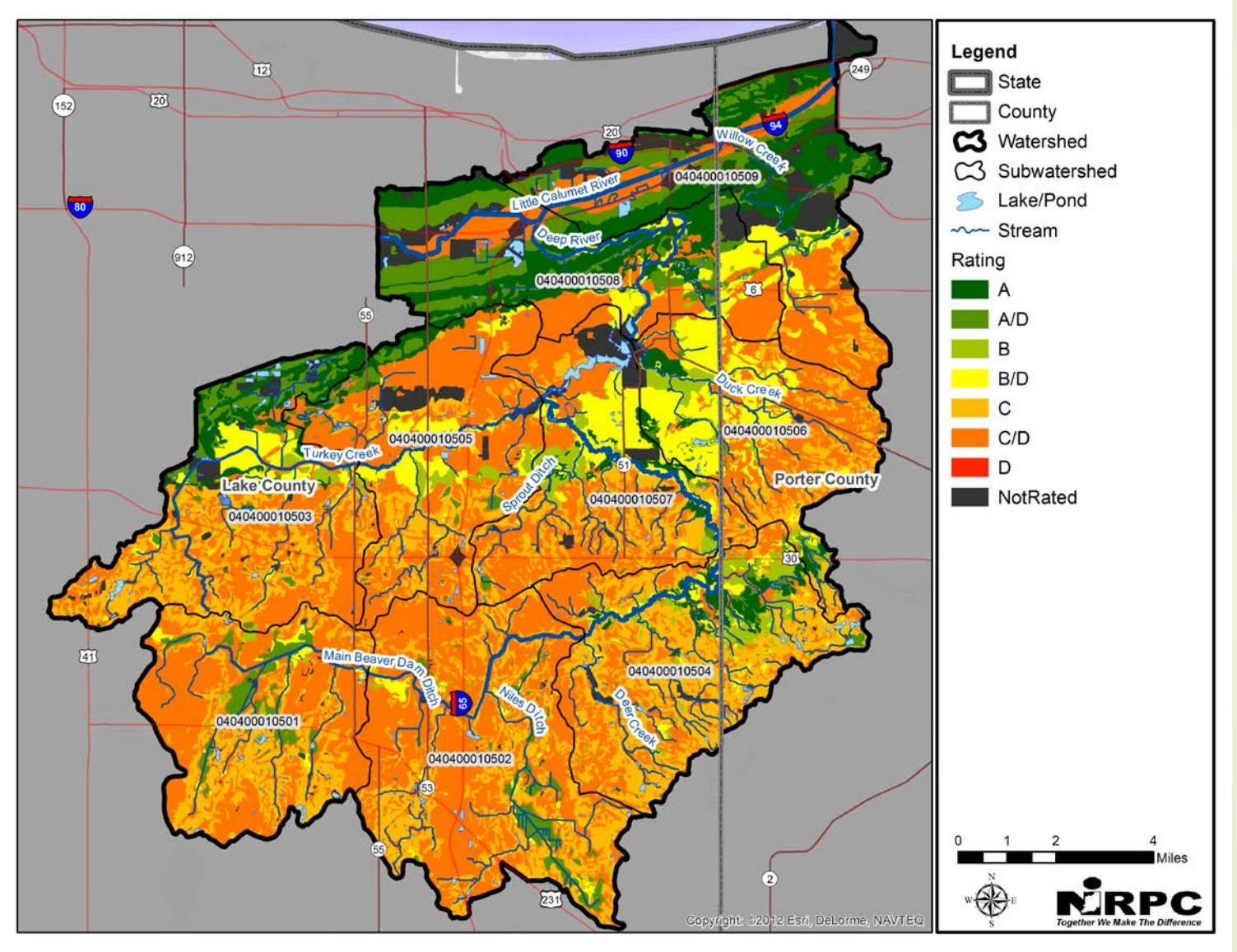




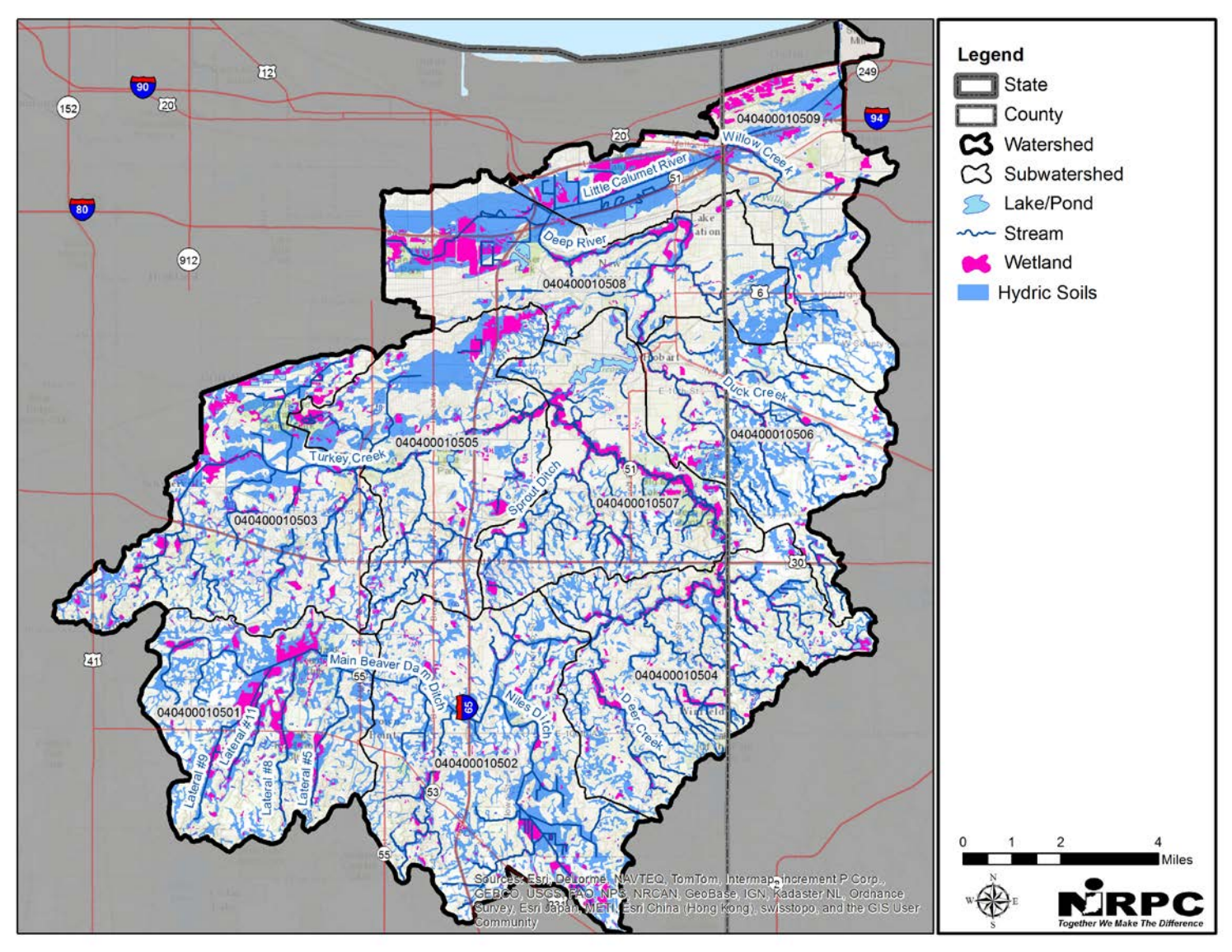
Land Cover Change



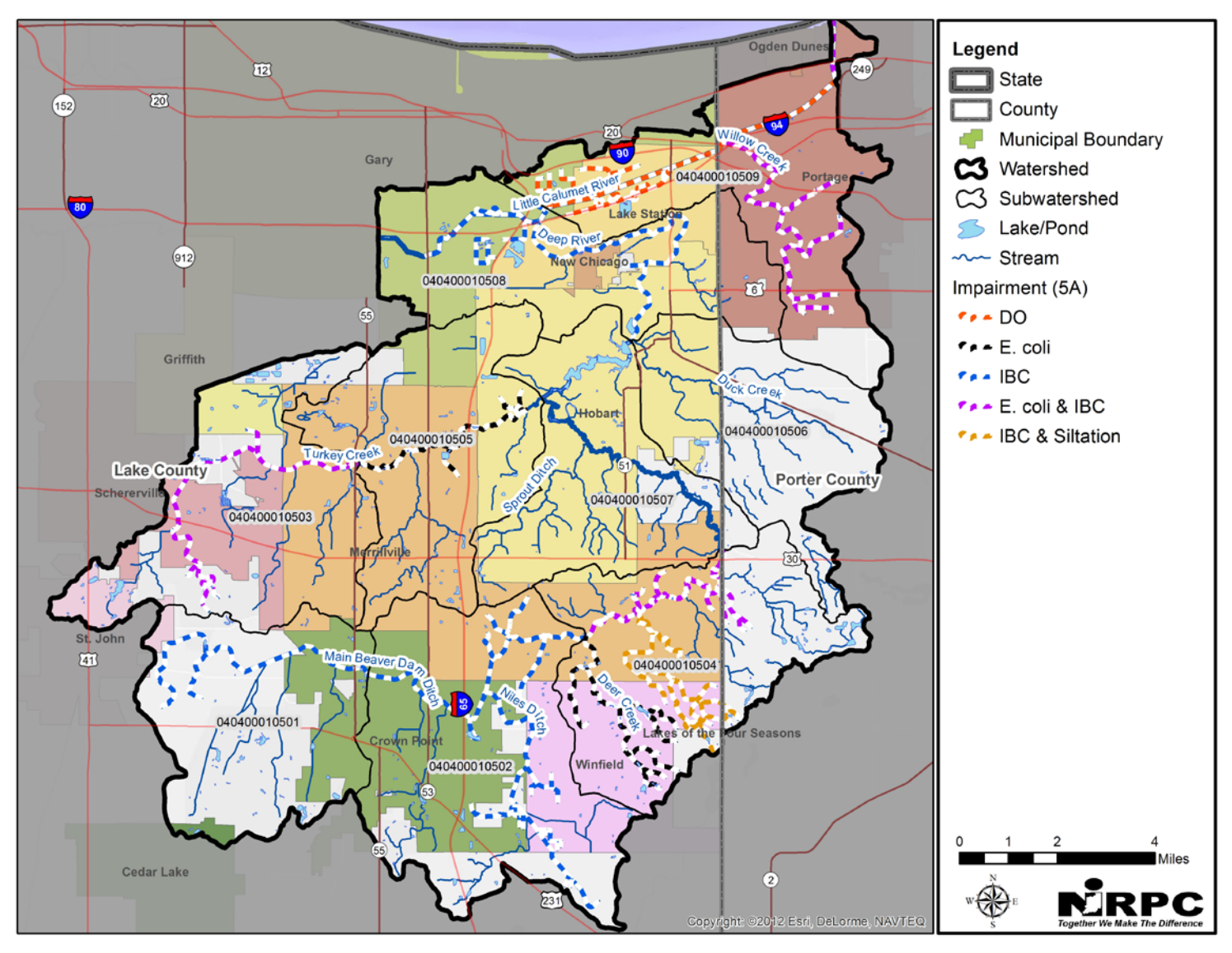
Soils- Runoff Potential



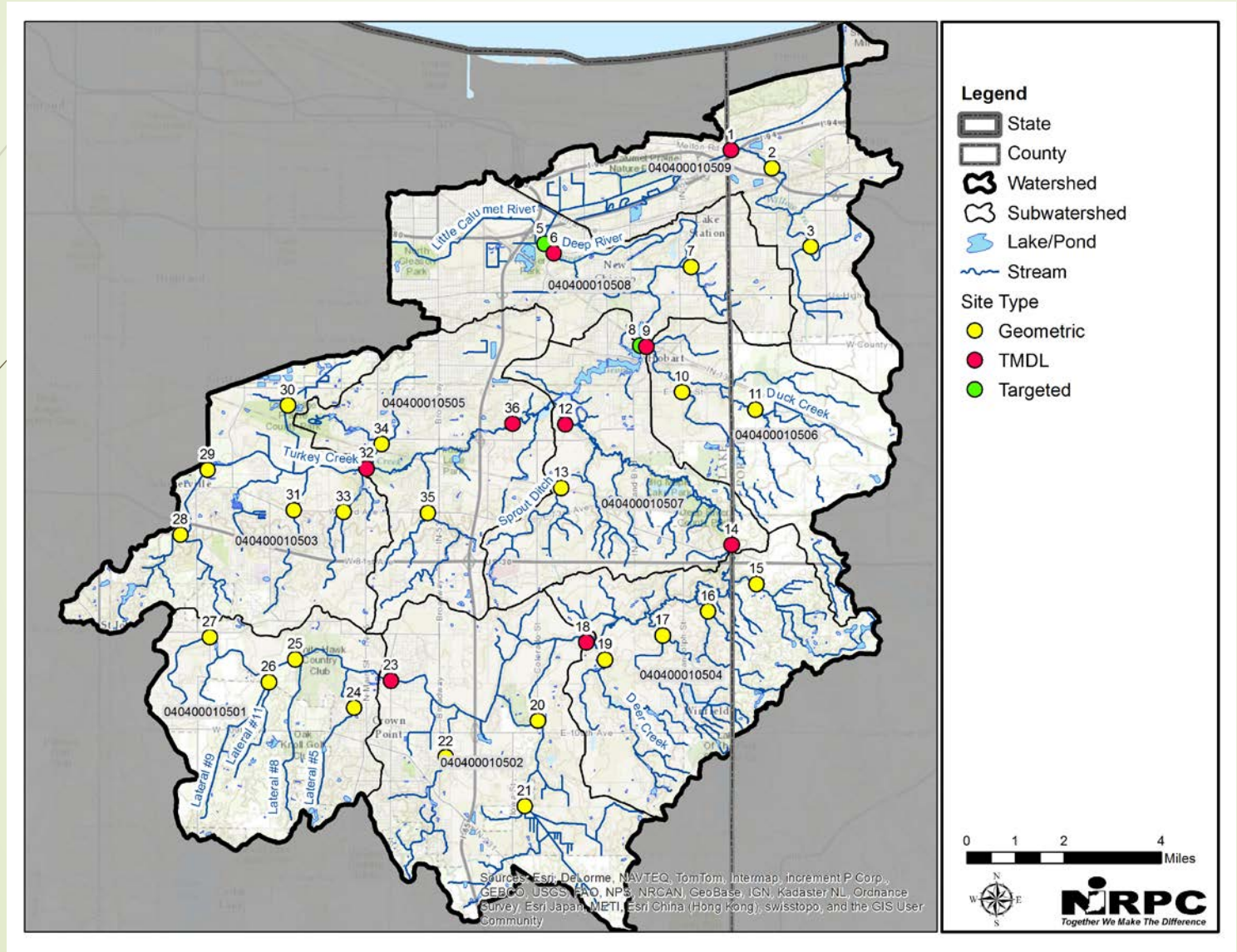
Wetland Loss



Impaired Streams (2012)



