

A story of Indiana lakes through data: The Indiana Lake Water Quality Assessment Report for 2015 to 2018.

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Talk outline

1. The Indiana Clean Lakes Program
2. Indiana Lake Water Quality Assessment Results
3. How to interact with our data



Indiana Clean Lakes Program



Background

1. Public information and education
2. Technical assistance
3. Volunteer lake monitoring
4. **Lake water quality assessment**
5. Coordination with other state and federal lake programs.



Why conduct assessments?

- 305b report
- Status and Trends
- The goals of the lake water quality assessment include:
 - (a) identifying water quality trends in individual lakes,
 - (b) identifying lakes that need special management, and
 - (c) tracking water quality improvements due to industrial discharge and runoff reduction programs



What data we collect

- Max depth
- Temperature
- Secchi depth transparency
- Light transmission
- Dissolved oxygen
- pH
- Alkalinity
- Conductivity
- Soluble Reactive Phosphorus (SRP)
- Total phosphorus (TP)
- Nitrate (NO_3^-)
- Ammonia (NH_3)
- Total nitrogen (TN)
- Chlorophyll-a
- Phytoplankton
- Zooplankton



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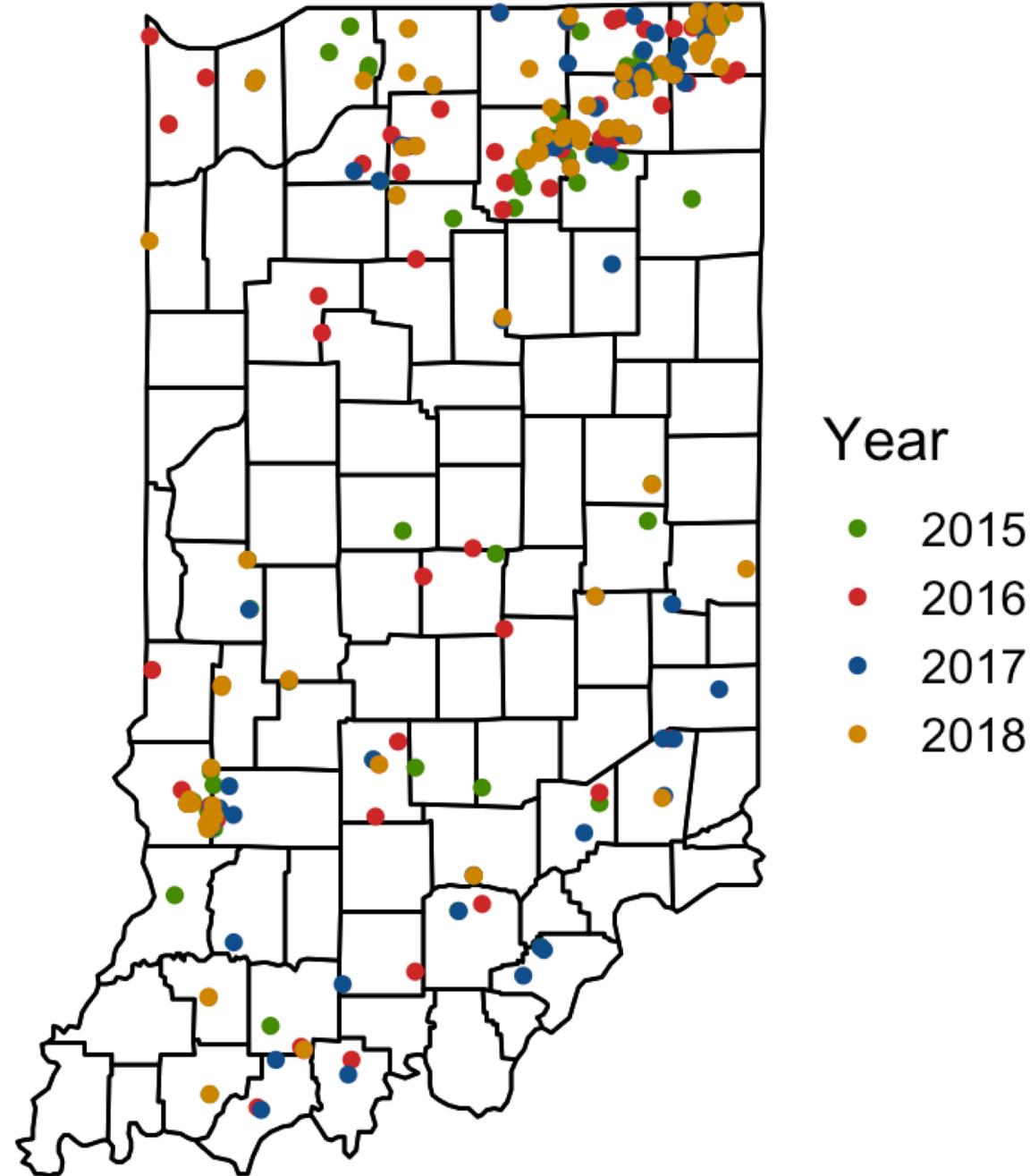
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Where we collect it

- 329 lakes sampled from 2015 – 2018
- Represent 51 counties

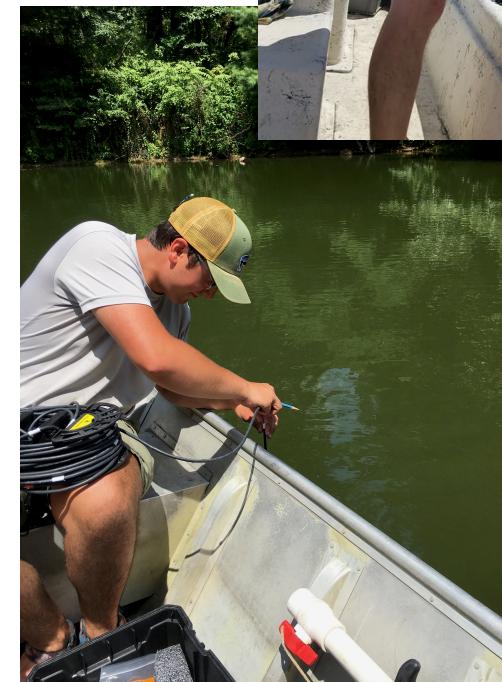
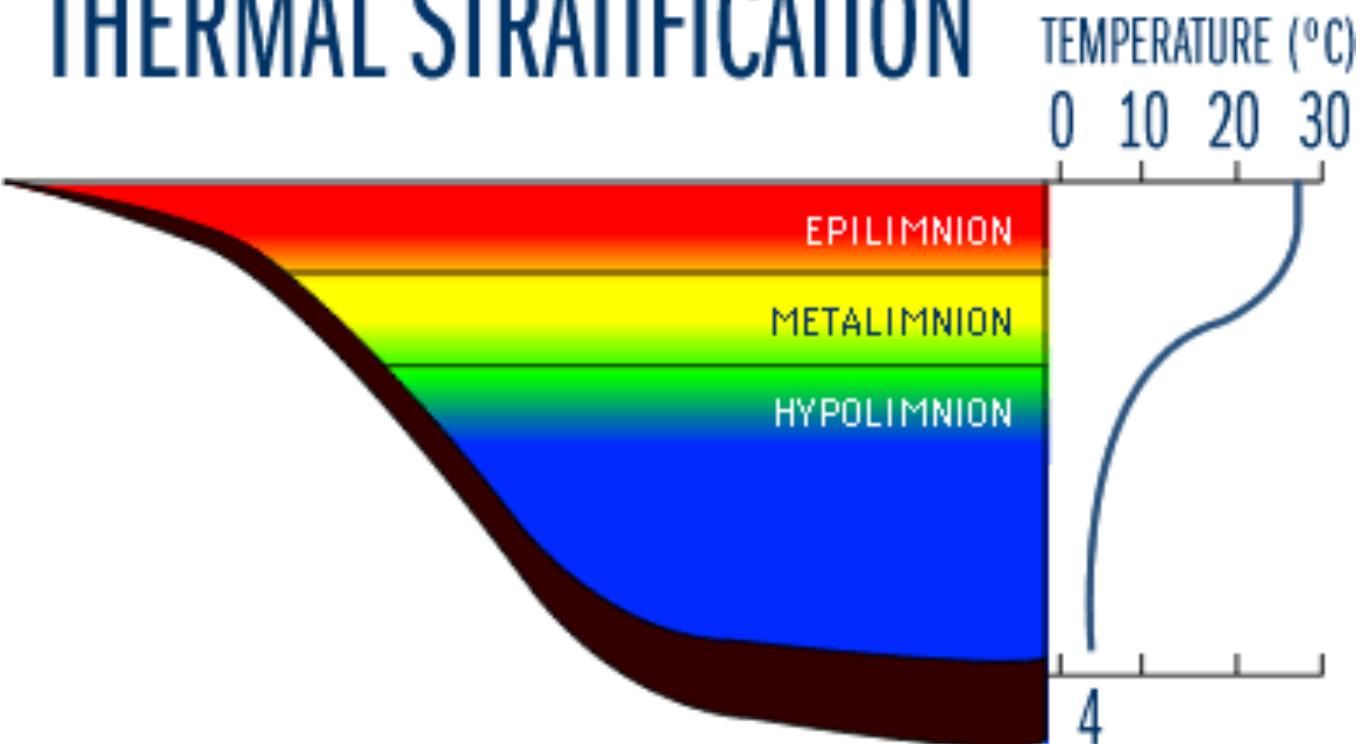


How we collect it



How we collect it

THERMAL STRATIFICATION



So we collect a lot of data on a lot of lakes...

1. Spatial patterns
2. Lake type
3. Overall trophic state

Carlson Trophic State Index

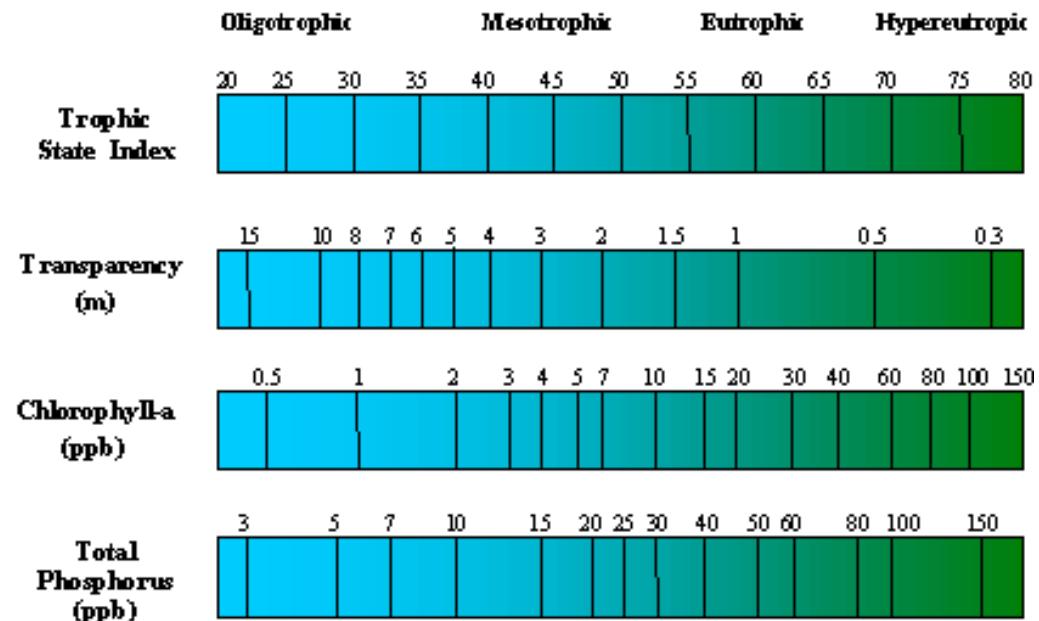
- Trophic state classifications

$$TSI(SD) = 60 - 14.41 \ln(SD)$$

$$TSI(\text{Chl-a}) = 9.81 \ln(\text{Chl-a}) + 30.6$$

$$TSI(\text{TP}) = 14.42 \ln(\text{TP}) + 4.15$$

- Total algal biomass in a water body at a specific location and time
 - 3 parameters that estimate algal biomass
- Measurement of biological response to inputs
 - Not the same thing as water quality

