



# Nutrient and Sediment Monitoring in Great Lakes Tributaries

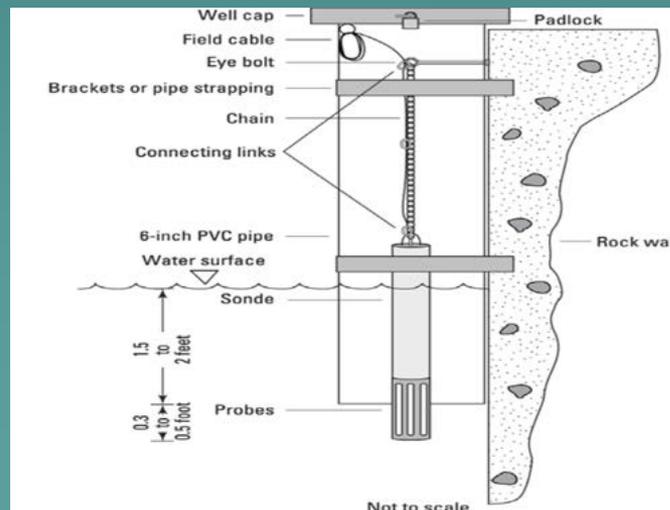
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U.S. Geological Survey

# Objectives

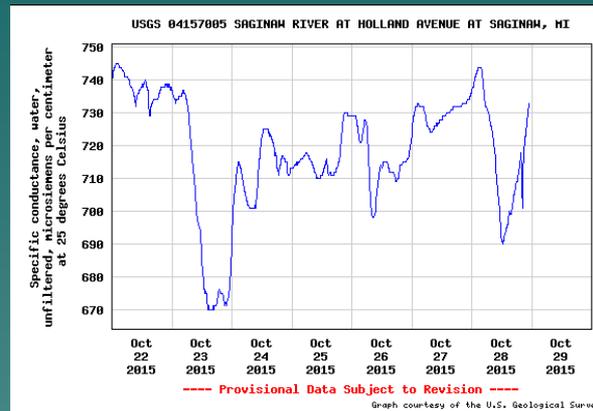
- *Periodic sampling for various constituents*
- *Continuous monitoring for basic parameters*
- *Load computations (sample results and flow)*
- *Real-time load computations (surrogates)*

# Analytes

- Sample analyses
  - Nutrients:
    - Total Phosphorus, Ortho-phosphorus
    - Ammonia, nitrite, nitrite + nitrate, total nitrogen
  - Suspended Sediment
  - Chloride
- Multi-parameter sondes
  - Dissolved oxygen
  - SC
  - pH
  - Temperature
  - Turbidity

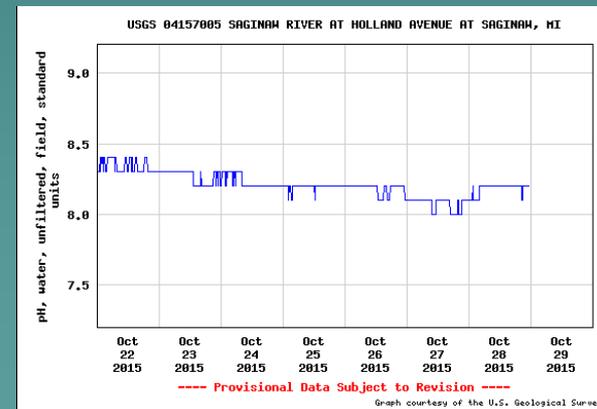
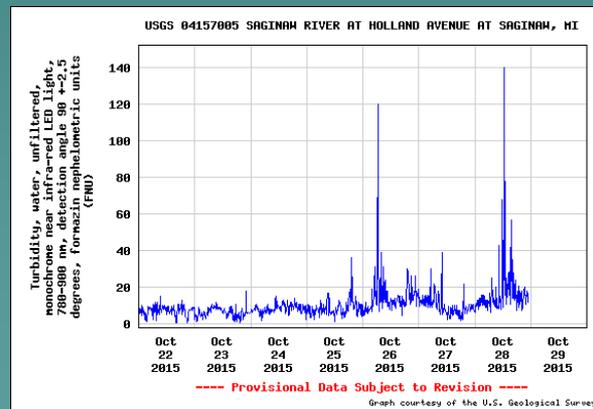
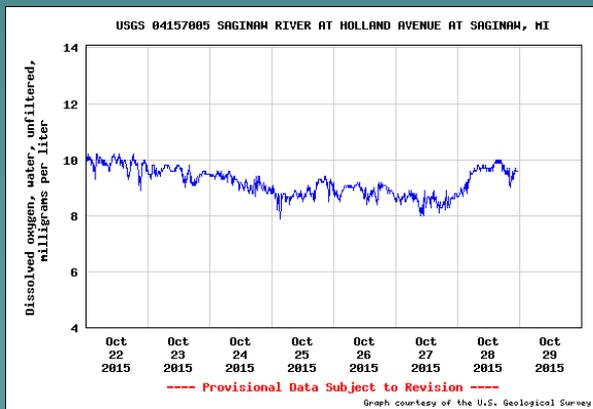