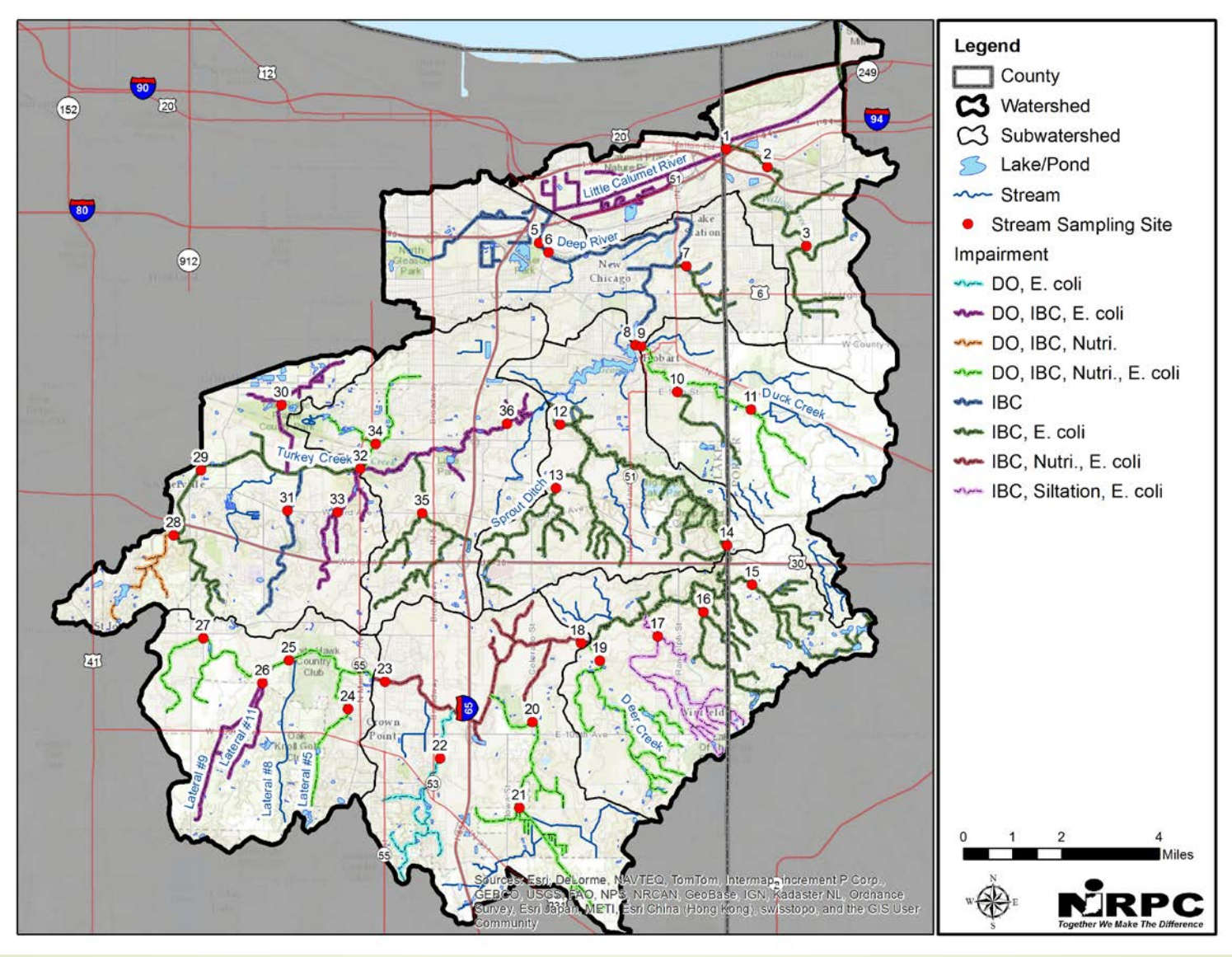
Stream Monitoring Study



Parameters:

- *E. coli*
- Fish & Macroinvertebrate Communities
- Temperature
- Dissolved Oxygen
- Nutrients
- Ammonia
- Sediments
- Habitat

Impaired Streams (2016)