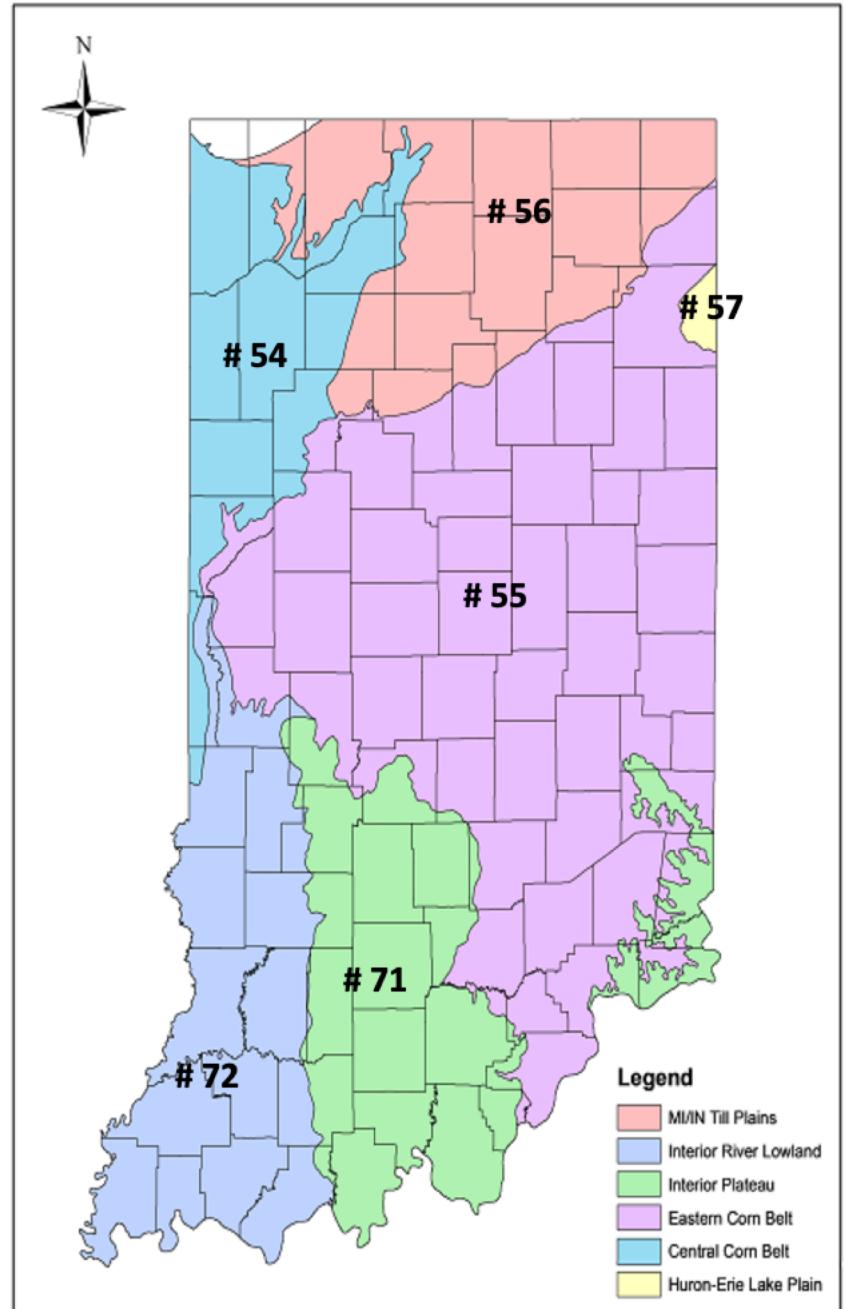


Carlson, RE. 1977. A trophic state index for lakes. Limnology and Oceanography. 22(2): 361 - 369

Water quality and spatial patterns

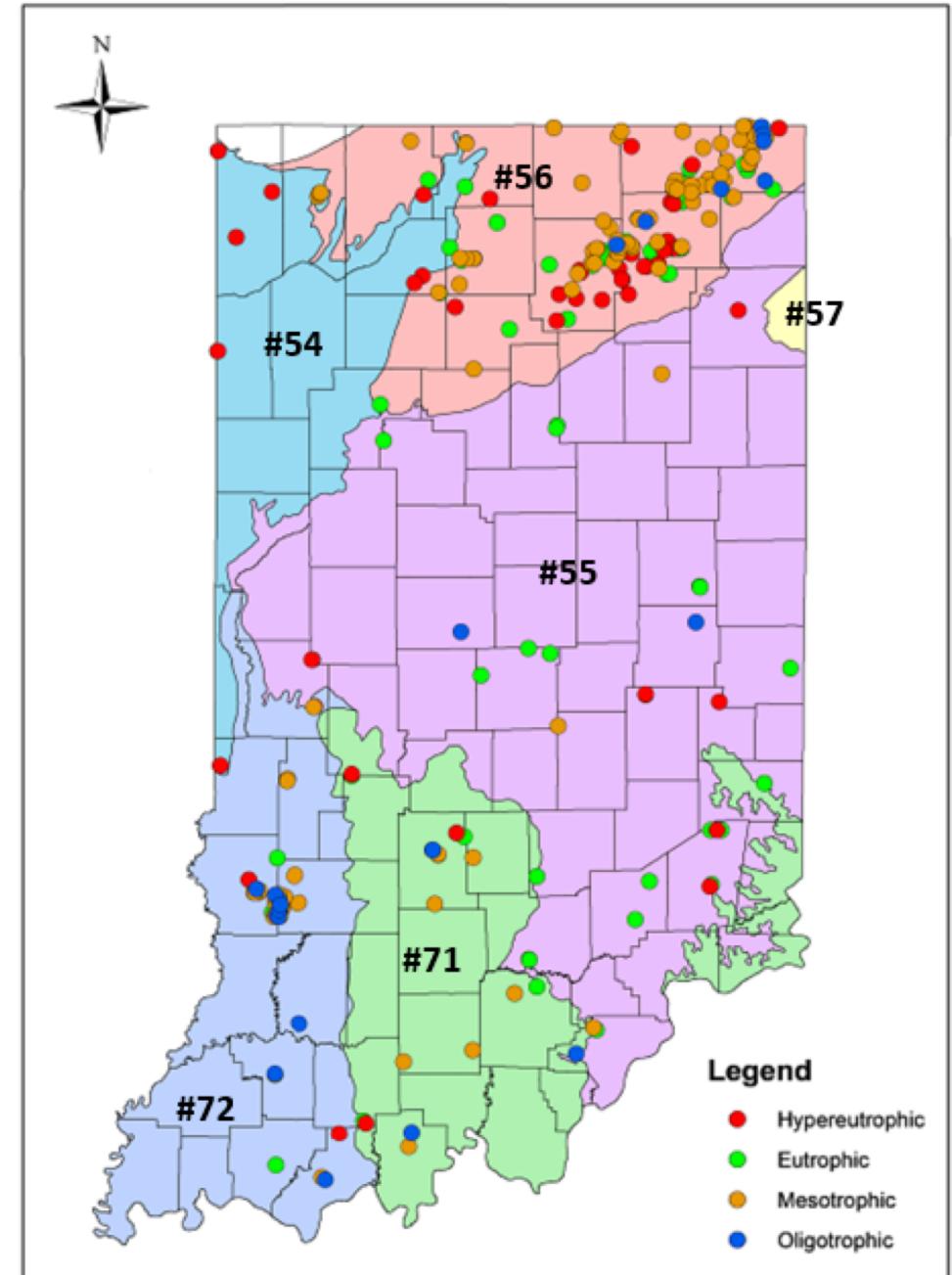
Spatial patterns

- **Central Corn Belt Plains (#54)**
 - High agricultural activity
- **Eastern Corn Belt Plains (#55)**
 - High agricultural activity
- **Southern Michigan/Northern Indiana Till Plain (#56)**
 - Dominant oak-hickory forests
 - Urban development
- **Huron/Erie Lake plain (#57)**
 - High agricultural activity
- **Interior Plateau (#71)**
 - Agricultural and forested land use
- **Interior River Lowland (#72)**
 - Agricultural and forested land use

