Blue-green algae toxins in northern Indiana lakes

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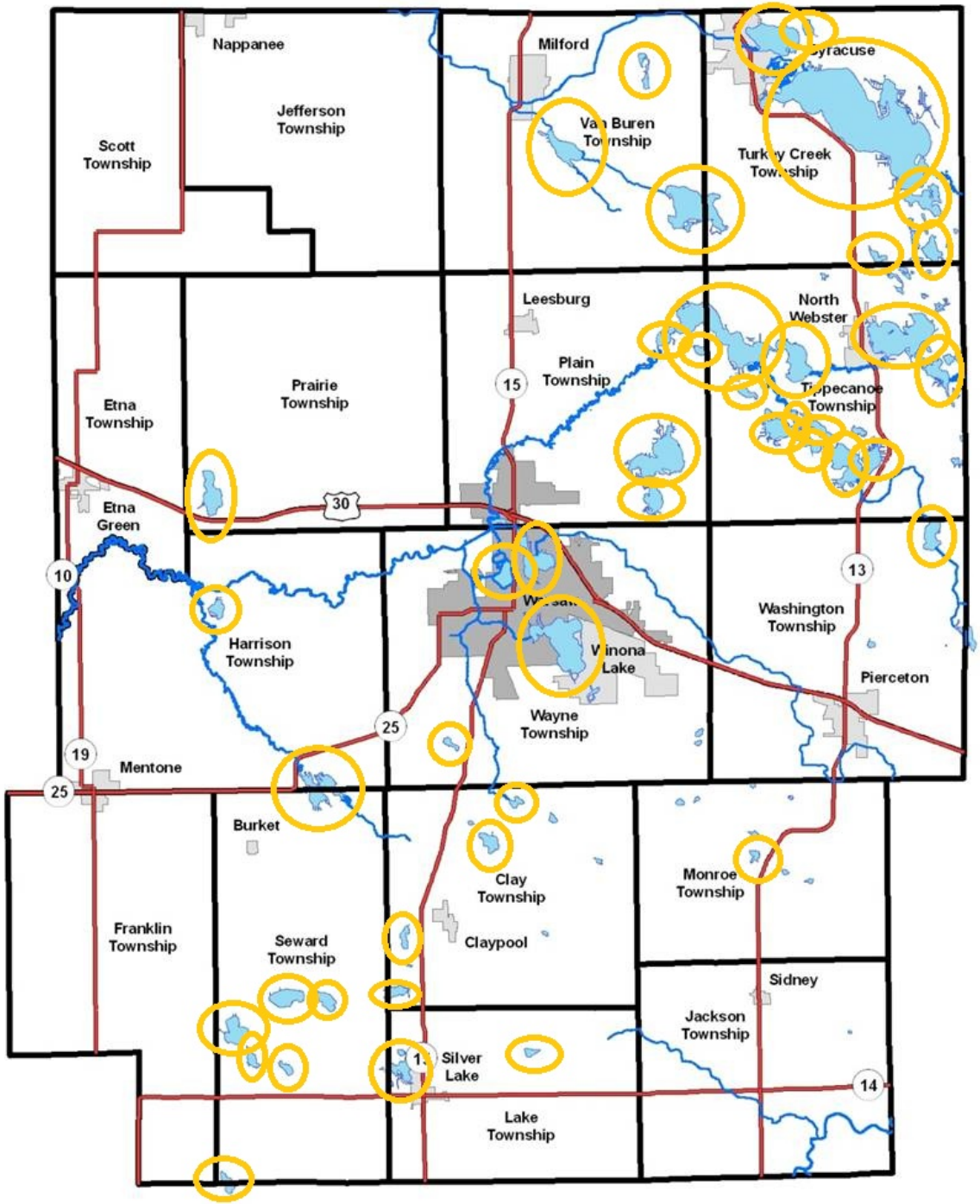
Kosciusko Lakes and Streams: *A center for applied research, water education, and community collaboration at Grace College*

Kosciusko County Lake Toxins study

- 2-year study; 56 lake sites
- Evaluate present and historic *E. coli* data
- Develop a scientific understanding of blue-green algae toxin level trends
- Launch lake notification systems