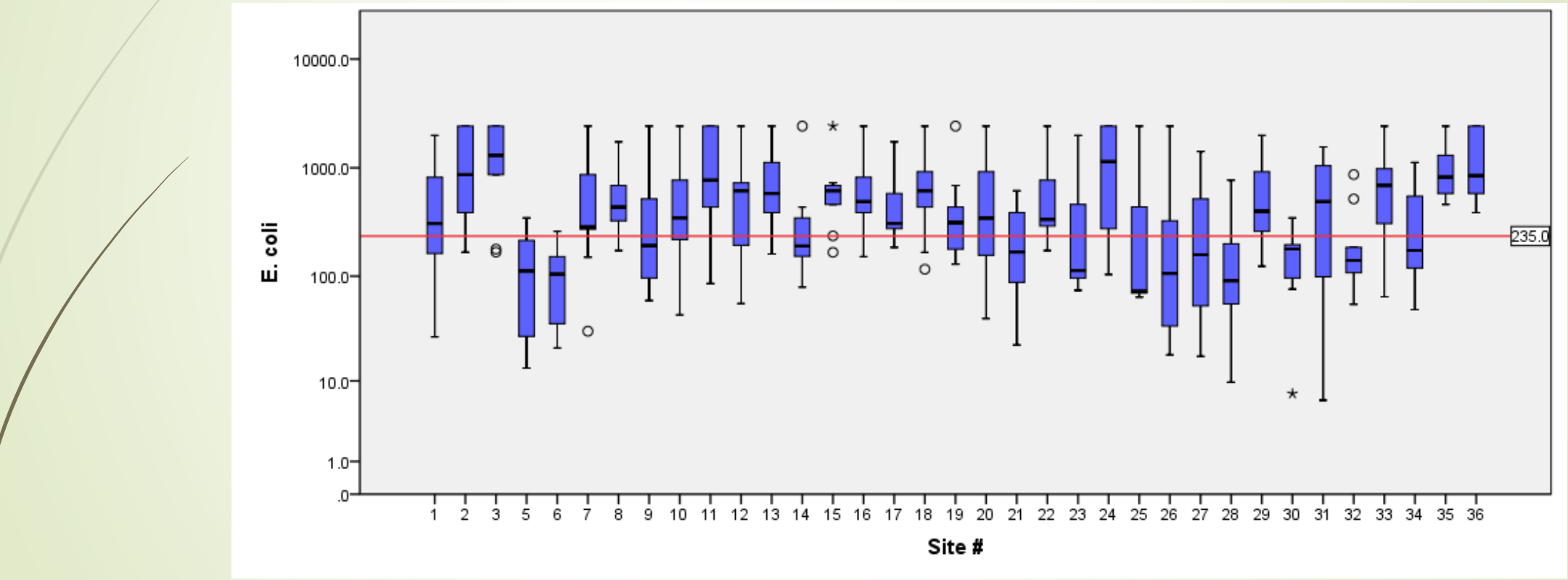
Water Quality Targets

Monitored to Assess	Parameter	Threshold Level	Source
Recreational Use	E. coli	Maximum: 235 CFU/100 mL (single sample	Indiana Administrative Code (327 IAC 2-1.5-8)
Aquatic Life Use	Temperature	Dependent on time of year (varies by month)	Indiana Administrative Code (327 IAC 2-1-6)
Aquatic Life Use	Dissolved Oxygen (DO)	Minimum: 4.0 mg/L Maximum: 12 mg/L	Indiana Administrative Code (327 IAC 2-1-6)
Aquatic Life Use	Total Phosphorus (TP)	Maximum: 0.3 mg/L 0.07 mg/L (fish community protection threshold)	TMDL Morris & Simon (2012)
Aquatic Life Use	Nitrate + Nitrite	Maximum: 10 mg/L in waters designated as a drinking water source 0.13 mg/L (fish community protection threshold)	Indiana Administrative Code (327 IAC 2-1-6) Morris & Simon (2012)
Aquatic Life Use	Total Kjeldahl Nitrogen (TKN)	1.27 mg/L (2nd break point for observed community response) 0.4 mg/L (fish community protection threshold)	Morris & Simon (2012)
Aquatic Life Use	Ammonia	0 – 0.21 mg/L (pH & temperature dependent) 0.03 mg/L (fish community protection threshold)	Indiana Administrative Code (327 IAC 2-1-6) Morris & Simon (2012)
Aquatic Life Use	Total Suspended Solids (TSS)	Maximum: 30 mg/L	TMDL
Aquatic Life Use	Turbidity	10.4 NTU 25 NTU	EPA Recommendation Minnesota TMDL
Aquatic Life Use	Qualitative Habitat Evaluation Index (QHEI)	> 51 points	Aquatic Life Use Support Criteria
Aquatic Life Use	Index of Biotic Integrity (IBI)	≥36 points	Aquatic Life Use Support Criteria
Aquatic Life Use	Macroinvertebrate Index of Biotic Integrity (mIBI)	≥36 points	Aquatic Life Use Support Criteria

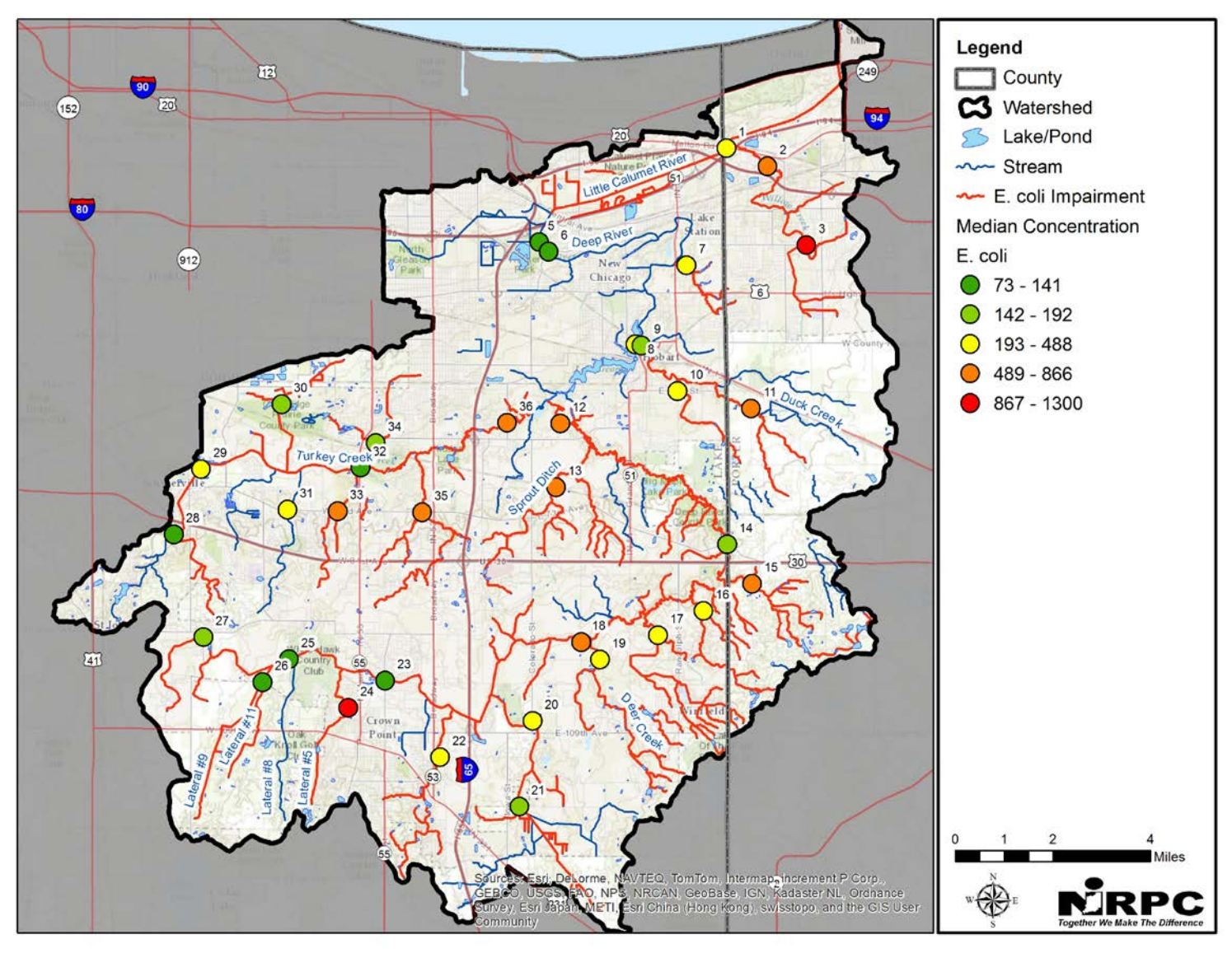
Is water quality safe enough for swimming?

Recreational Use

Recreational Use Threats



E. coli “Hot-Spots”



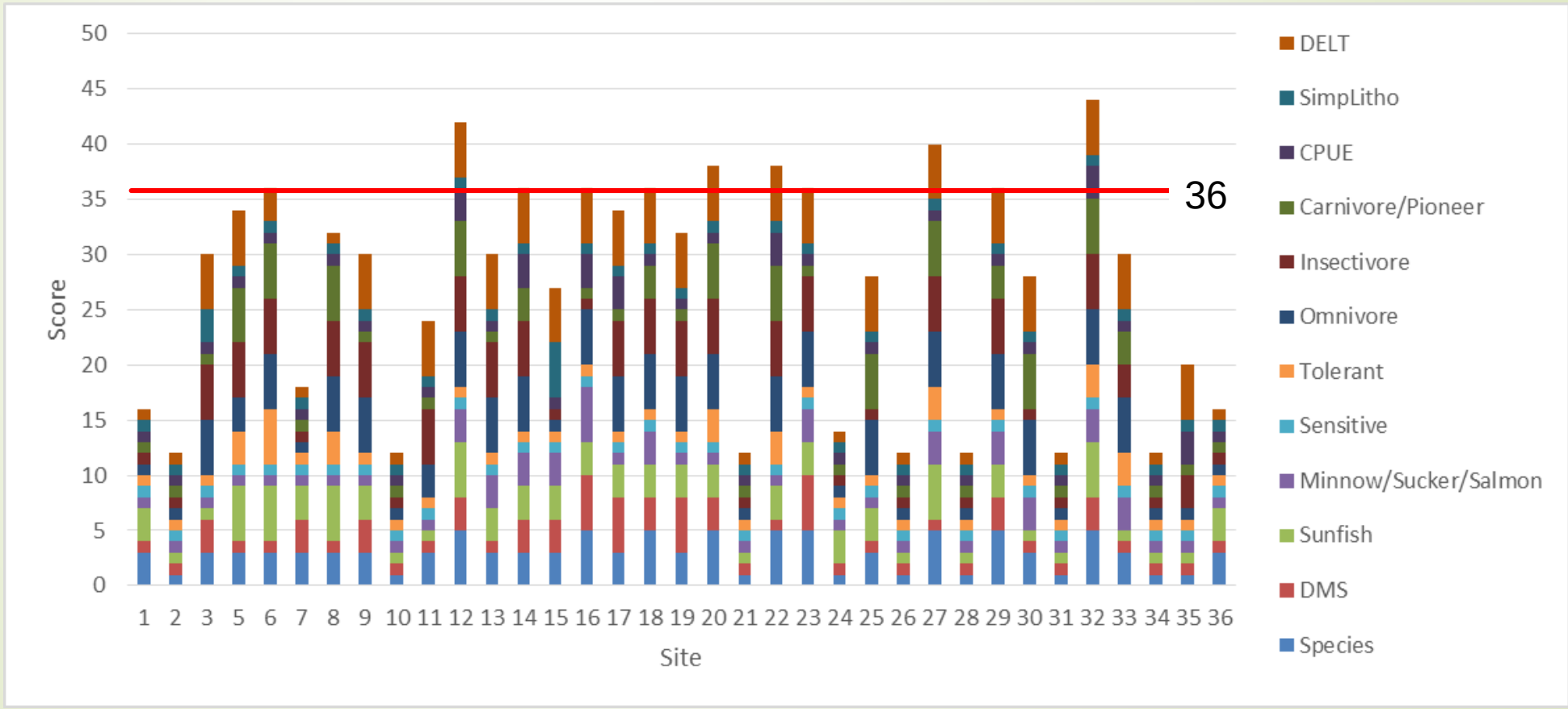
Do the streams support healthy fish & macroinvertebrate communities?