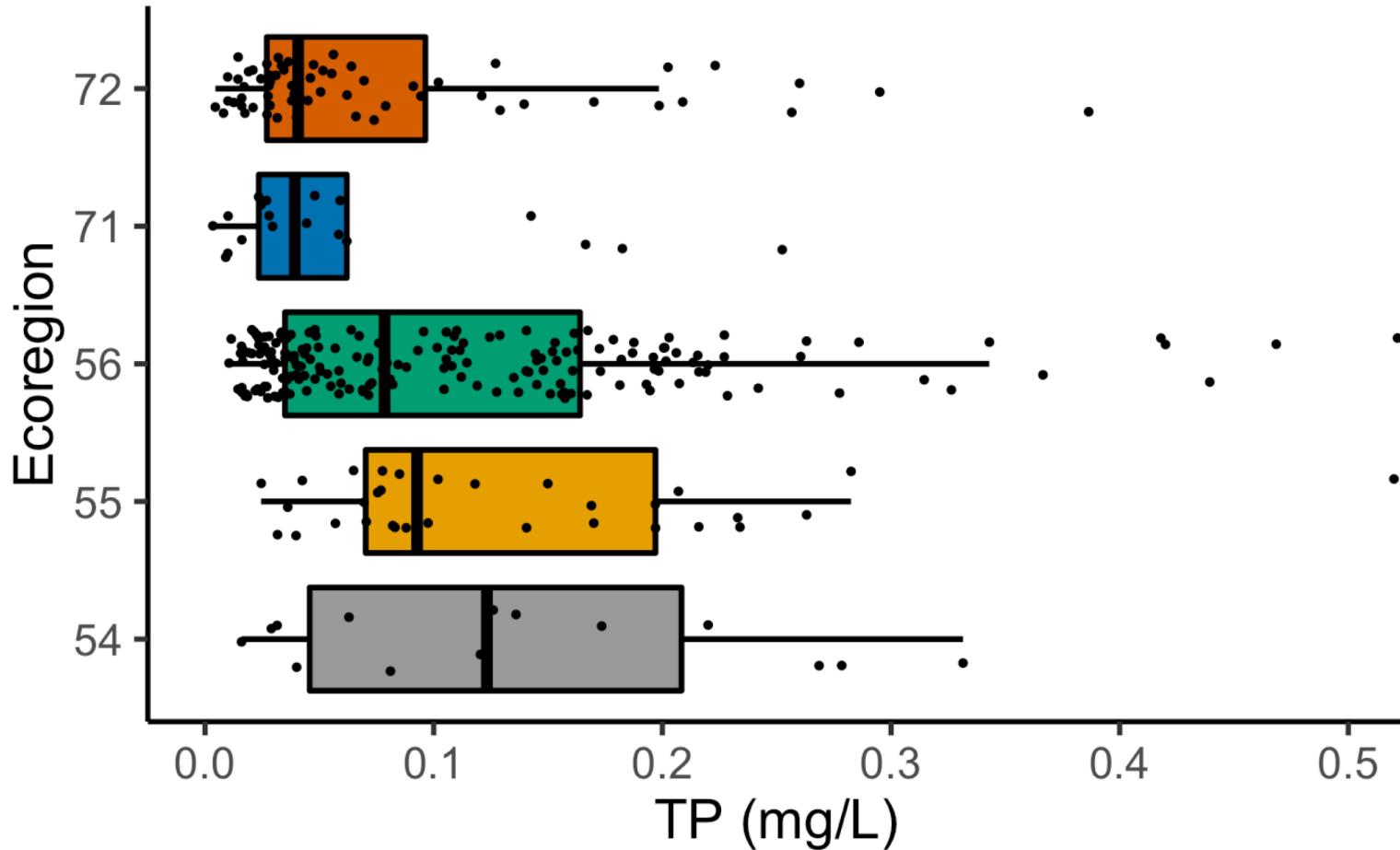


Spatial patterns

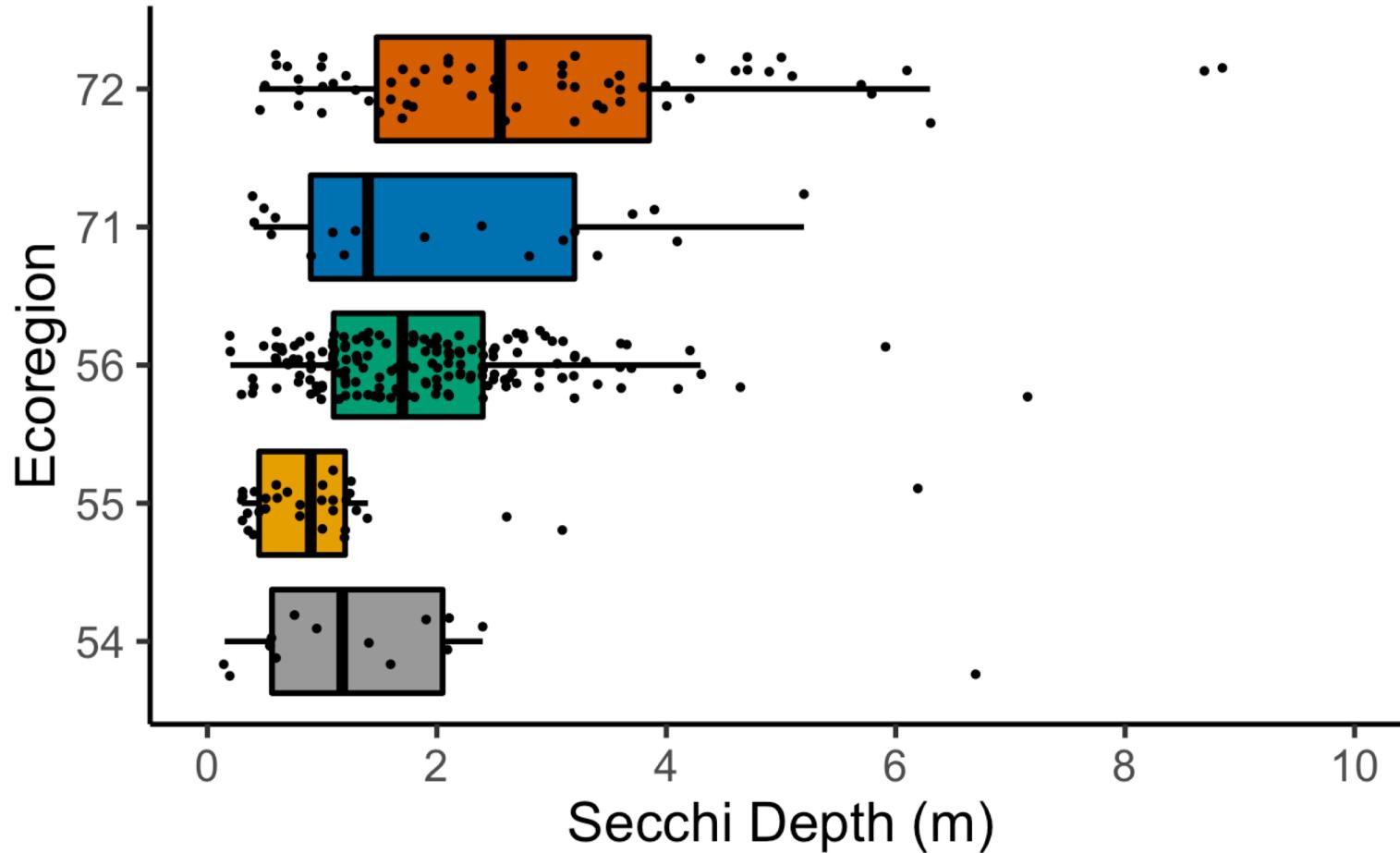
- Lakes were located in 5 of 6 ecoregions in Indiana
- 58% of lakes were in Ecoregion 56 (Southern Michigan/Northern Indiana Till Plain)