# Continuous Data



**Available Parameters**

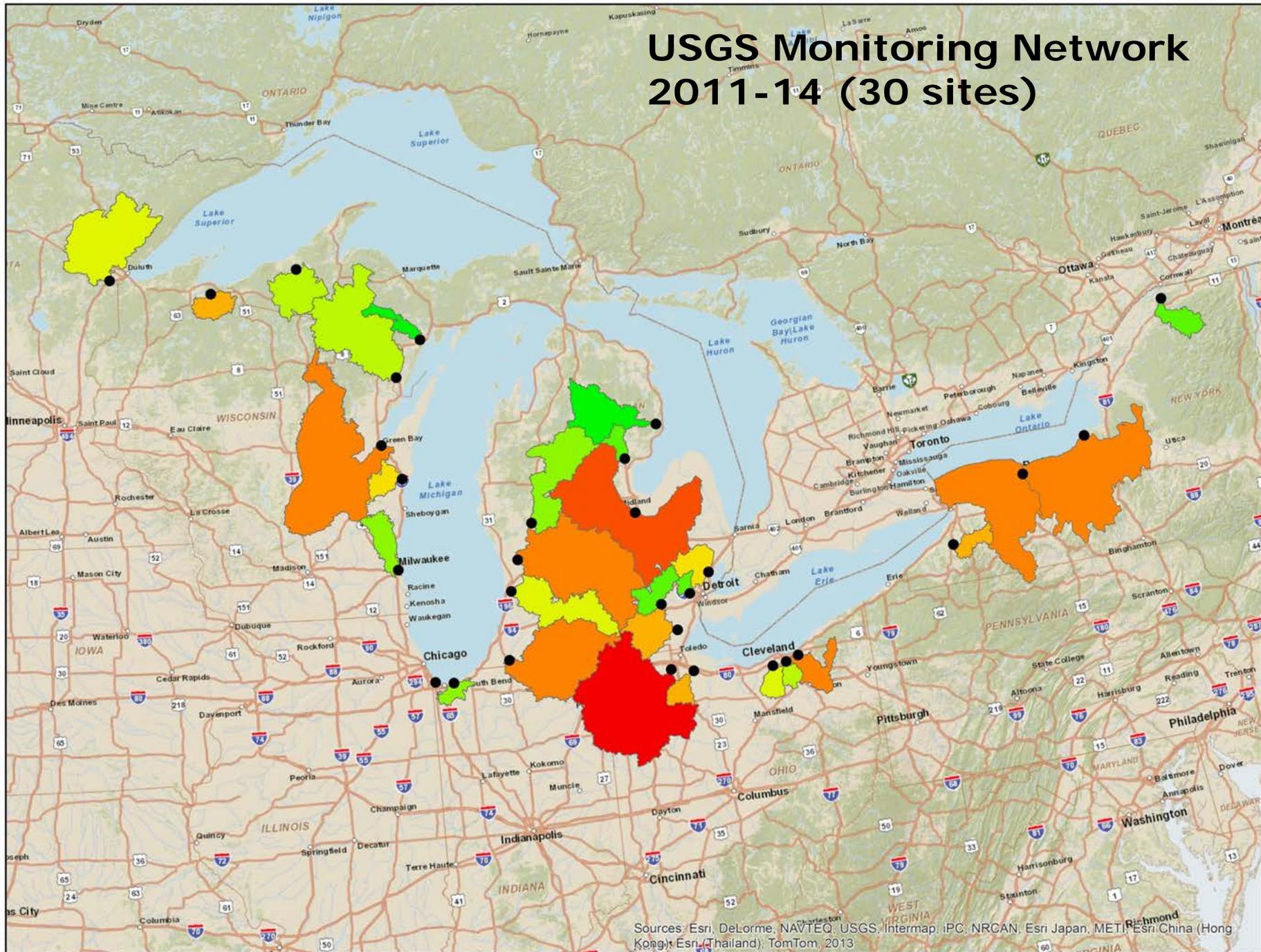
- All 8 Available Parameters for this site
- 00010 Temperature, water
- 00300 Dissolved oxygen
- 00095 Specific cond at 25C
- 63680 Turbidity, Form Neph
- 00400 pH