Aquatic Life Use

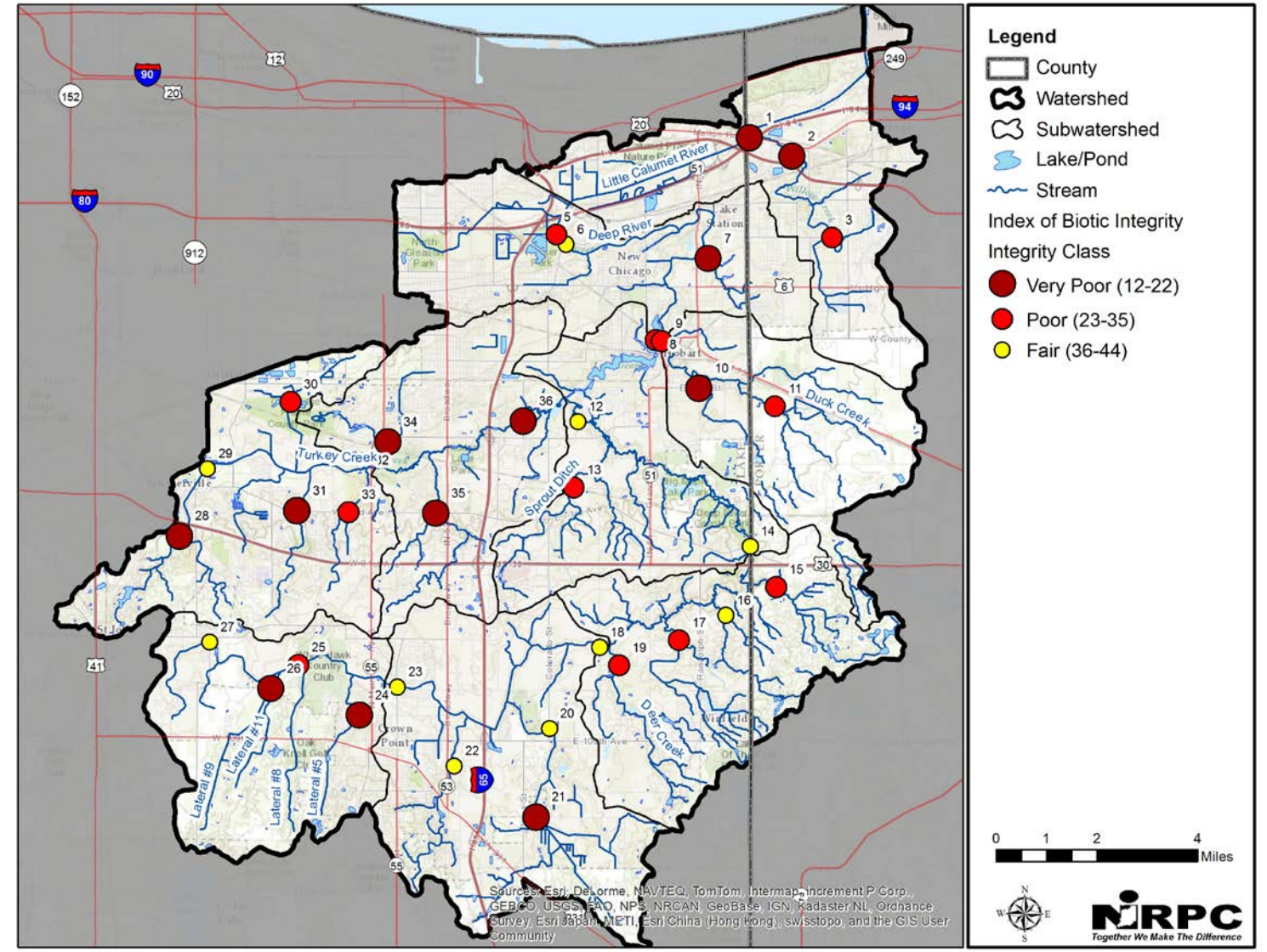
Aquatic Life Use Support Criteria

Biotic Index		Integrity Class	Corresponding Integrity Class	Attributes
Fish community Index of Biotic Integrity (IBI) Scores (Range of possible scores is 0-60)	Fully Supporting IBI ≥ 36	Excellent	53-60	Comparable to “least impacted” conditions, exceptional assemblage of species
		Good	45-52	Decreased species richness (intolerant species in particular), sensitive species present
		Fair	36-44	Intolerant and sensitive species absent, skewed trophic structure
	Not Supporting IBI < 36	Poor	23-35	Many expected species absent or rare, tolerant species dominant
		Very Poor	12-22	Few species and individuals present, tolerant species dominant
		No Organisms	12	No fish captured during sampling.

Index of Biotic Integrity



Integrity Class Rating

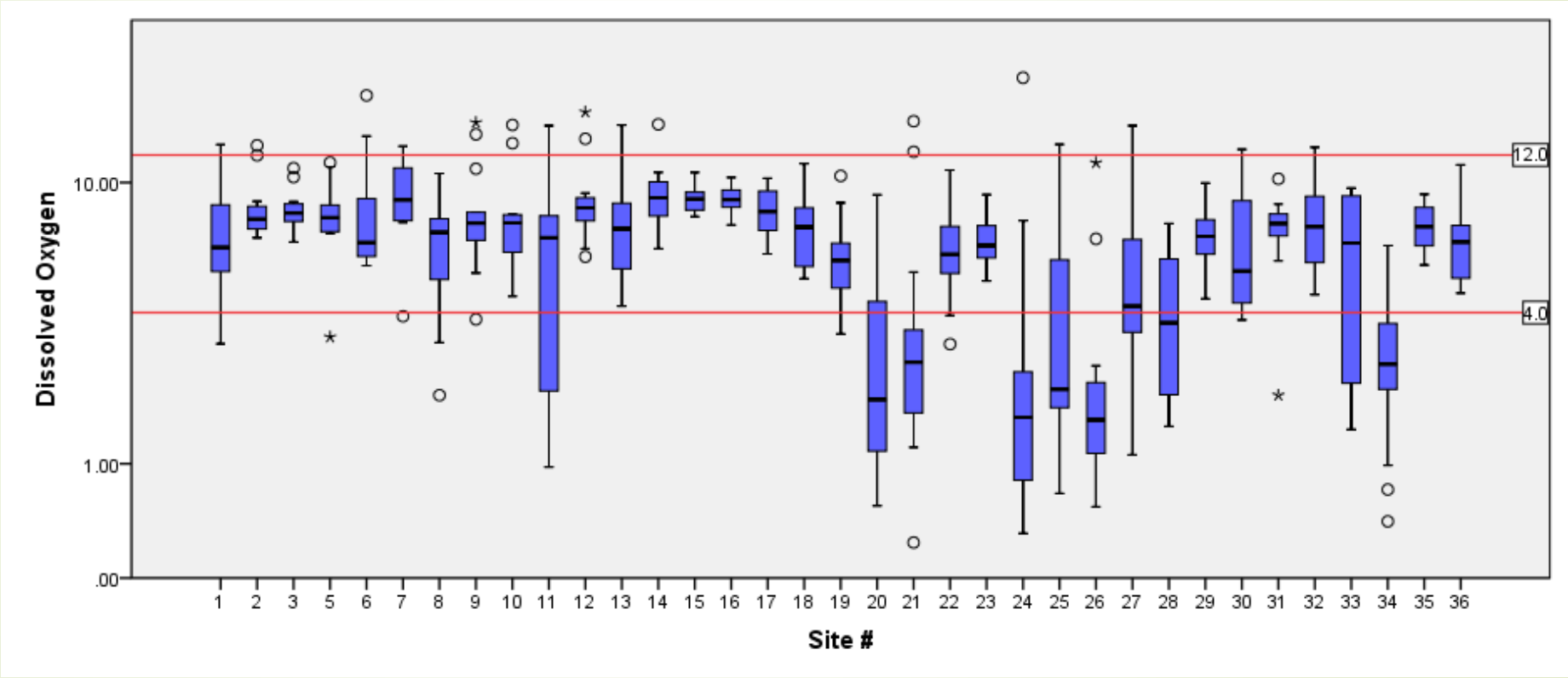


If Not, Why?

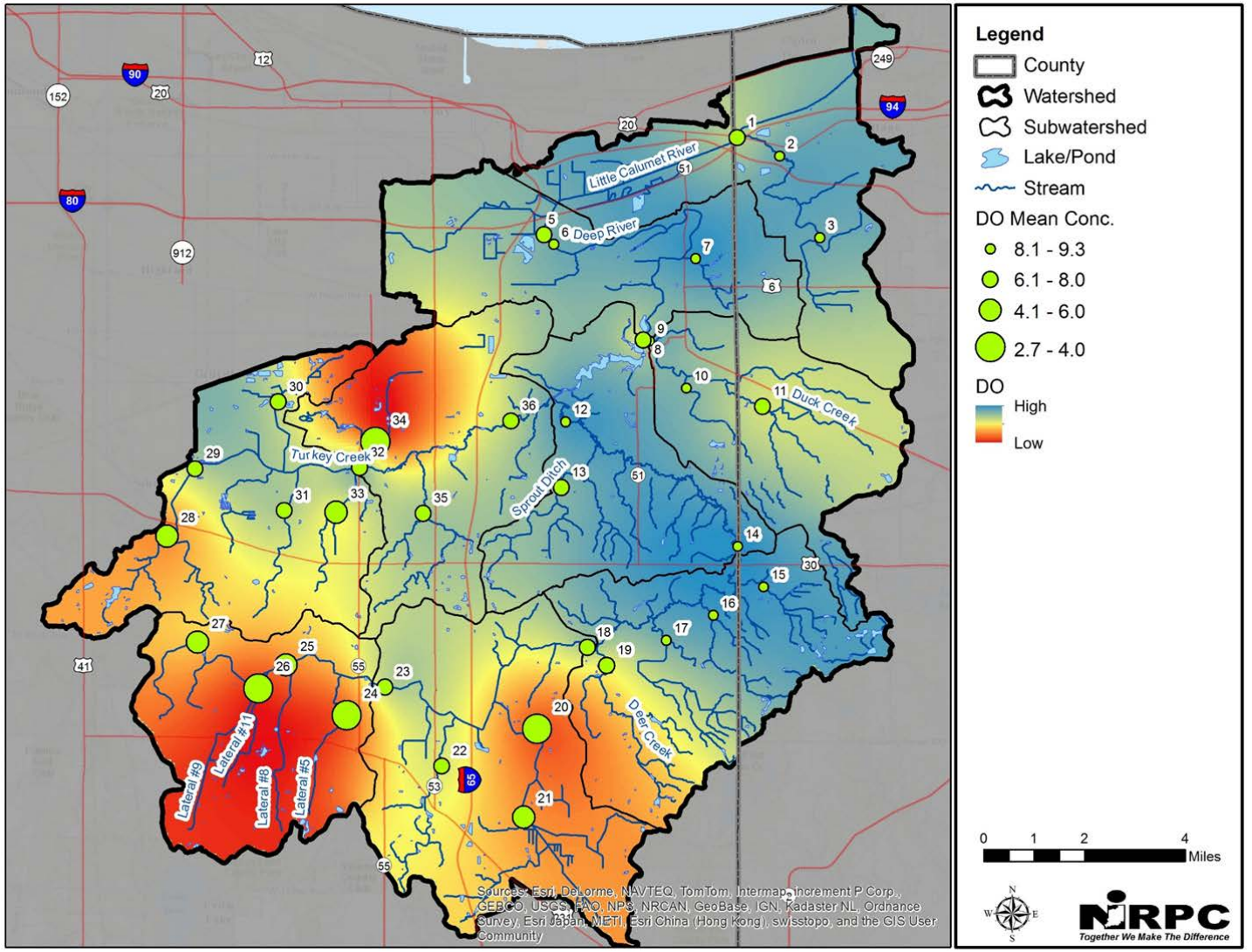
Stressor Identification

- Increased stream temperatures
- Low dissolved oxygen levels
- Excess nutrient loading
- Ammonia toxicity
- Excessive sediment loading
- Poor habitat quality