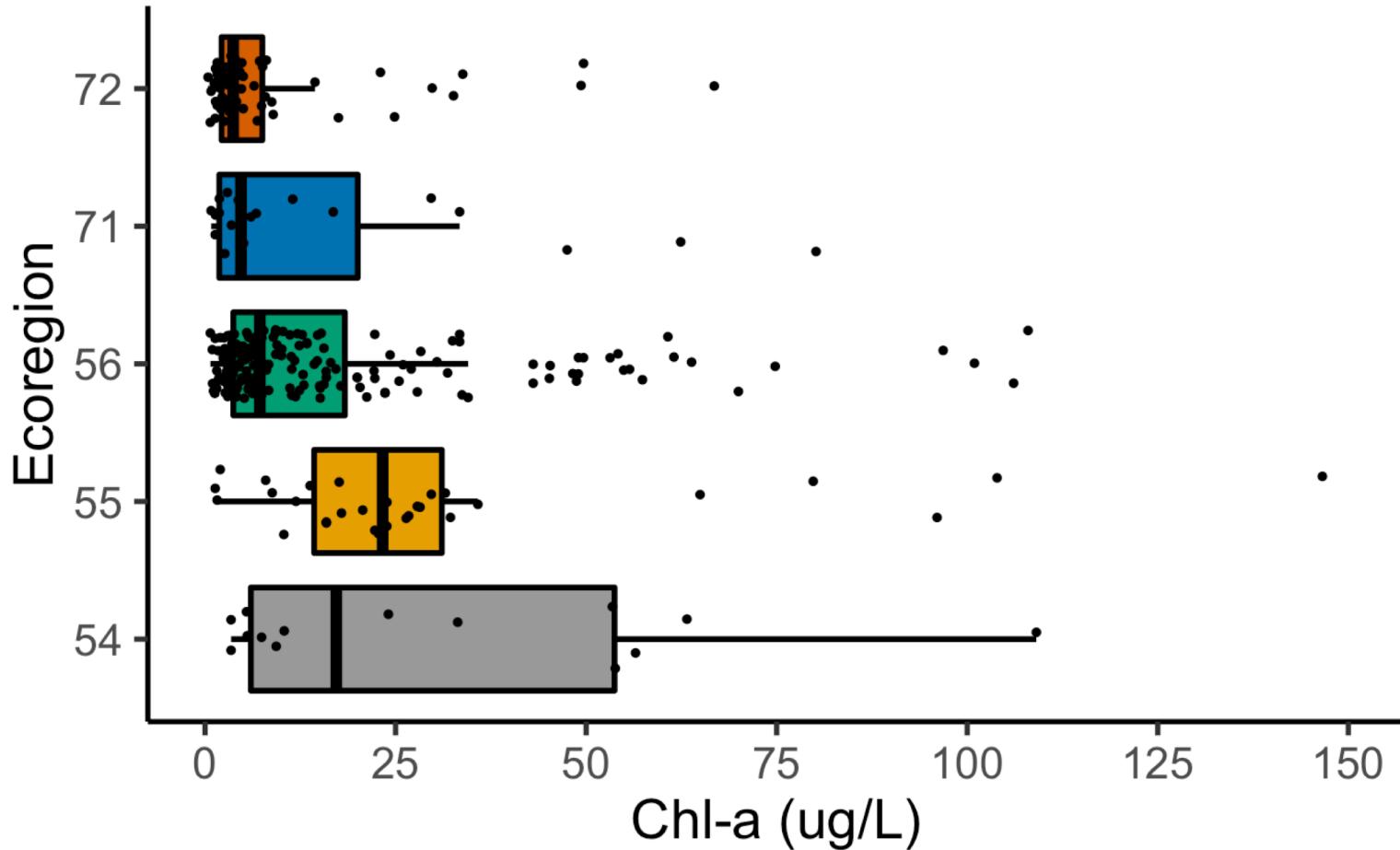
Spatial patterns



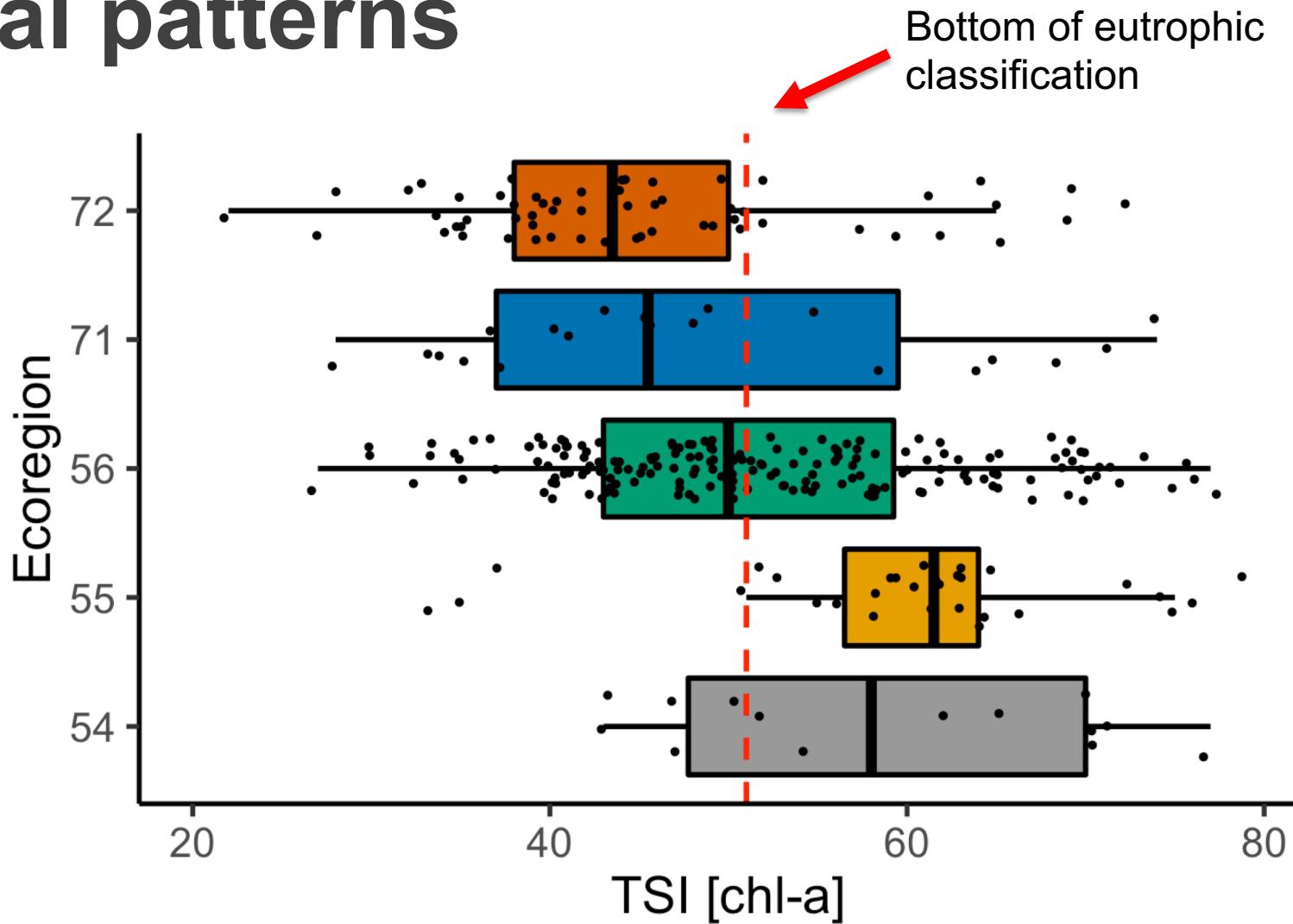
Spatial patterns



Spatial patterns

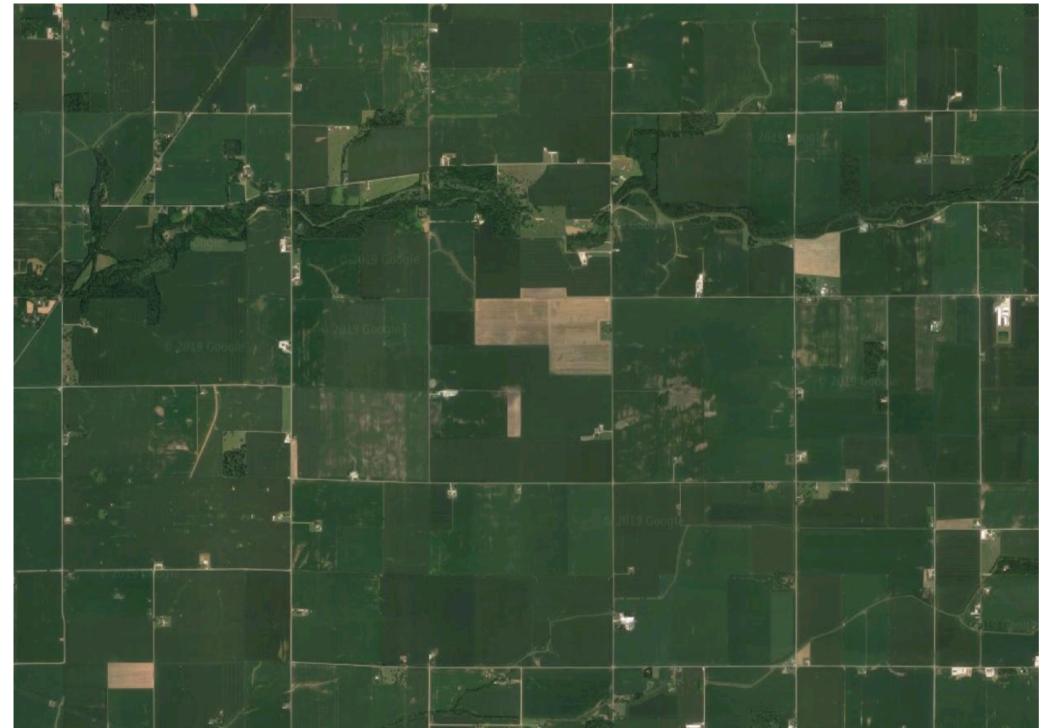


Spatial patterns



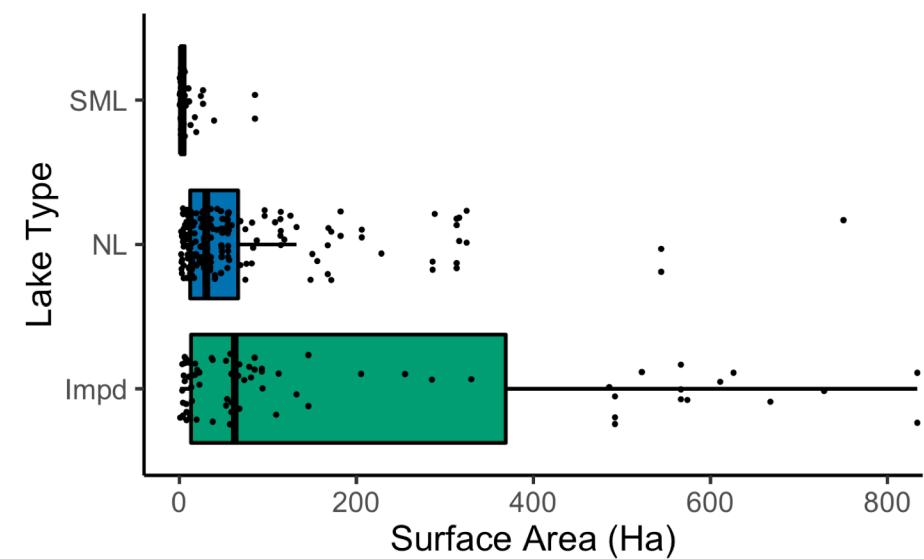
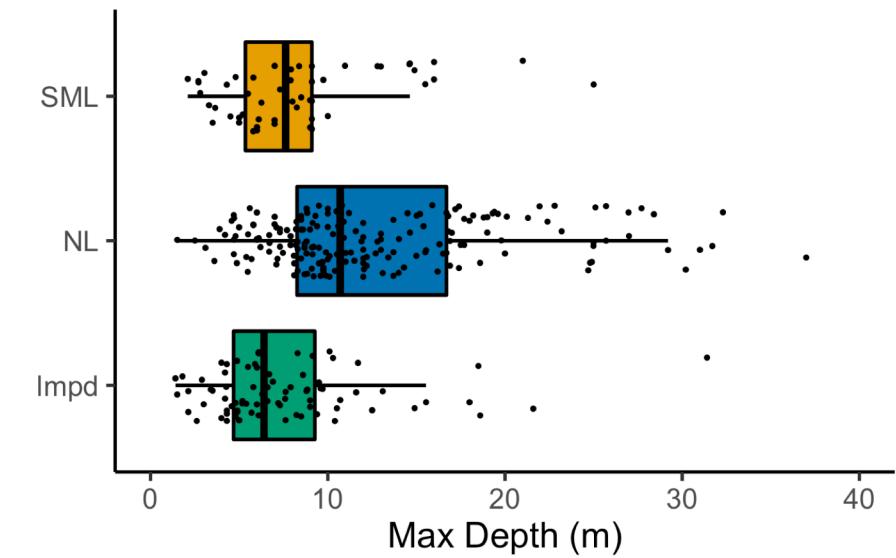
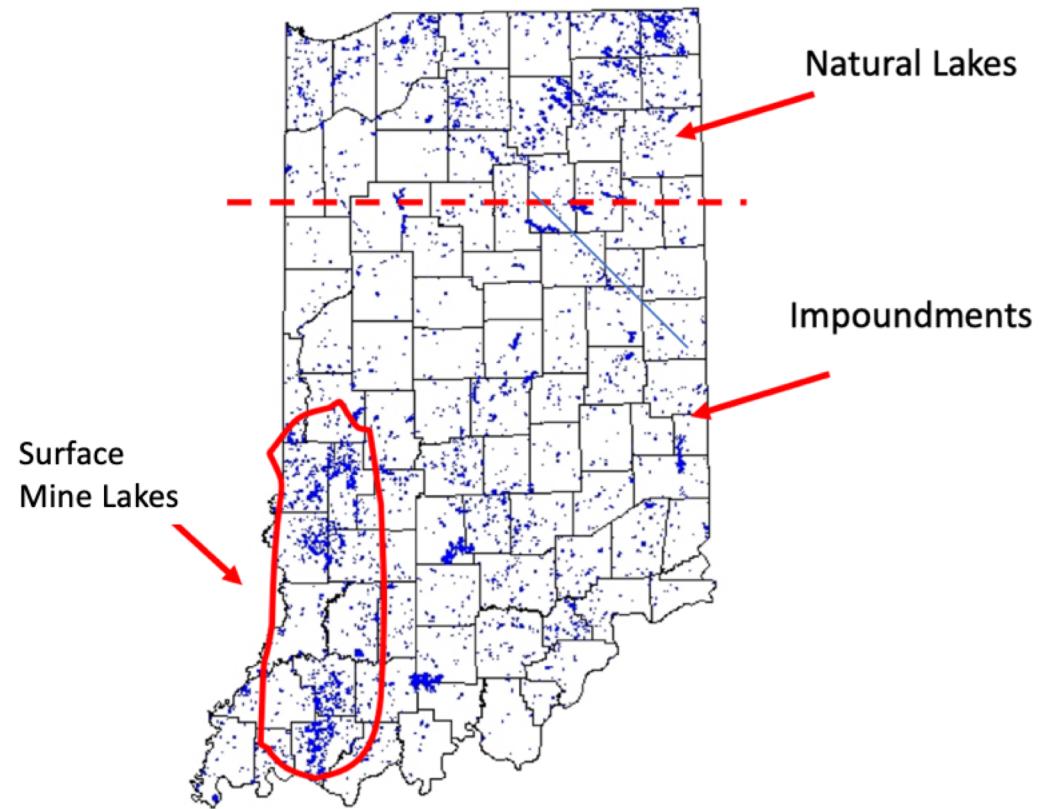
Conclusions – Spatial patterns

- It appears that lakes in the Eastern and Central Corn belts are generally more productive than the other 3 ecoregions.
 - Could be associated with non-point source runoff from agricultural fields
- The other 3 regions – especially those in the lower part of the state – are generally more forested and likely receive less nutrient loading