# Network Design

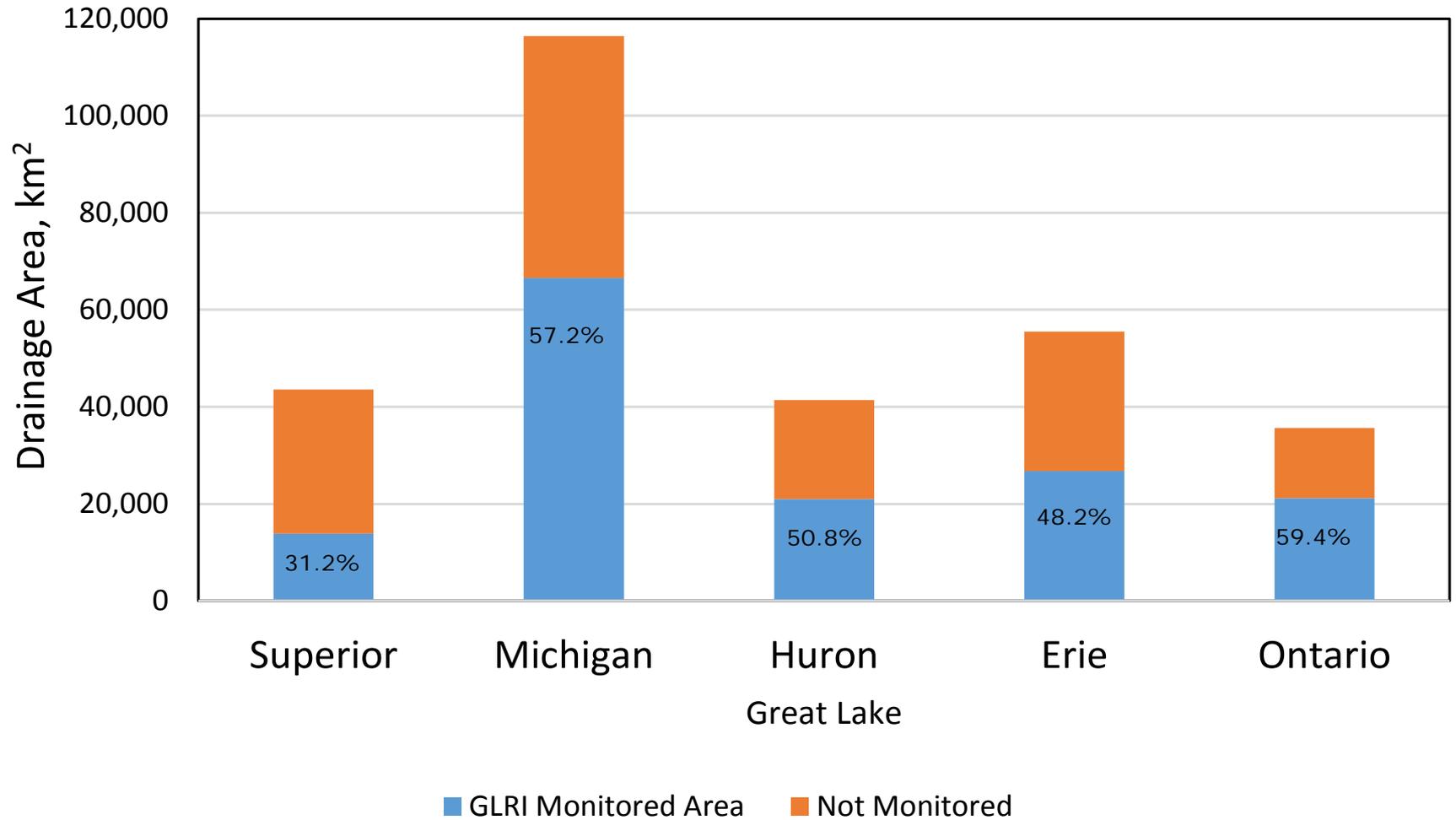
- Emphasis on quantifying inputs to the Lakes
  - Major drainages
  - Major contributors
- Document overall restoration success (GLRI)