Nappanee
Milford
Syracuse
Jefferson Township
Scott Township
Van Buren Township
Turkey Creek Township
Leesburg
North Webster
Plain Township
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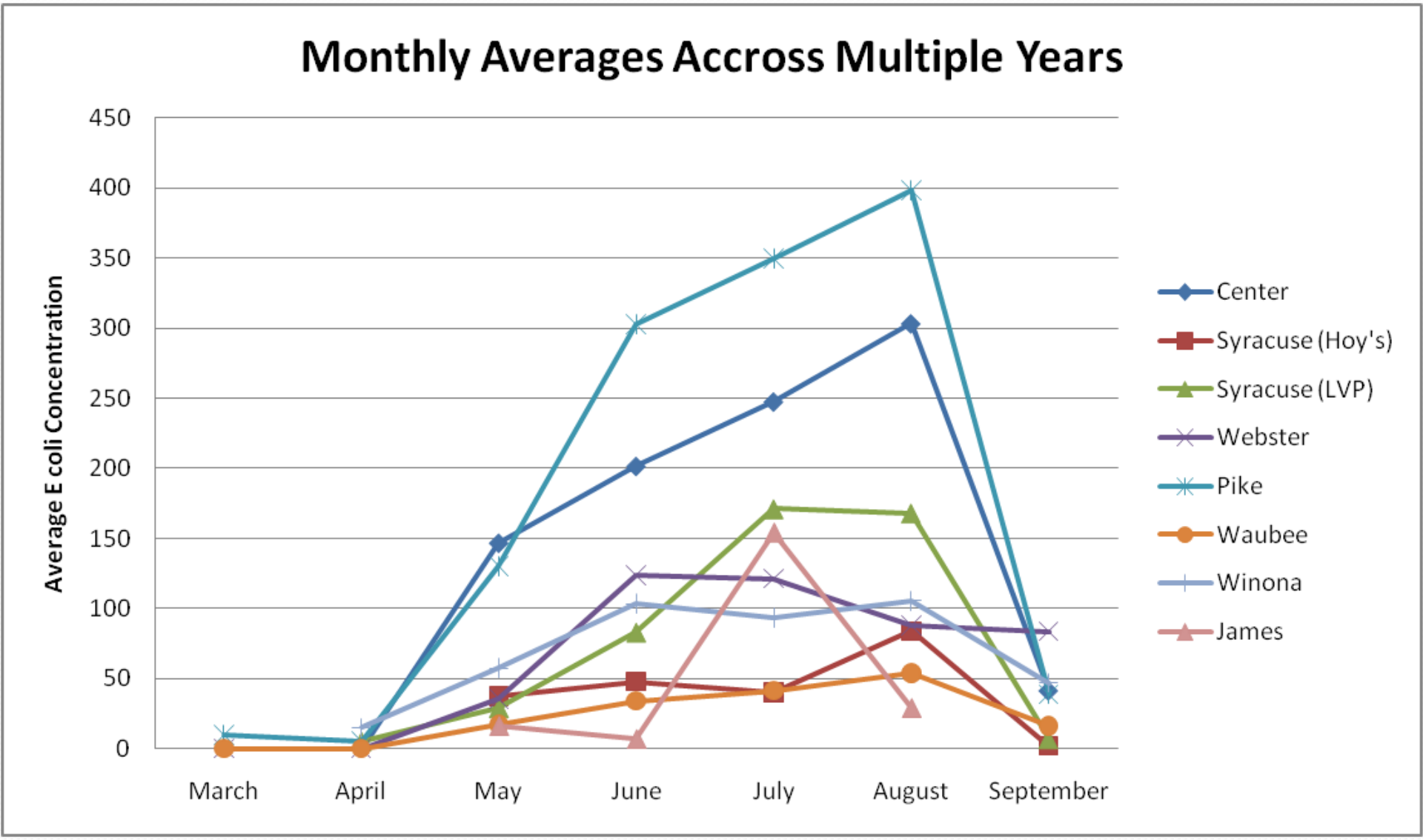
Prairie Township
Etna Township
Tippecanoe Township
Etna Green
30
10
13
Washington Township
Harrison Township
Winona Lake
Pierceton
Wayne Township
25
19
Mentone
25
Burket
Clay Township
Monroe Township
Franklin Township
Seward Township
Claypool
Sidney
Jackson Township
Silver Lake
14
Lake Township

Methods

E. coli results

- Higher concentrations on average near shoreline indicate most sources are from land
  - Sampling near exposure risk areas important
- Health Dept weekly sampling frequency is important
- Health Dept seems to be sampling most of the problematic lakes
  - Few other sporadic high concentrations in other lakes
  - Center Lake had unsafe levels in 32% of samples
  - Pike Lake had unsafe levels in 41% of samples
- July and August have highest levels on average


Monthly Averages Accross Multiple Years
Average E coli Concentration
450
400
350
300
250
200
150
100
50
0
March
April
May
June
July
August
September
Center
Syracuse (Hoy's)
Syracuse (LVP)
Webster
Pike
Waubee
Winona
James

Welcome to the Indiana BeachGuard System. Select a county from the map below to see beach information for that county. Use the search box in the navigation bar to find by beach or waterbody by name.