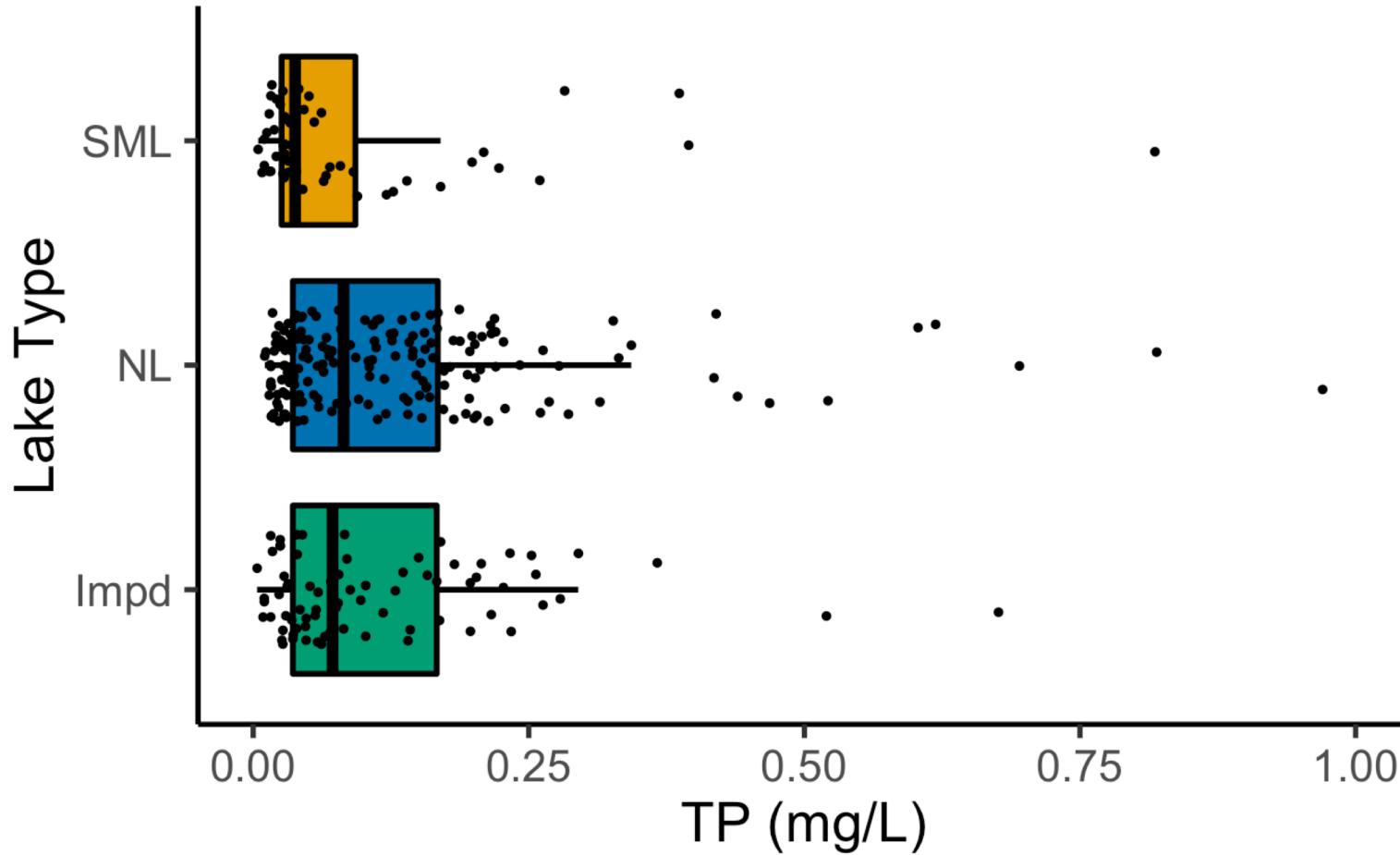


Water quality and lake type

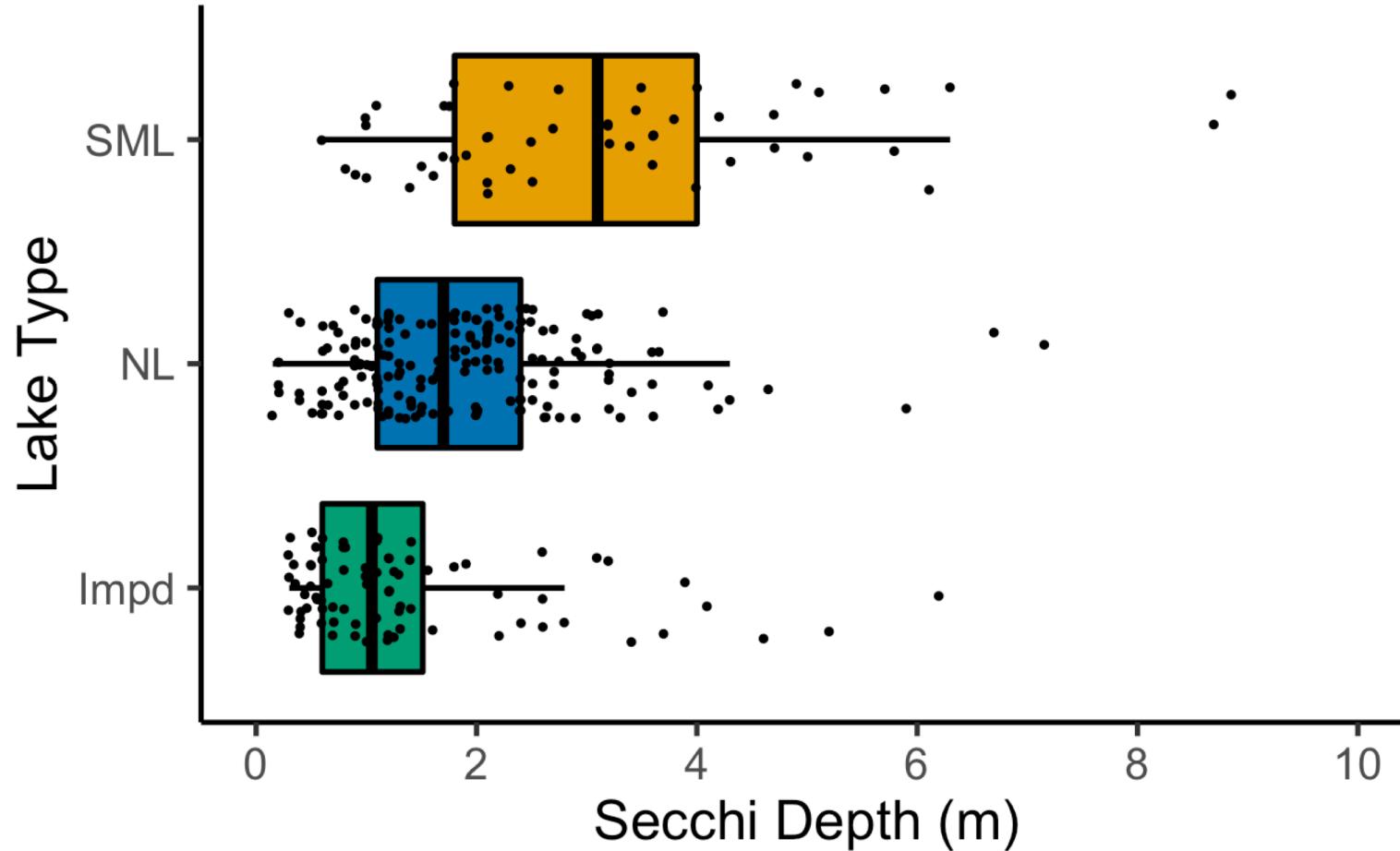
Lake type



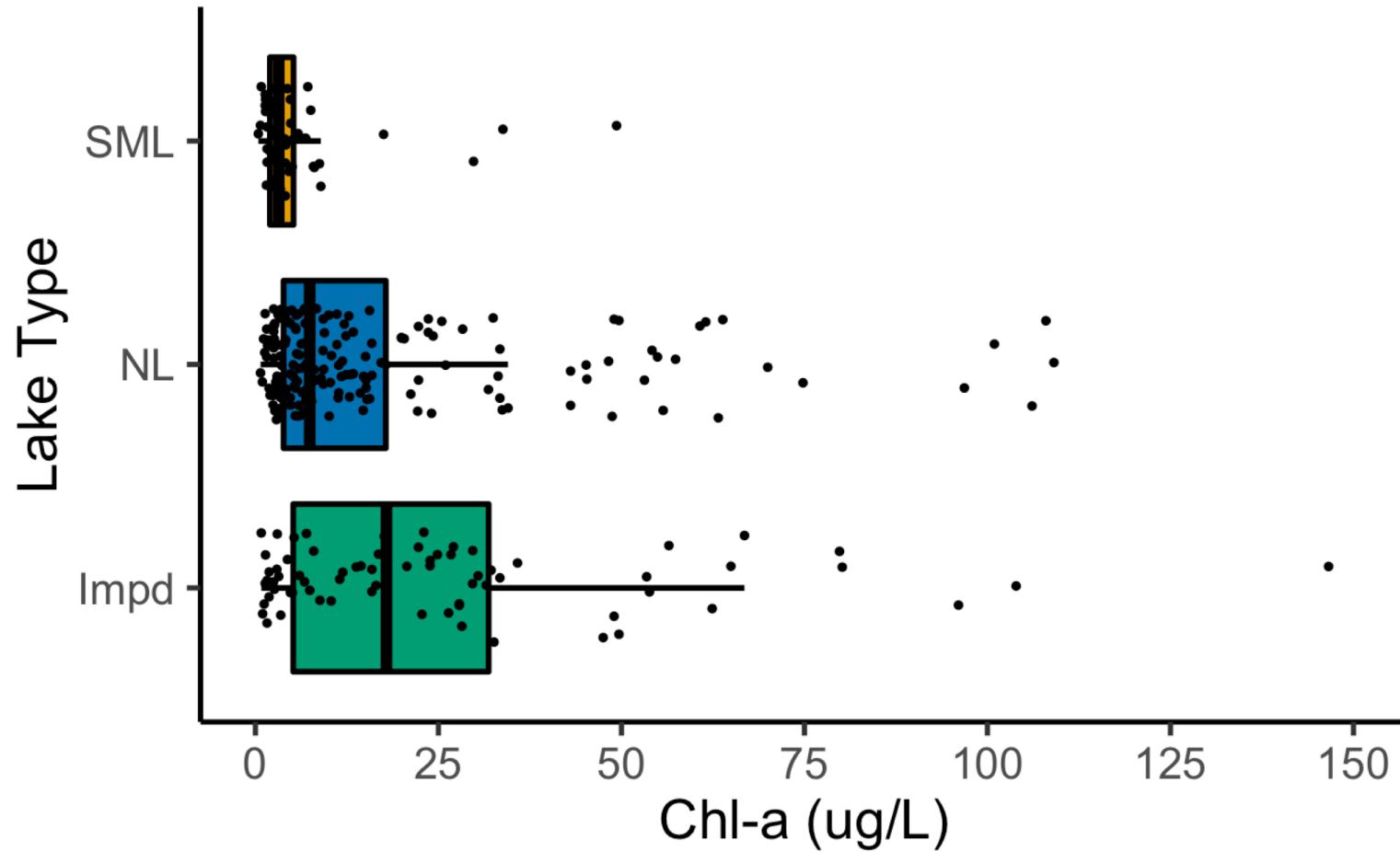
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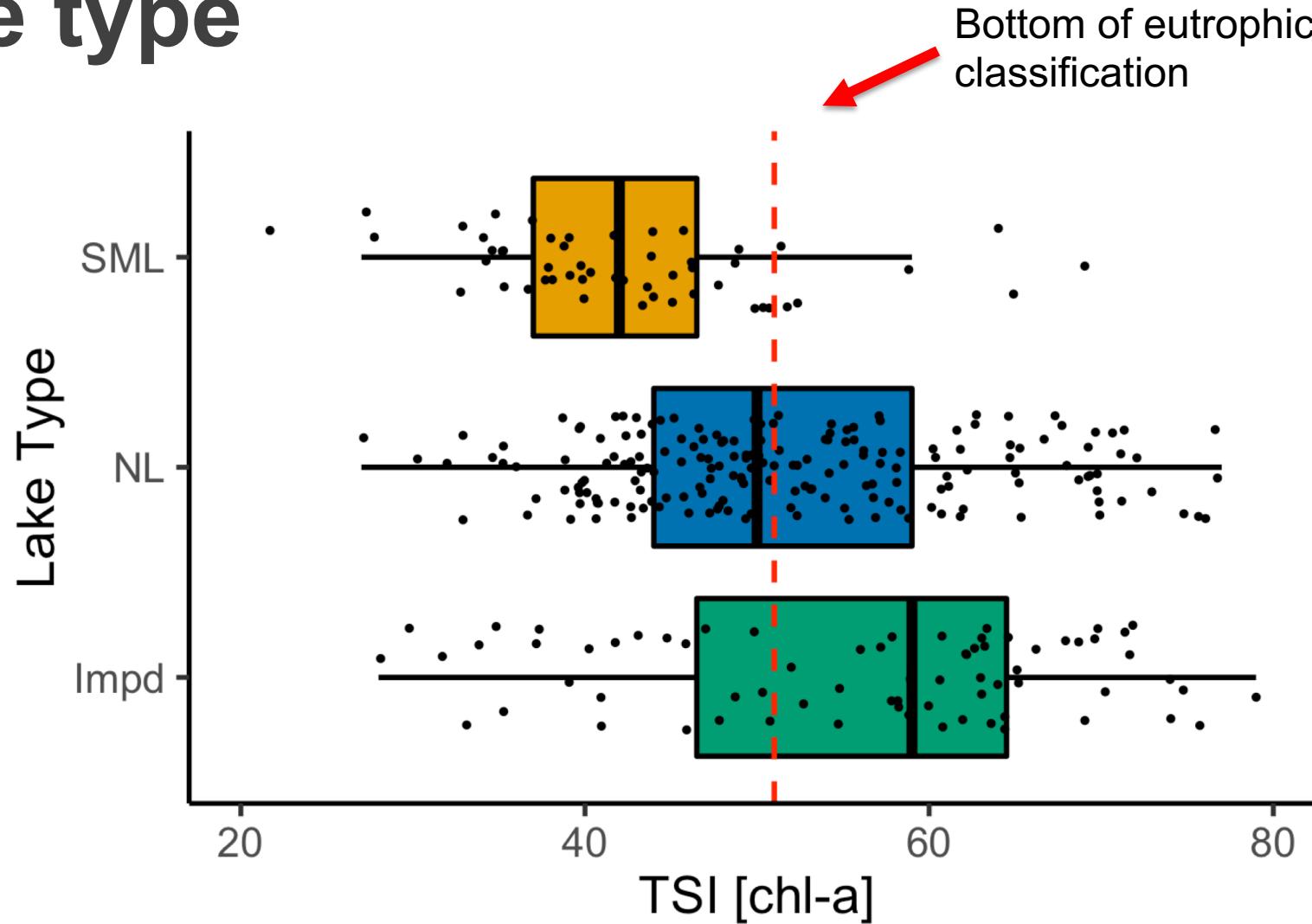
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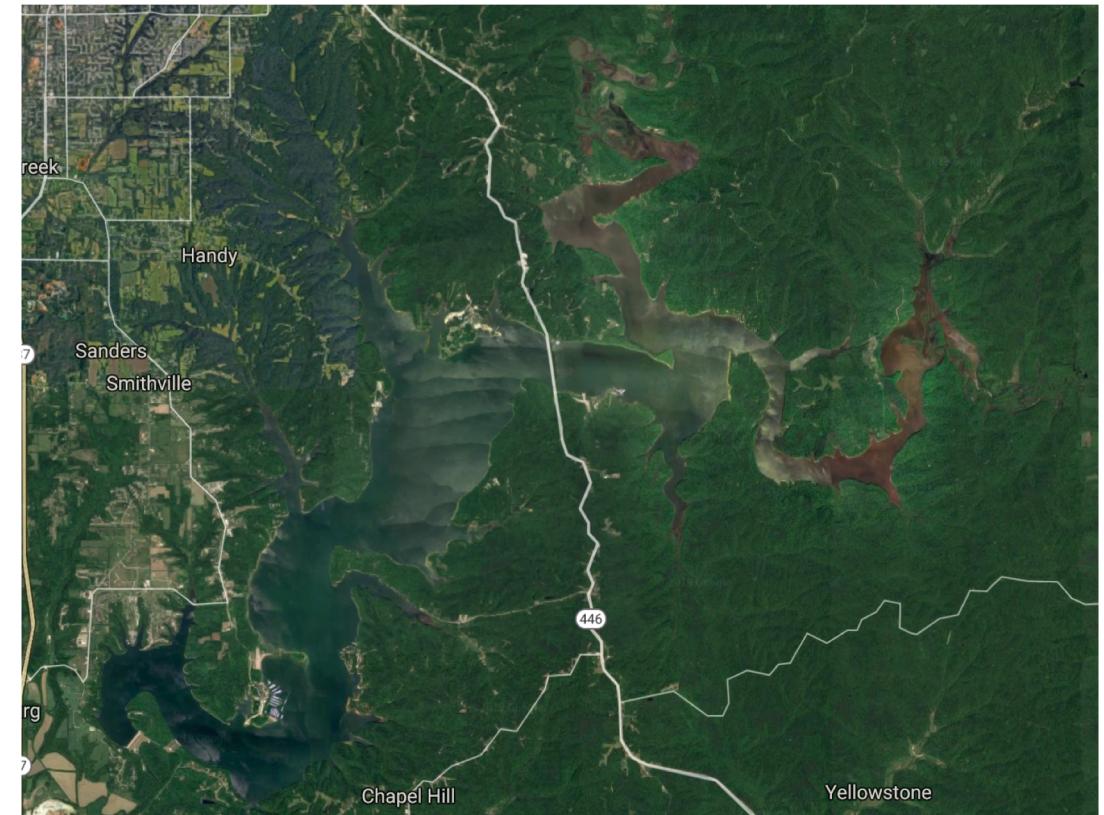