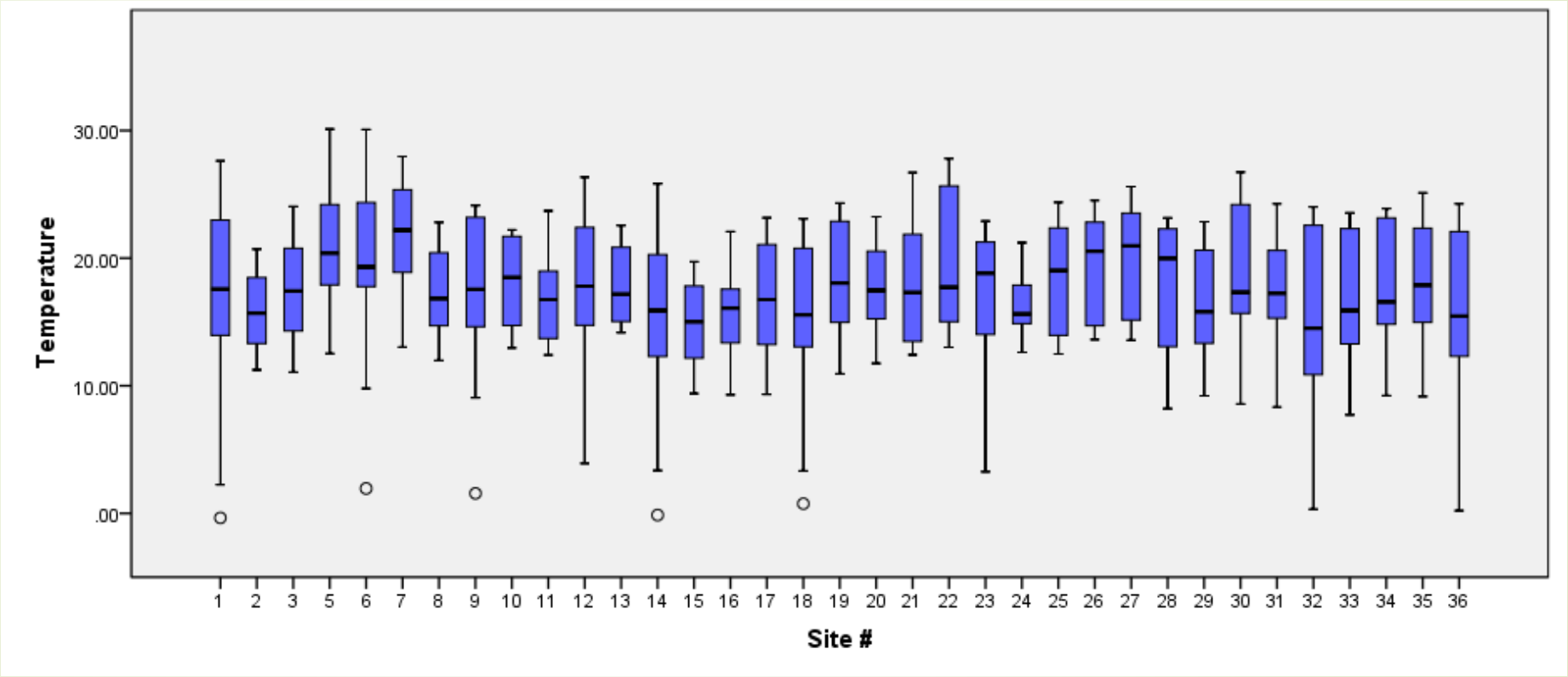
Dissolved Oxygen Levels



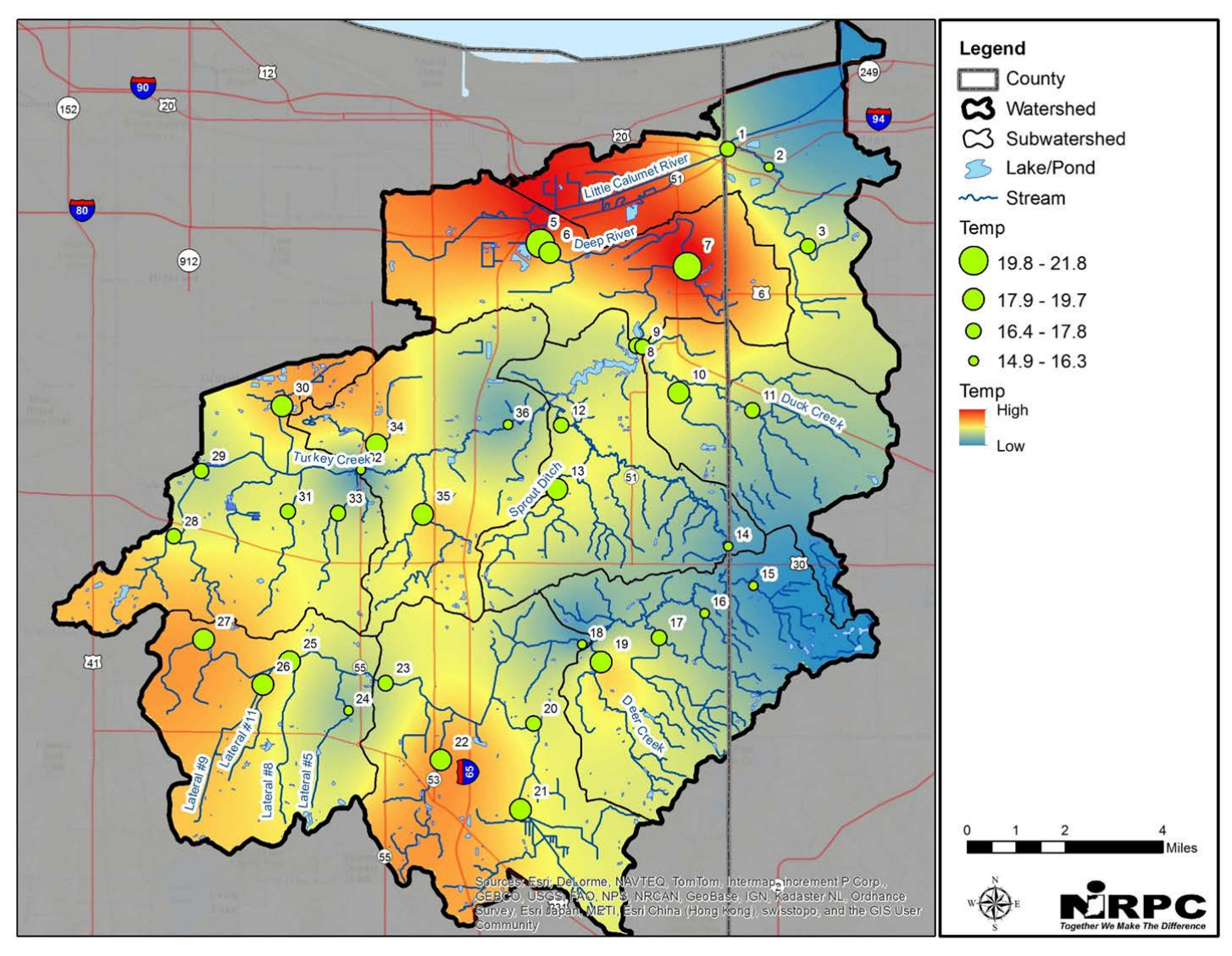
Dissolved Oxygen Levels



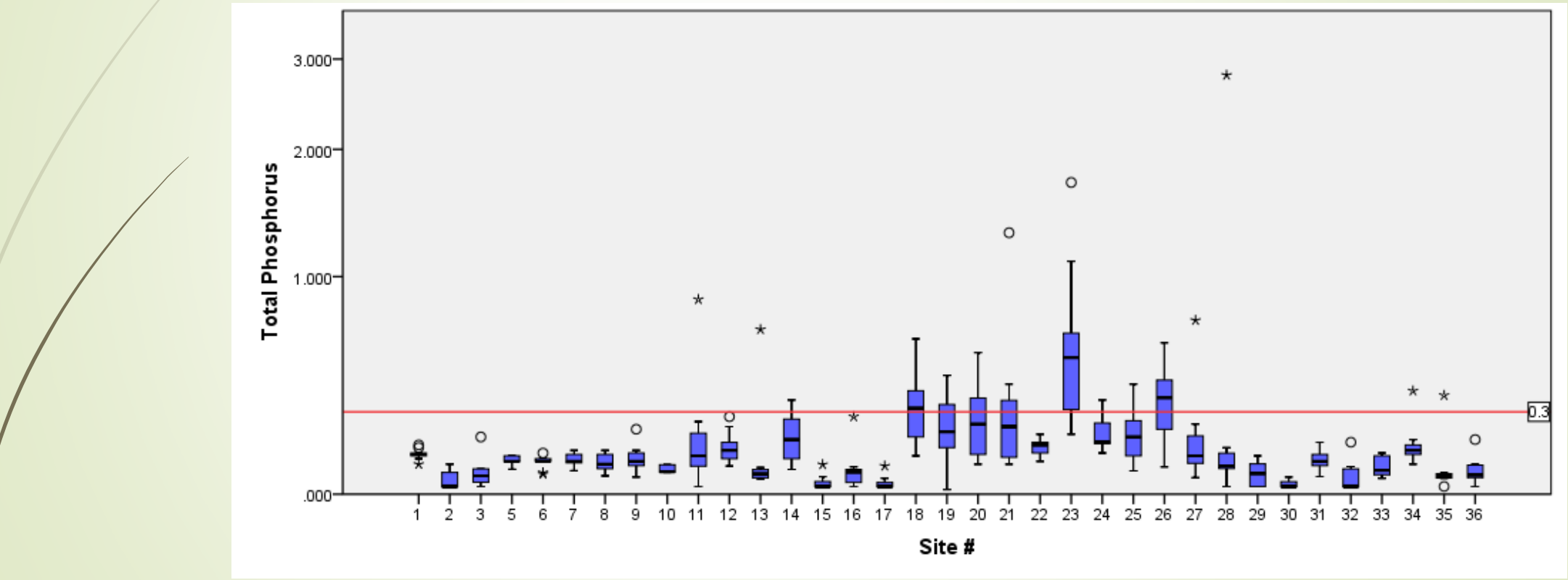
Stream Temperature



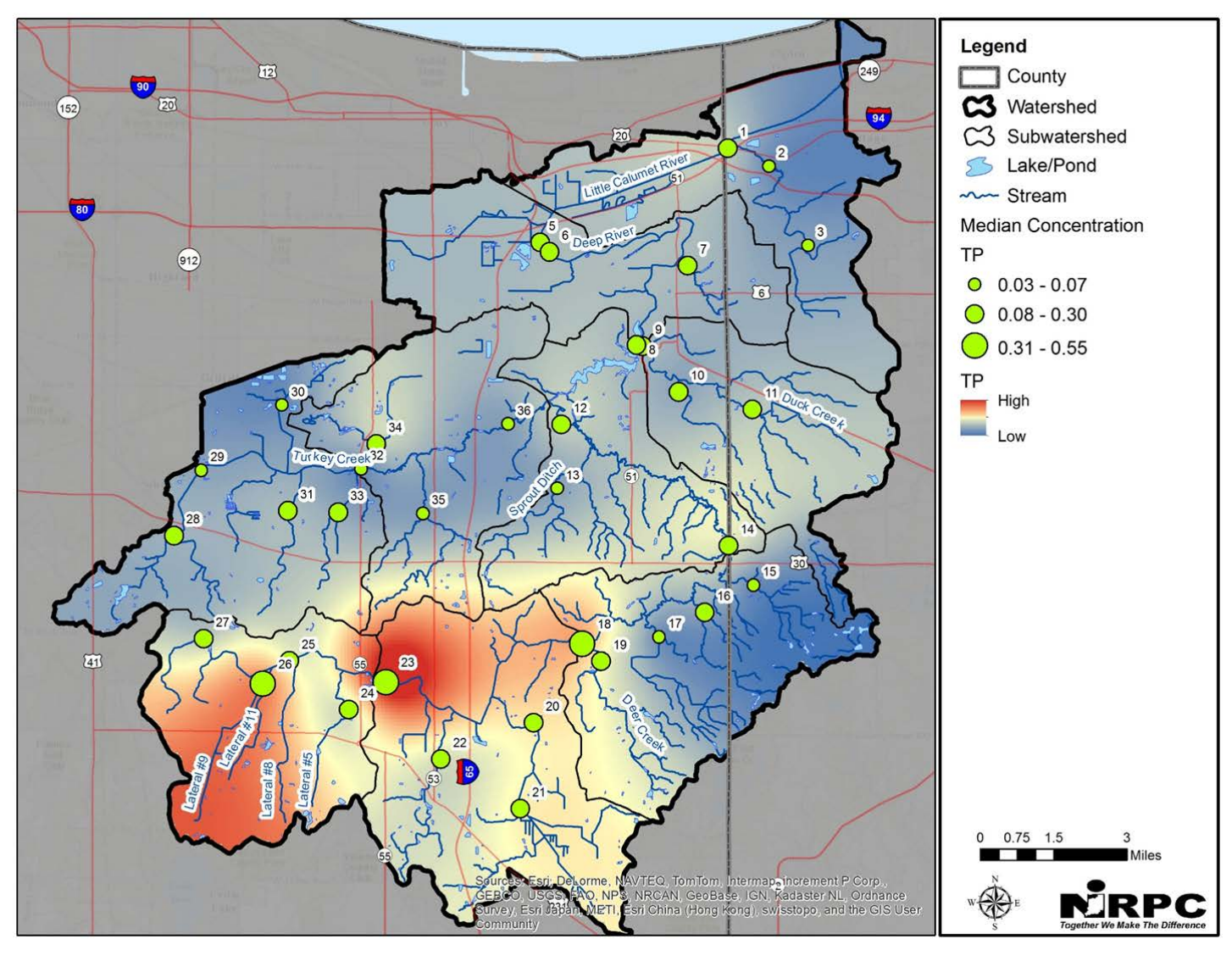
Stream Temperature



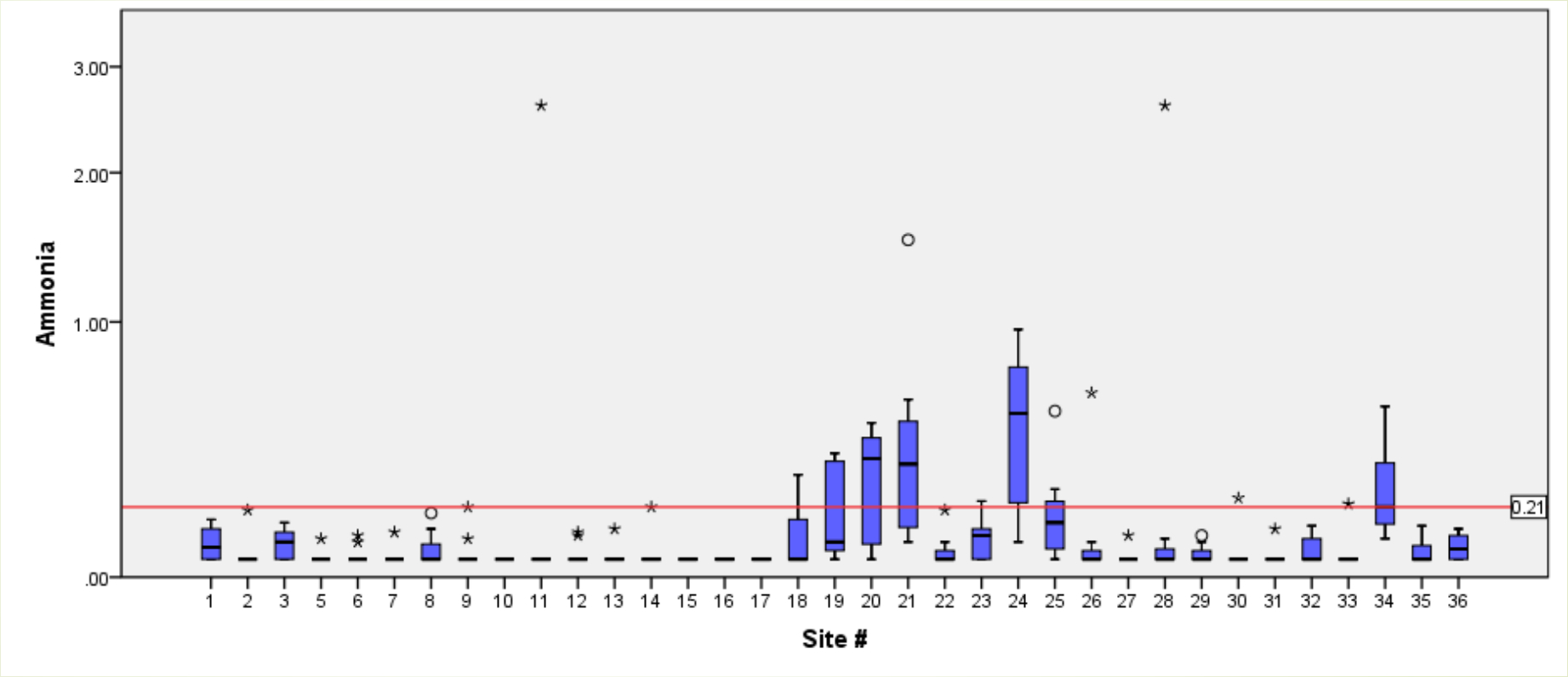
Nutrients- Phosphorus



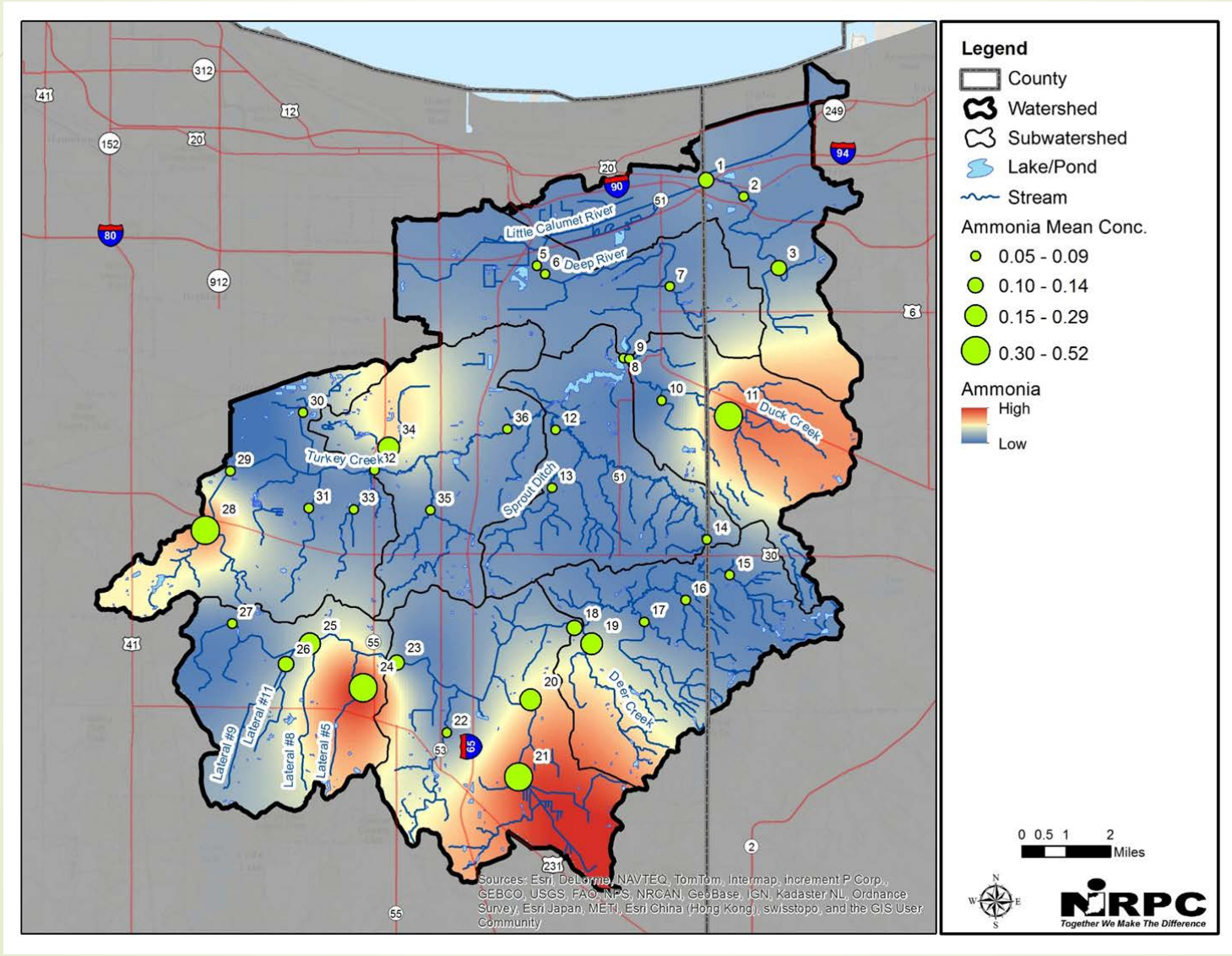
Nutrients- Phosphorus



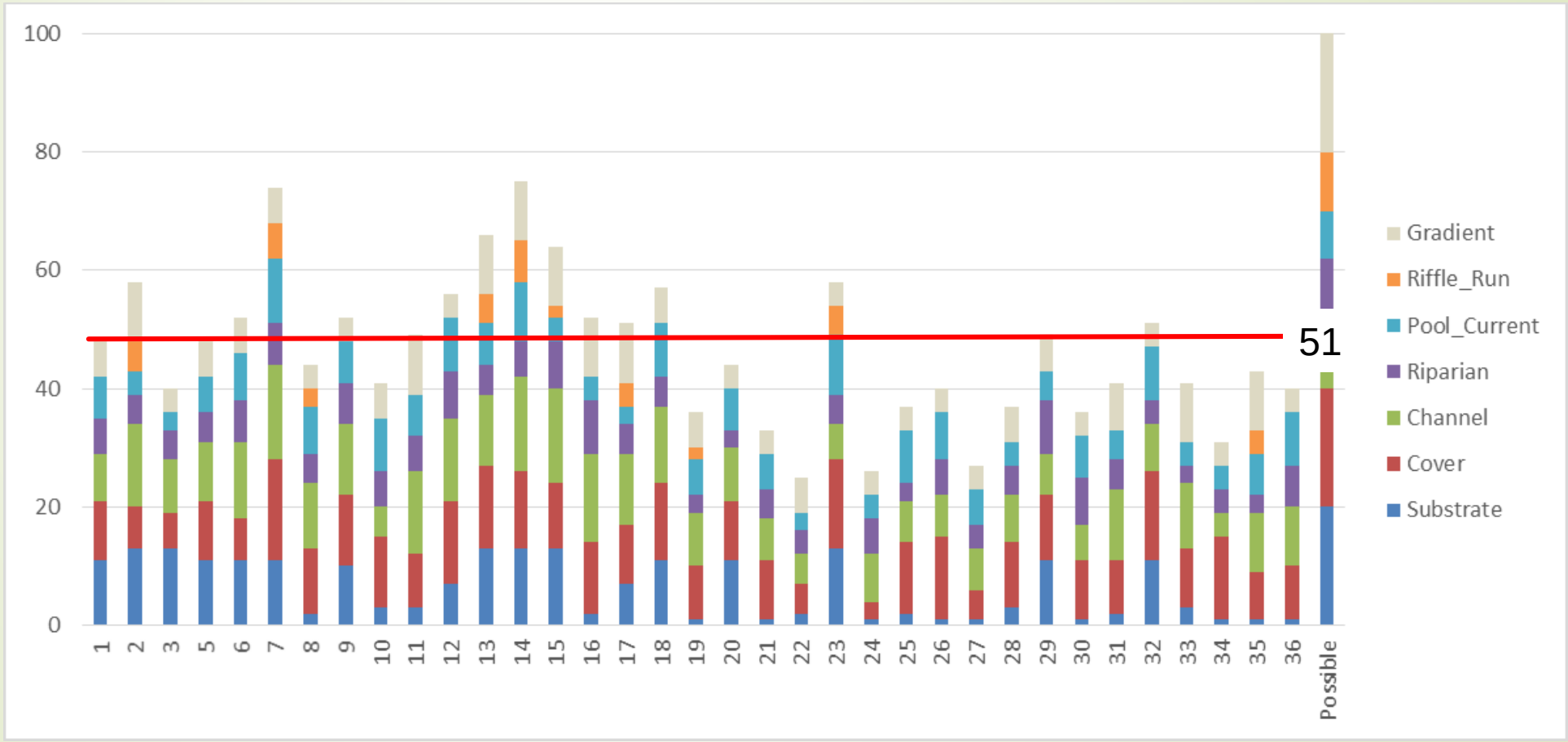
Ammonia Toxicity



Ammonia Toxicity