# USGS Monitoring Network 2011-14 (30 sites)



Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013

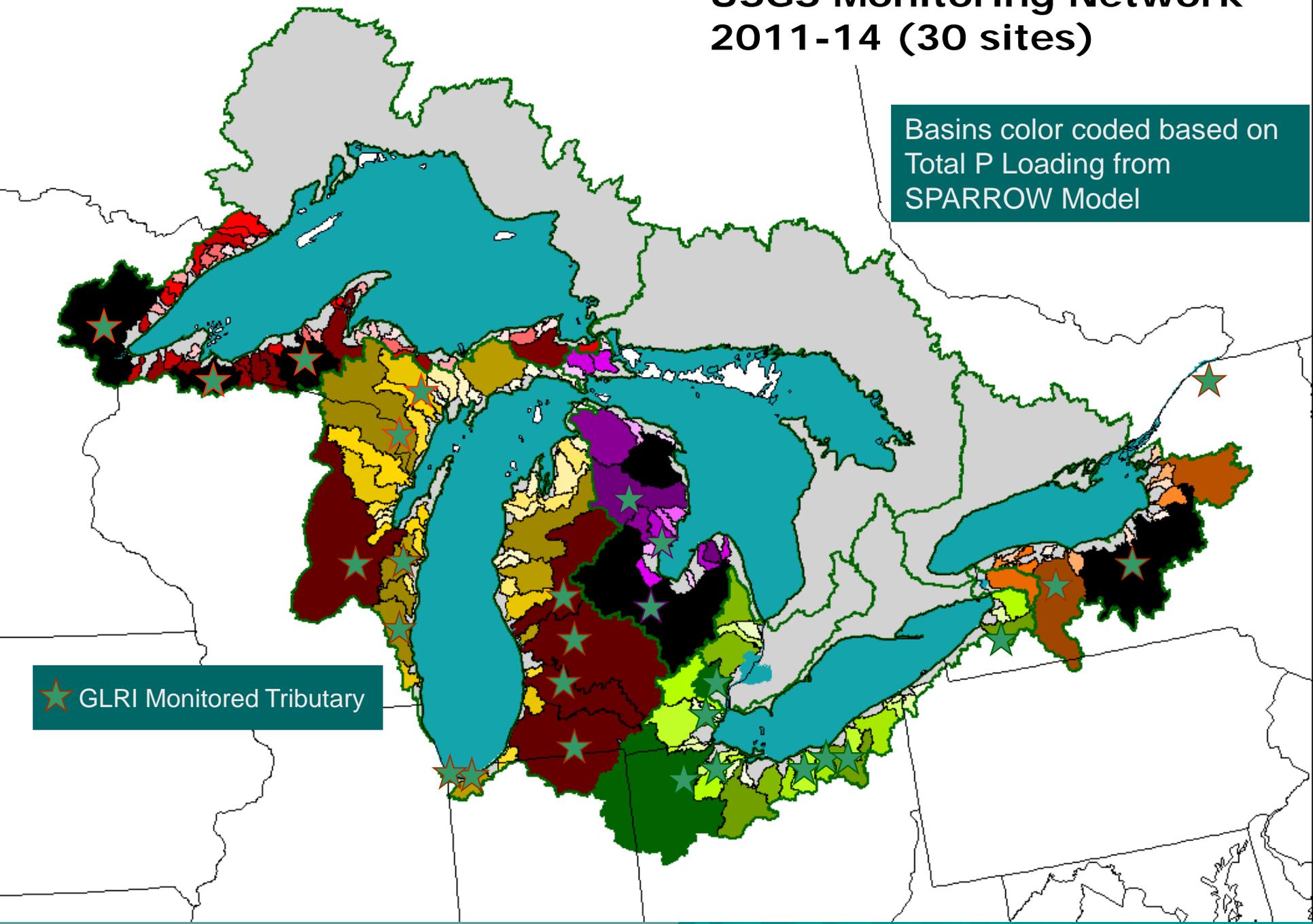
## U.S. Area Monitored By Lake



# USGS Monitoring Network 2011-14 (30 sites)

Basins color coded based on  
Total P Loading from  
SPARROW Model

★ GLRI Monitored Tributary



# Loads Computations

- Currently finalizing loads at all 30 sites for 2011-14
- Use of surrogate methods: loads computed every 15 minutes