Lake type



Conclusions – Lake type

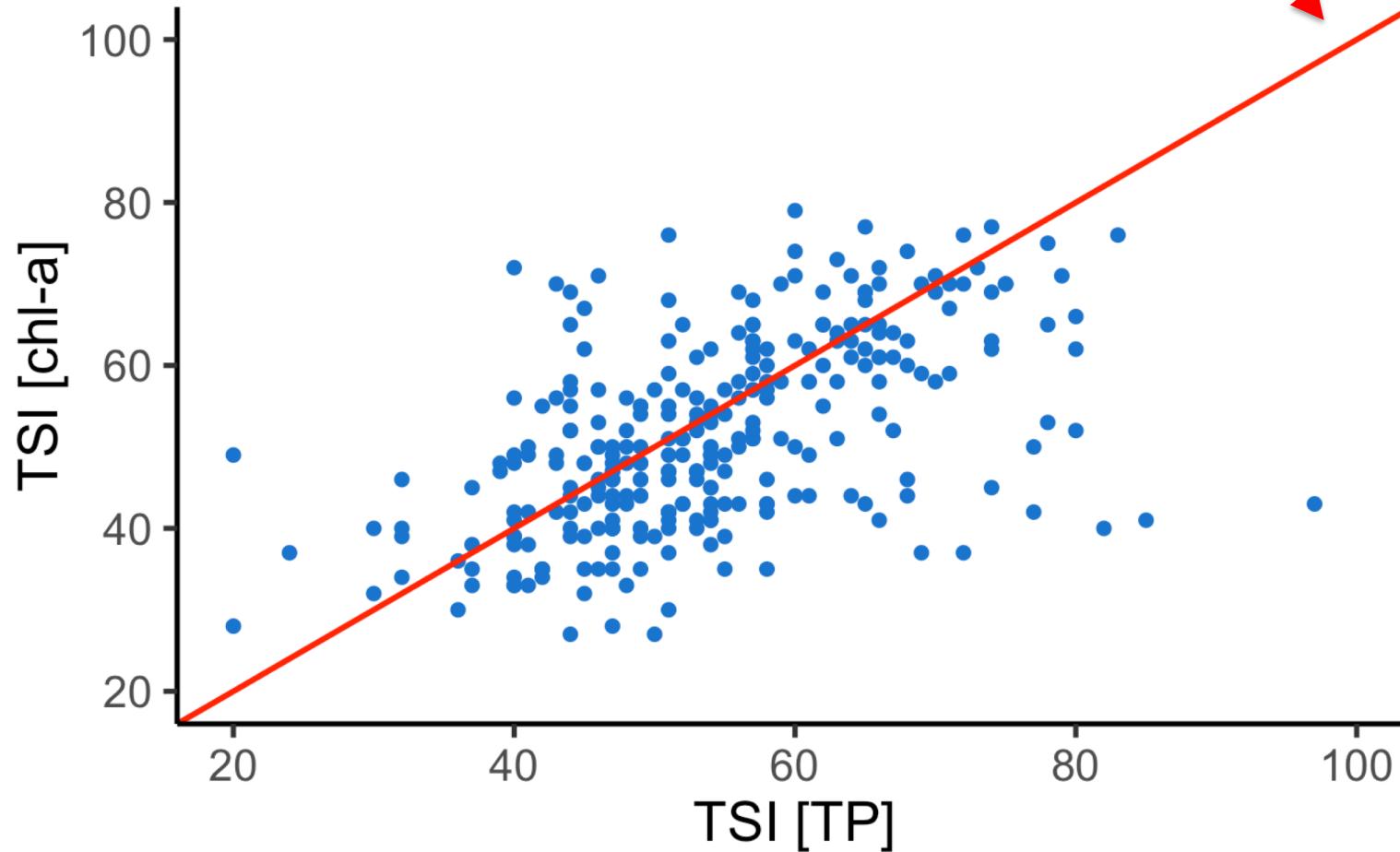
- Impoundments were generally shallower, had a larger surface area, and more productive
 - Larger watersheds = increased nutrient loads
 - Shallower lakes = increased euphotic zone
- Surface mine lakes are unique