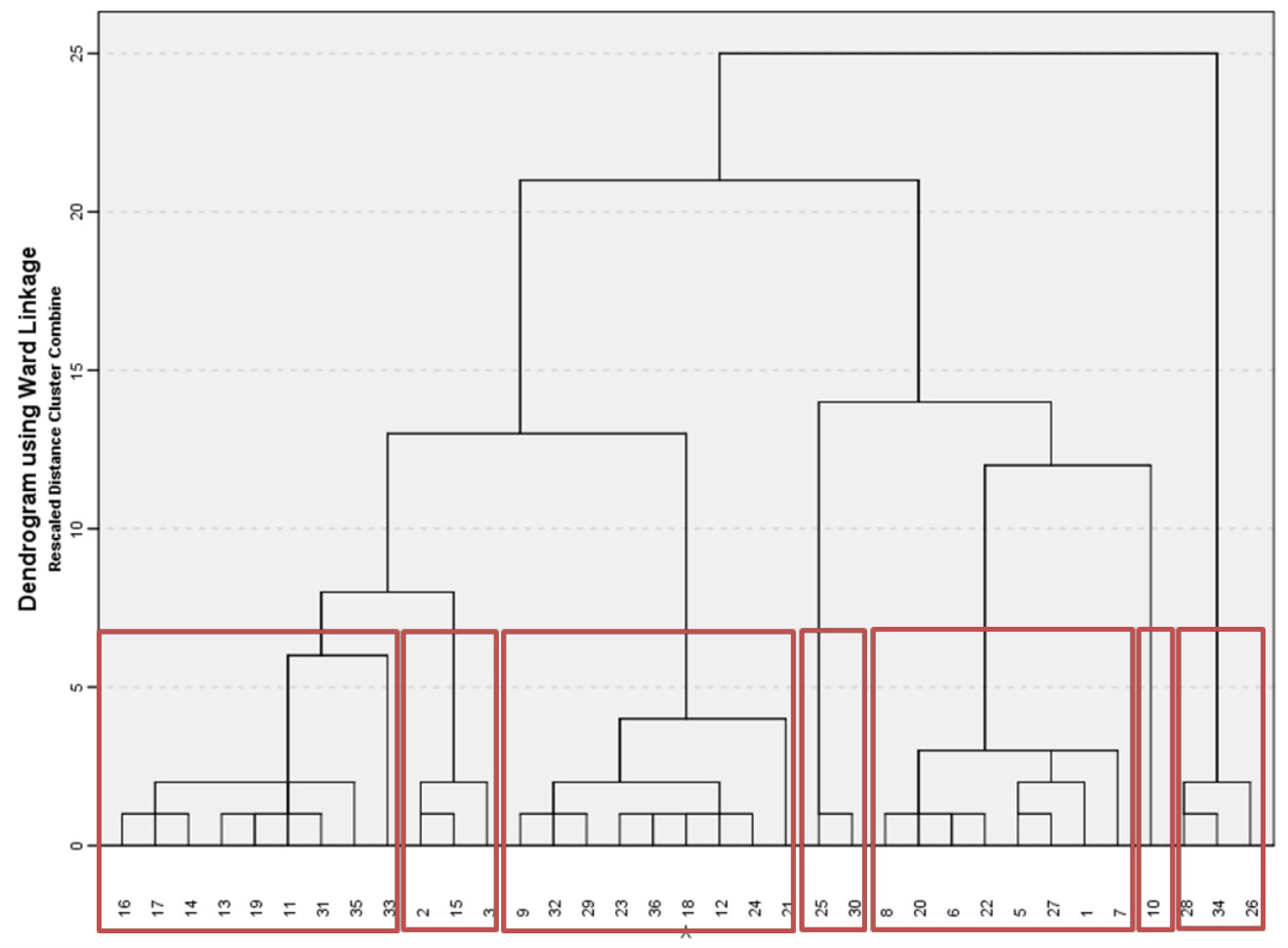
Habitat Quality



Stressor Co-occurrence with Impairment

Site	Biotic Impairment		Candidate Causes/ Stressors											
			↑Temp	↓DO	↑ Nutrients			Toxicity	↑ Sediment		↓Habitat Quality			
	Fish	Macros	Temp	DO	TP	NO3	TKN	NH3	TSS	Turb	QHEI	Emb	Chan	Grad
1	Yes	No	0	+	+	0	0	+	-	+	-	+	+	0
2	Yes	Yes	0	-	-	0	0	0	-	-	-	-	-	-
3	Yes	Yes	0	-	-	0	0	+	-	0	+	-	+	+
5	Yes	No	0	-	+	-	0	0	-	+	-	+	+	0
6	No	Yes	0	-	+	-	0	0	-	0	-	+	+	0
7	Yes	Yes	0	-	+	-	0	0	-	+	+	+	-	+
8	Yes	Yes	0	+	+	-	0	+	-	0	-	+	+	0

Site Cluster Analysis of Fish & Macroinvertebrate Communities



Variable Predictive of Community Structure

Fish

- Temperature
- Dissolved Oxygen
- Turbidity
- E. coli
- Total Organic Carbon
- Chemical Oxygen Demand
- Wetland
- Channel Morphology
- Stream Gradient
- Stream Embeddedness

Macroinvertebrates

- Dissolved Oxygen
- Dissolved Oxygen % Saturation
- Ammonia
- pH
- Wetland
- Forest
- Scrub/Shrub
- Channel Morphology
- Riparian Quality
- Stream Gradient