  - Relate continuous parameters to concentrations from samples
  - Use relationships to compute concentrations during periods with no samples
- Flow-based methods must be computed after the fact

# Future Loads Computations

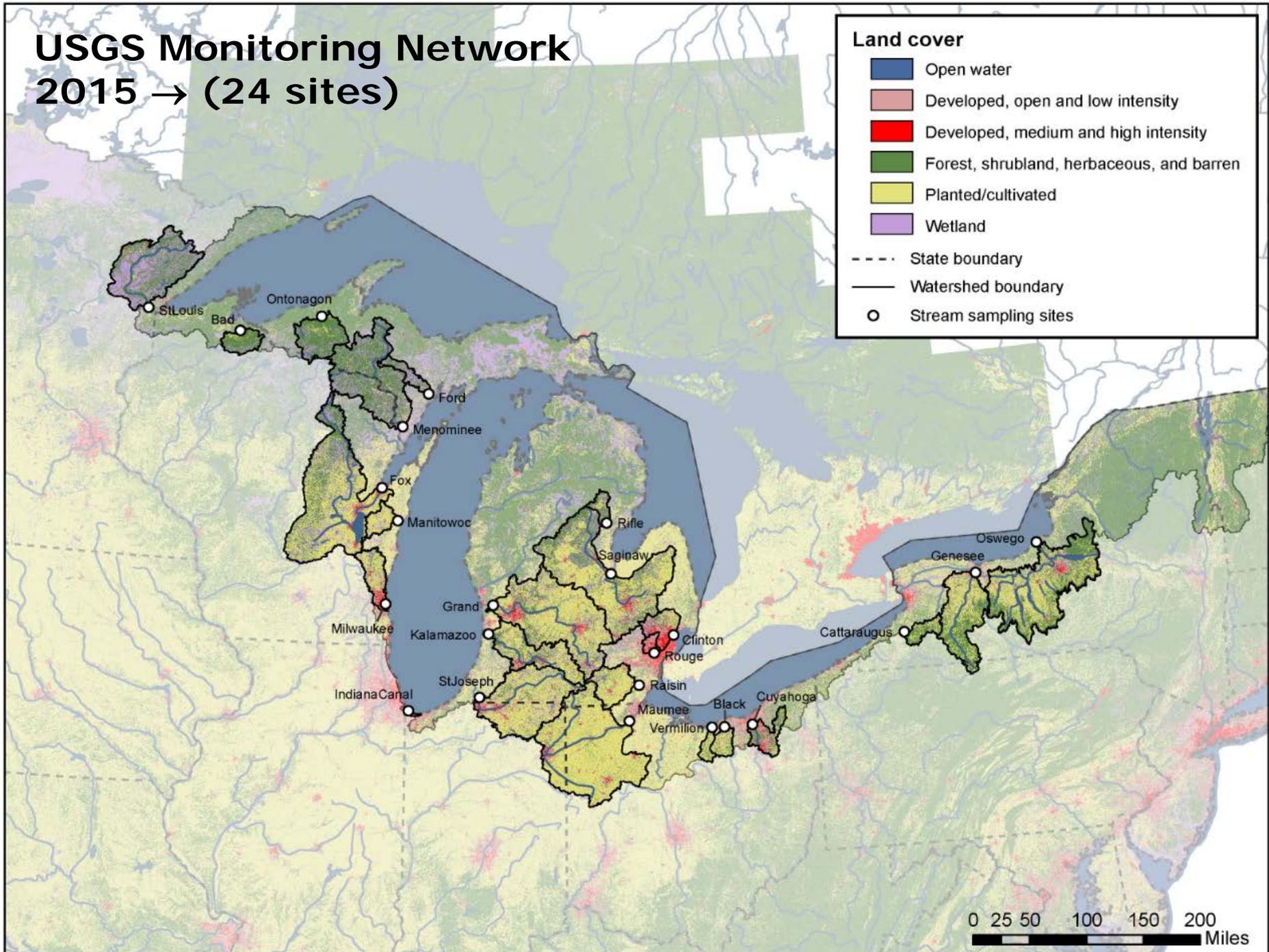
- Goal: 2017 and beyond
- Use surrogate relationships to present loads in real-time
  - Include error analyses (error bars)
- Reduced network of 24 sites
- Potentially investigate other load computation methods