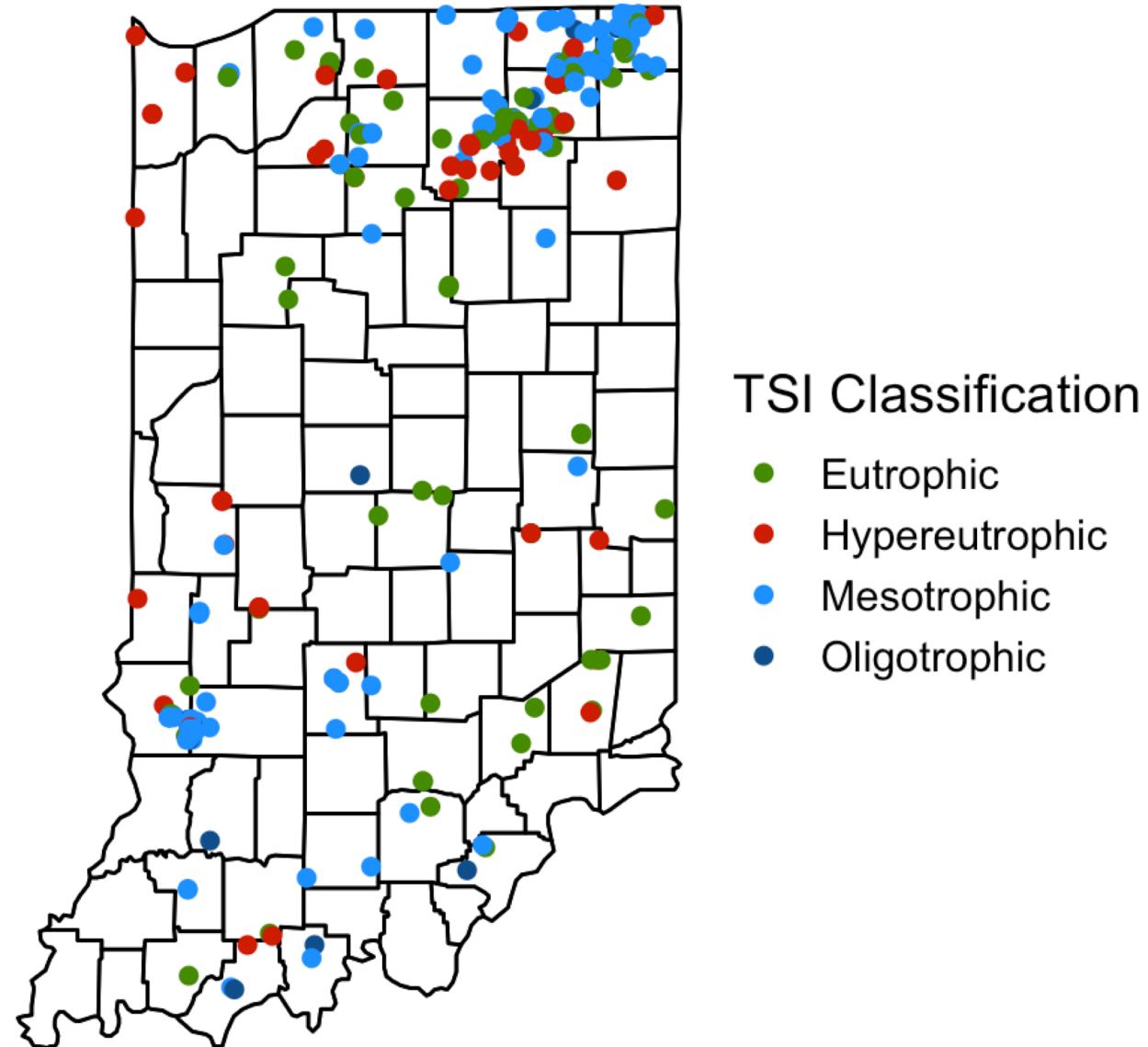
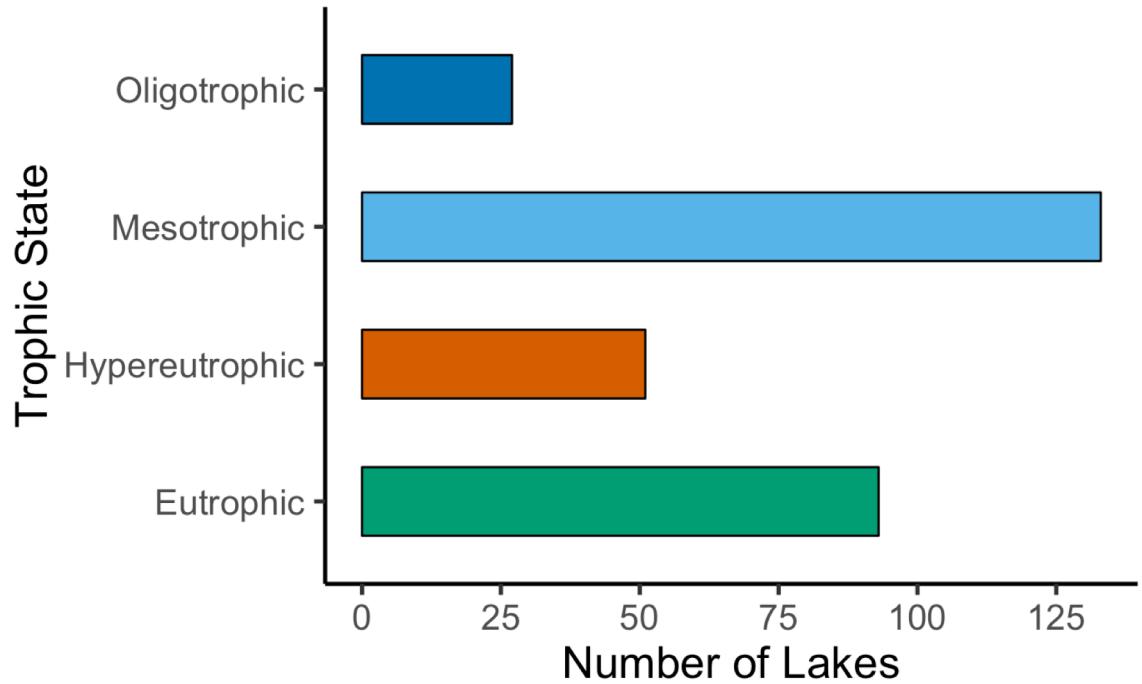
Overall trophic state

Trophic state

Carlson's Predicted Relationship



Trophic state



Conclusions – State of Indiana lakes

- Many lakes throughout the state of Indiana receive high nutrient loads, and thus are productive aquatic systems
- Trophic state is a useful measure of productivity in Indiana lakes
 - Also indicated instances of increased non-algal turbidity in Indiana lakes

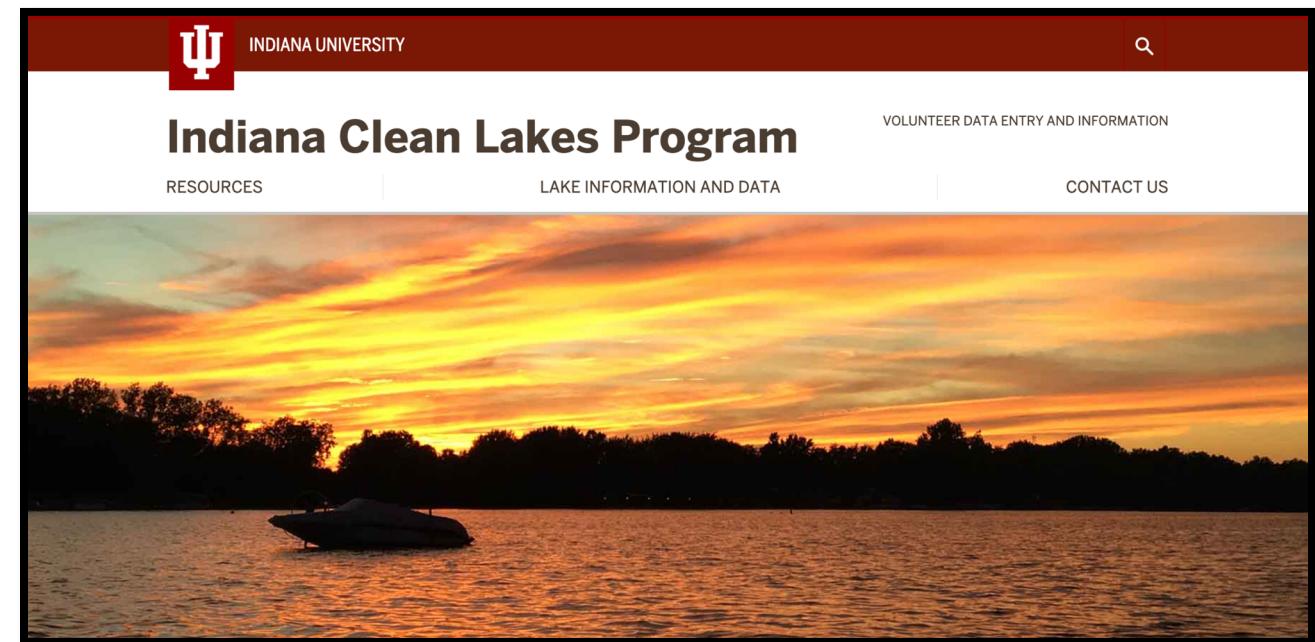




**How can you interact with
our data?**

Website

- clp.indiana.edu
- Types of data and information available
 - CLP sampling data
 - Volunteer monitoring
 - Technical reports
 - Water Column Newsletter