Most Influential Factors

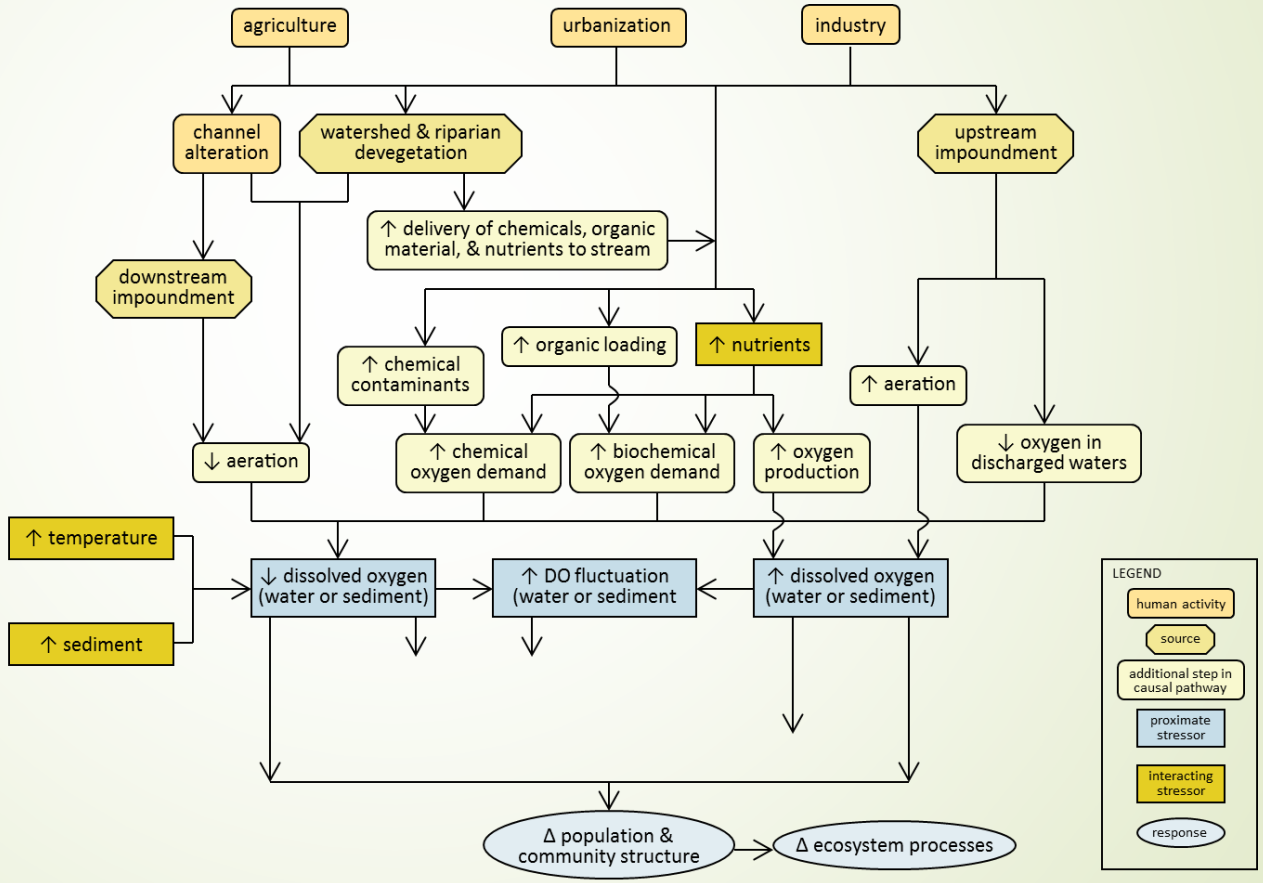
Fish

- Dissolved Oxygen
- Channel Morphology
- Stream Embeddedness
- Stream Gradient

Macroinvertebrates

- Dissolved Oxygen
- Channel Morphology
- Riparian Forest
- Stream Gradient
- Riparian Scrub/Shrub

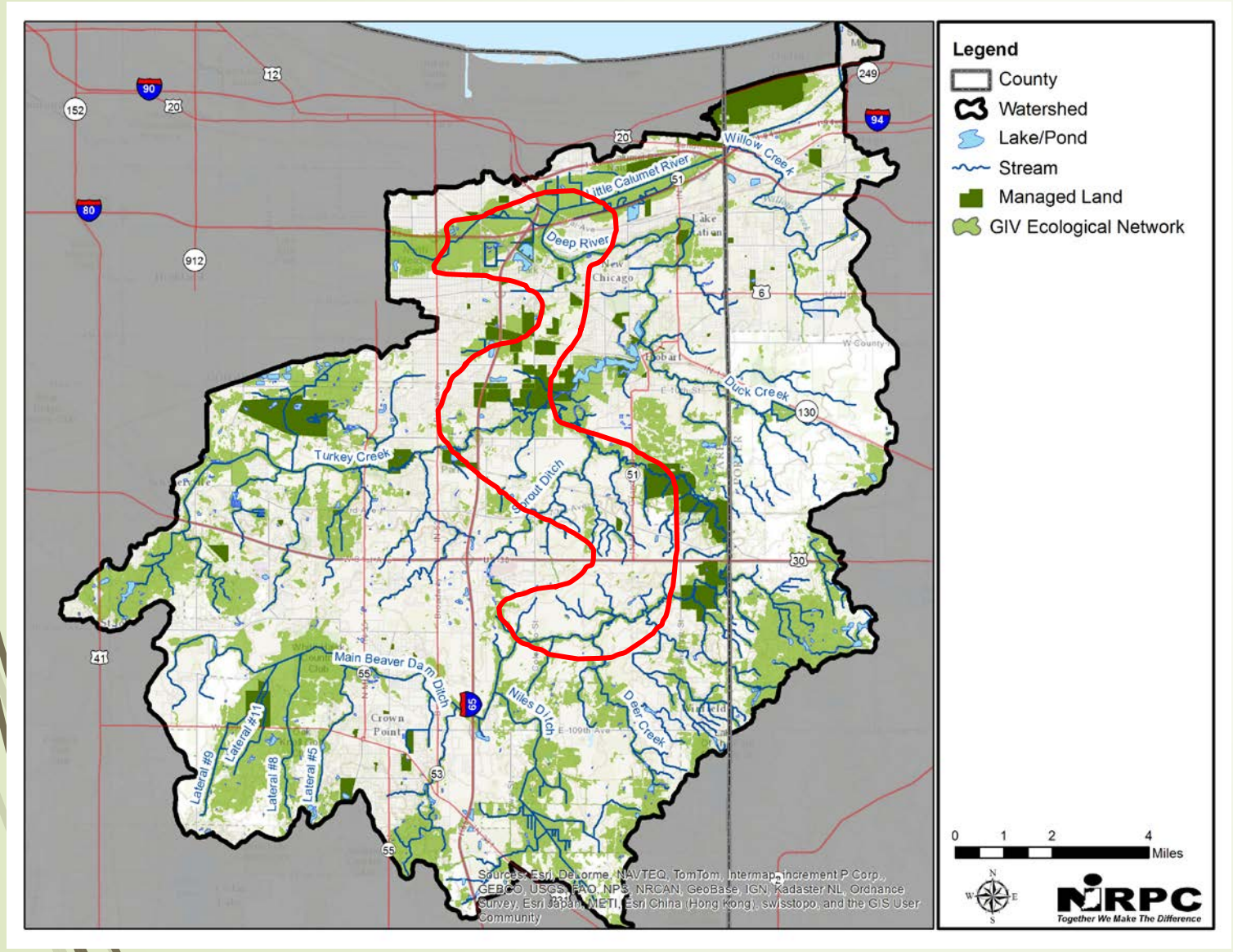
Linking Biotic Impairments to Stressors, Sources, and Human Activities

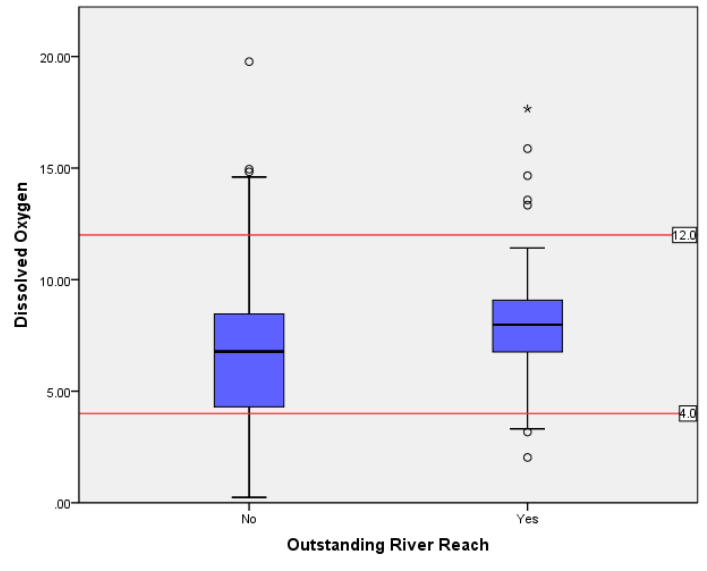


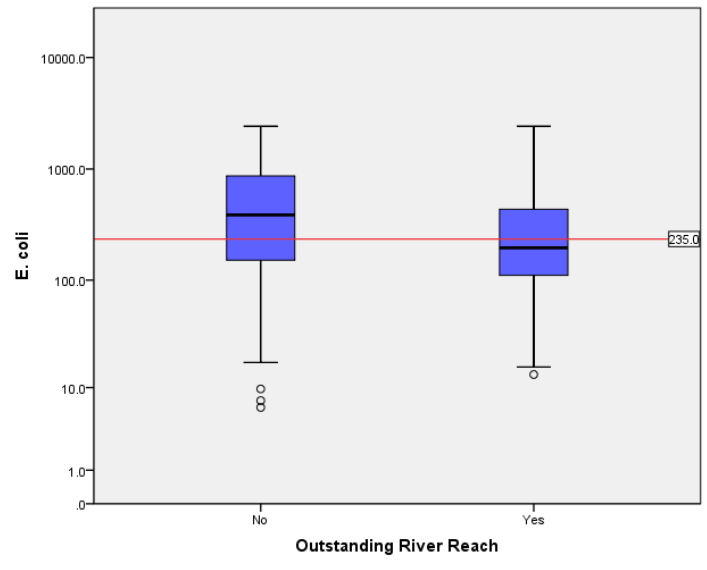
Simple conceptual diagram for **DISSOLVED OXYGEN**

Developed 7/2007 by Kate Schofield & Suzanne Marcy; modified 4/2015

Opportunities for Conservation



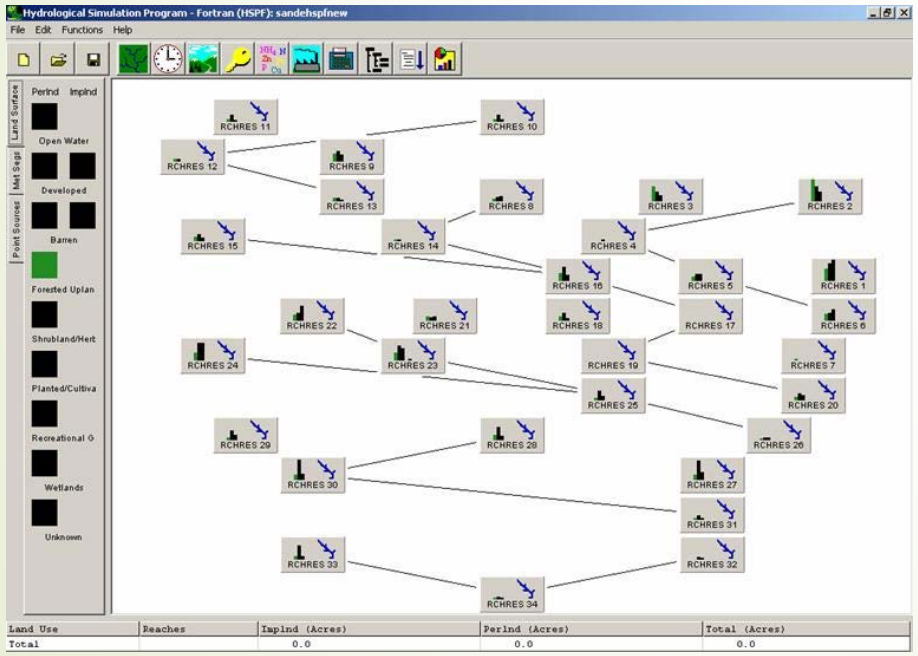




Looking Ahead

- Identify problems that reflect the concerns
- Potential causes for each problem
- Potential sources for each pollution problem
- Pollutant loads
- Load reductions needed
- Set goals and identify critical areas

Water Quality Modeling Project- Purdue University Calumet



Volunteer Water Quality Monitoring

Monitoring Site Staff Gages

Photos taken by USGS

Questions or Comments

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www.nirpc.org/environment/deep-river-portage-burns-waterway-initiative.aspx