# USGS Monitoring Network 2015 → (24 sites)

## Land cover

- Open water
- Developed, open and low intensity
- Developed, medium and high intensity
- Forest, shrubland, herbaceous, and barren
- Planted/cultivated
- Wetland

- State boundary
- Watershed boundary
- Stream sampling sites



# Indiana Real-time Water Quality

Home	<a href="#">View Data</a>	<a href="#">Methods</a>	<a href="#">Constituents</a>	<a href="#">Models</a>	<a href="#">Bibliography</a>	<a href="#">Links</a>
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NRTWQ Home >> Indiana >> View Data >> 03353200

- Plot
- Data Table
- Statistics
- Duration Curve
- Site Info
- Model Info

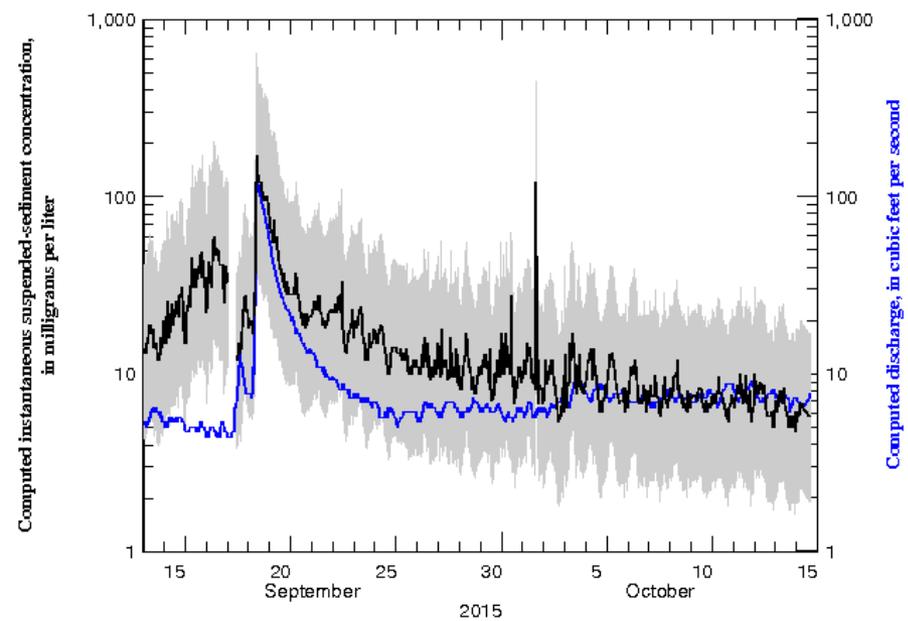
USGS station:

[Go to NWISWeb](#)

Constituent:

Time period:

The data used to produce this plot are [provisional](#) and have not been reviewed or edited. They may be subject to change.



Computed instantaneous suspended-sediment concentration in Eagle Creek at Zionsville, IN

Generated 10-15-15 17:21

### EXPLANATION

- Discharge
- Measured or computed water-quality constituent
- 90-percent prediction interval for computed value
- Value obtained from discrete sampling and analysis
- Load calculated using laboratory analysis and discharge
- ⋯ Water-quality criteria

# Future Data Collection

- How to deal with soluble phosphorus and nitrogen?
- Surrogate methods generally do very well with predicting particulate phosphorus and nitrogen
- Typical water quality parameters don't relate well to soluble forms

# Future Data Collection?

- In-situ phosphate analyzer
  - Wet lab --- pumps in water and analyzes
- Nitrate sensor
  - UV absorption method



# Contaminants of Emerging Concern (CECs)

- Monthly sampling at 16 of the current sites
- Pesticides
- Organics
- Glyphosate
- Neonicotinoids
- Metabolomics
- Transcriptomics
- EPA ToxCast

# Questions?