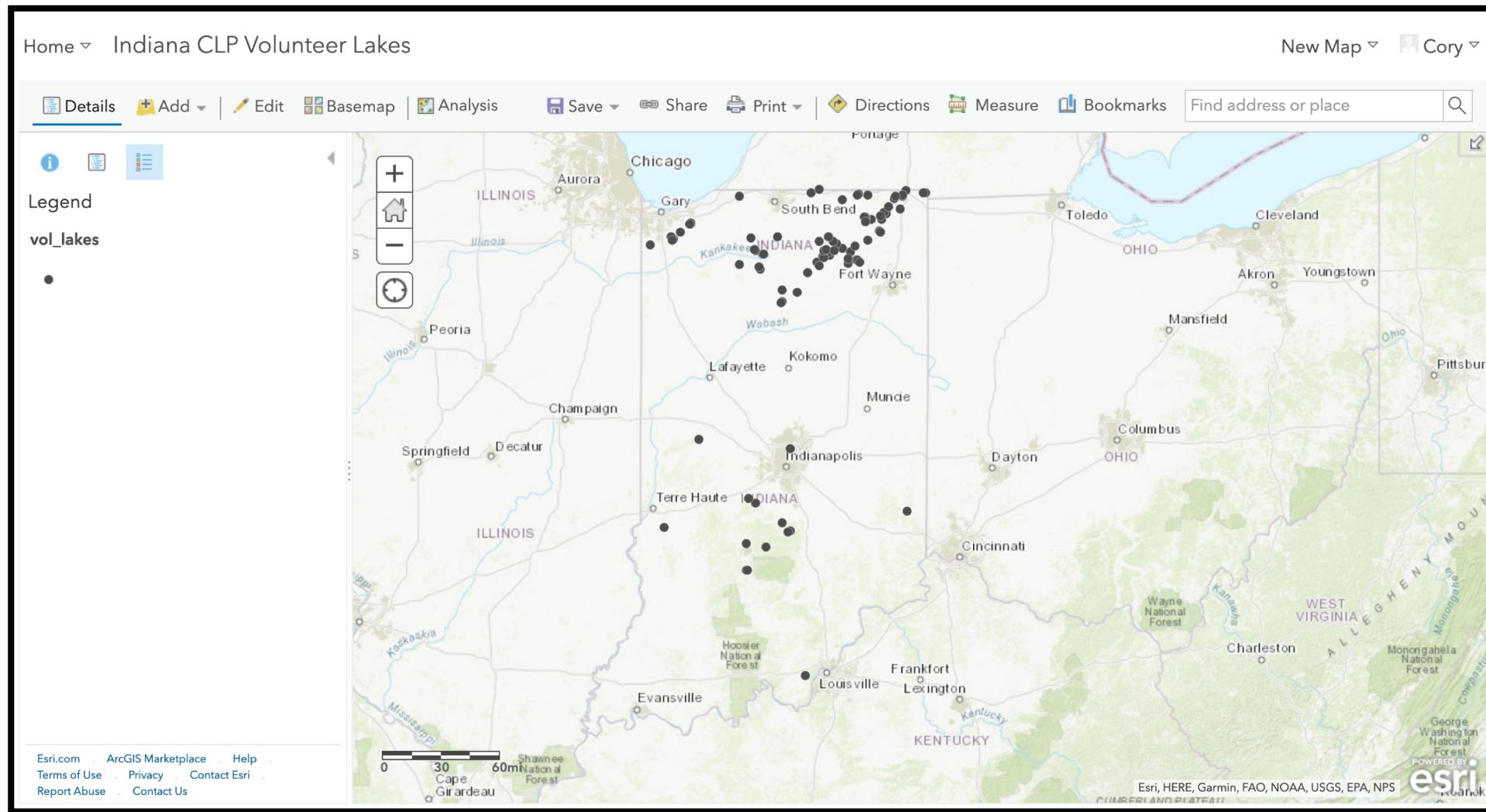
Story Map



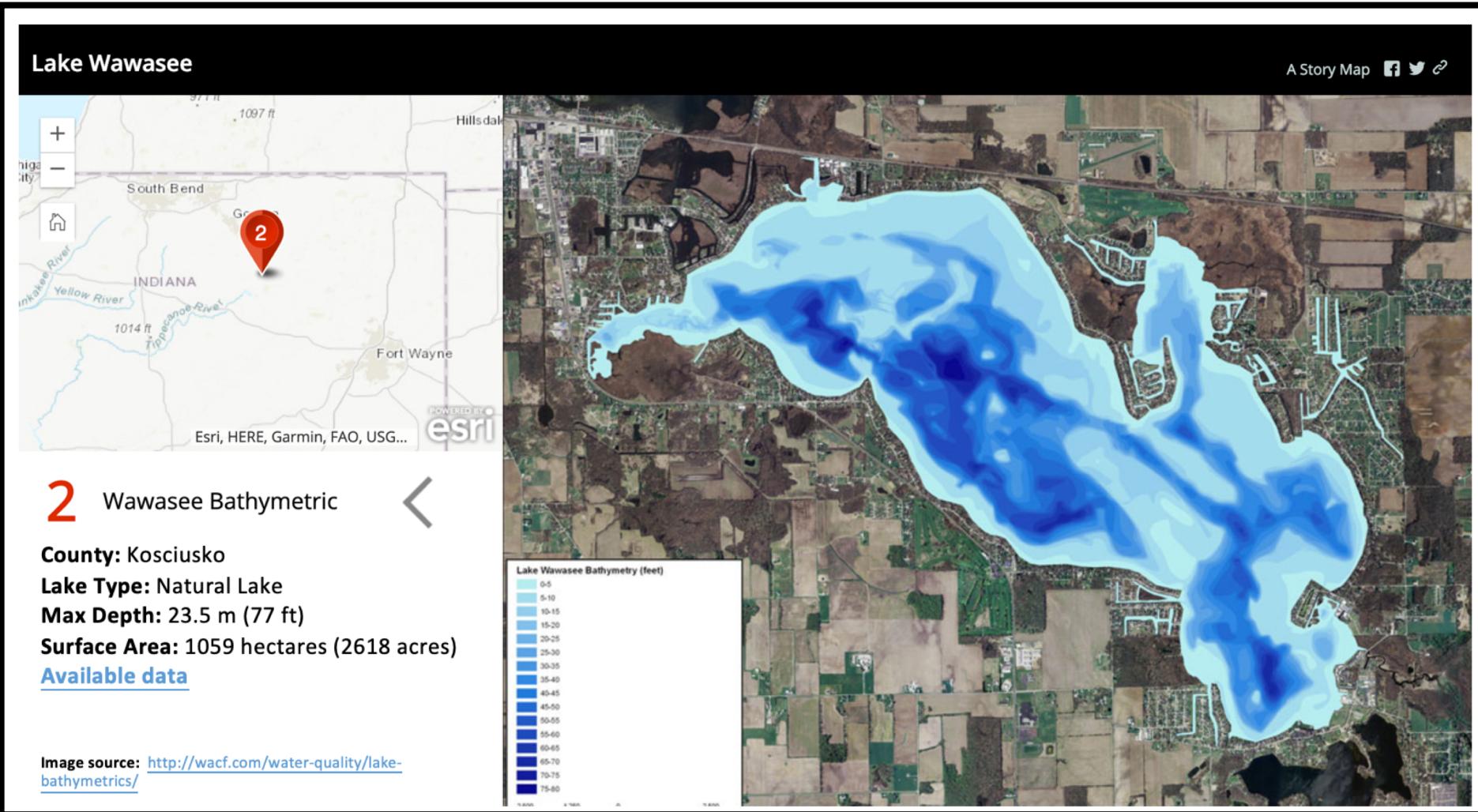
- Software from Esri
- Hosted by IU SPEA
- Will include all volunteer and CLP lakes
- All you need to access it is an internet connection



Story Map



Story Map



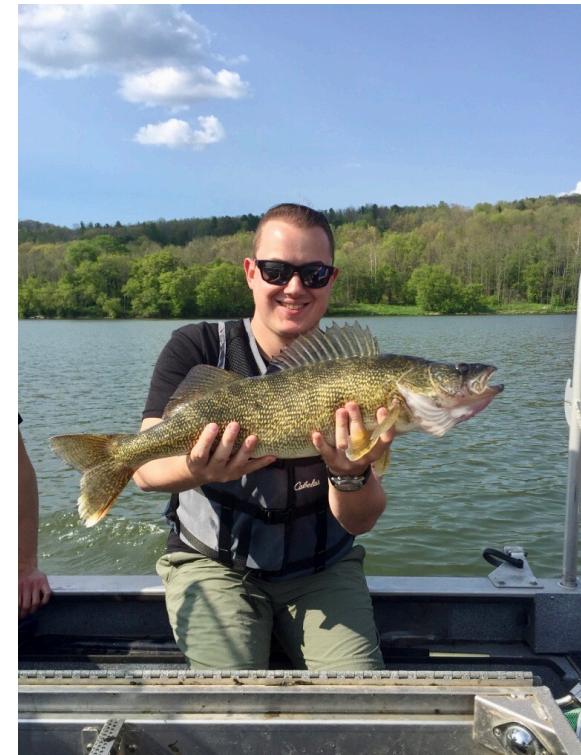
We want to hear from you!

- If you want to see anything specific with the new functions of our website, contact us!
 - Email: inclf@indiana.edu
 - Office Phone: (812) 855-1600
 - Director: Melissa Laney
Phone: (812) 855-6905
Fax: (812) 855-7802
 - Website: clp.indiana.edu



Slides, code, and further questions

- Happy to provide my slides, code, or answer any questions relating to the talk:
 - My email: csauve@iu.edu
 - GitHub: github.com/corysauve



Acknowledgements

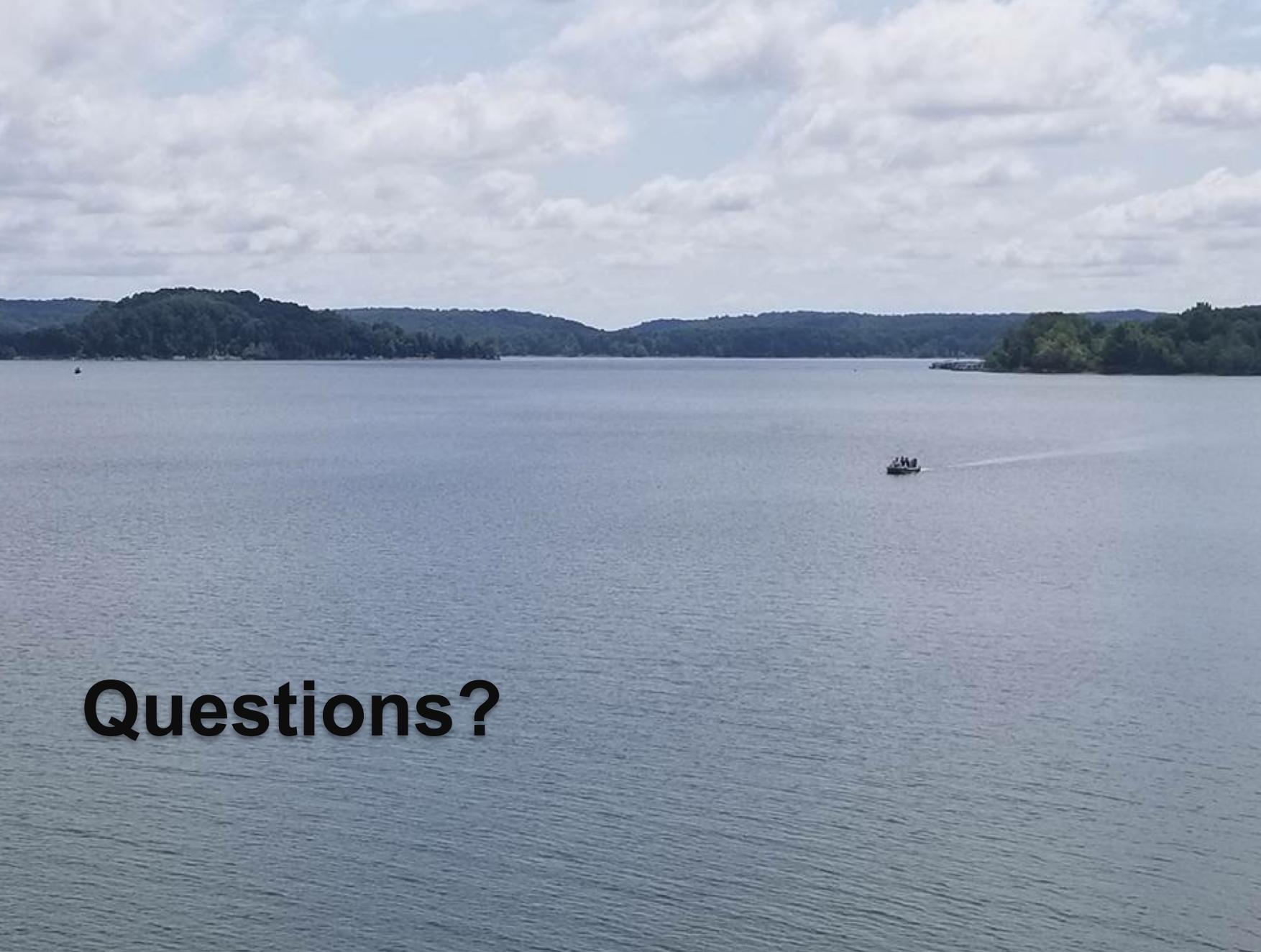
- Indiana Lakes Management Society
- Indiana Clean Lakes Program
- Indiana University - O'Neill School of Public and Environmental Affairs



O'Neill

School of Public and Environmental Affairs





Questions?



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