Counties participating in the BeachGuard Project are shaded.

Current closures and advisories are displayed above

Indiana Beaches

52 Public Beaches

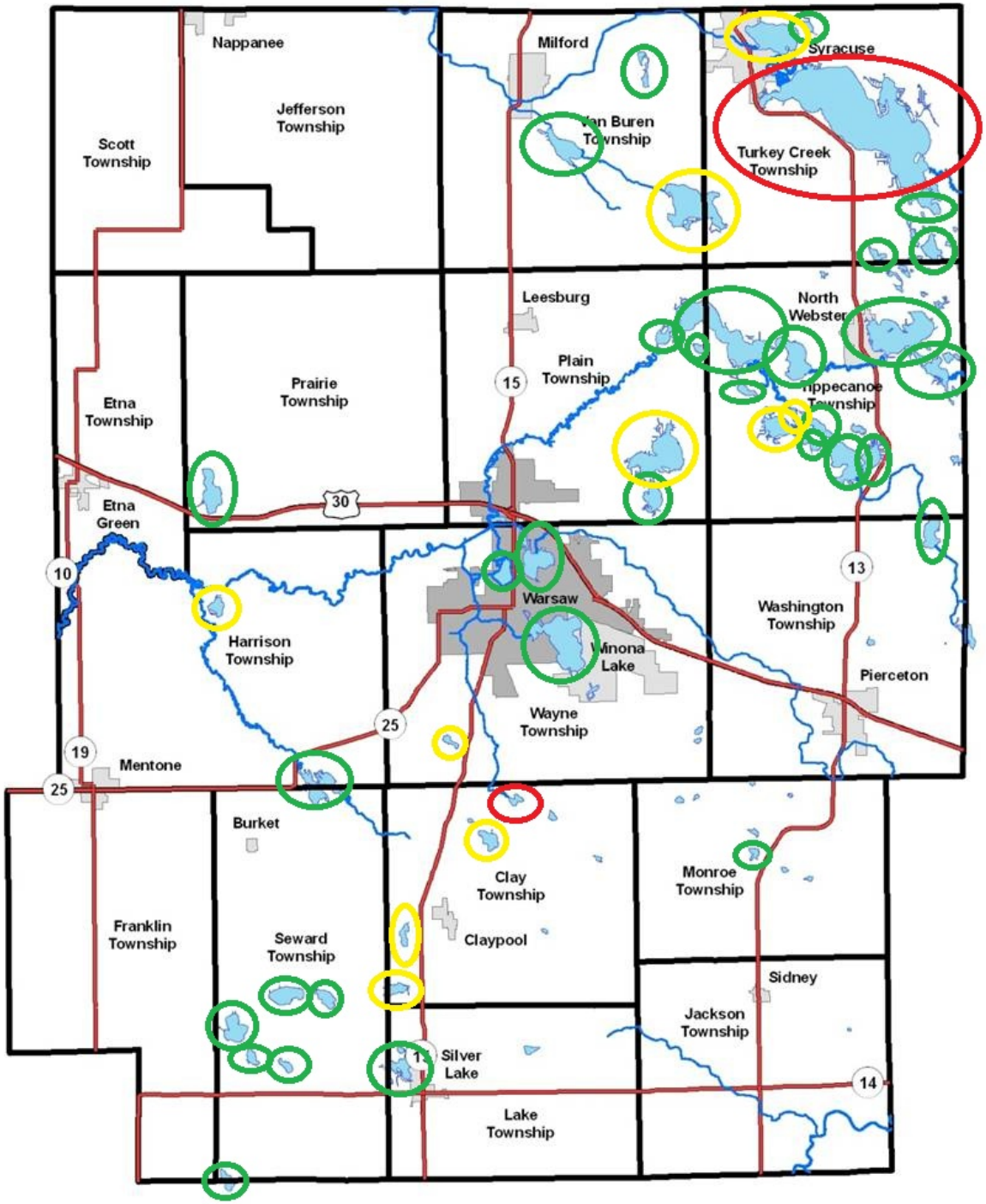
2 Private Beaches

6 Closures and Advisories

Waterbody and Location Name	County
Hidden Lake - Hidden Lake Beach	Lake
Cedar Lake - Cedar Lake Beach	Lake
Lake Michigan - Whihala Beach West	Lake
Lake Michigan - Jeorse Park Beach I	Lake
Lake Michigan - Long Beach Stop 20	LaPorte
Lake Michigan - Whihala Beach East	Lake

E. coli future actions

- Use of IDEM Indiana Beaches Alert and BeachGaurd notification systems will continue by the Health Dept
  - May need to determine if Latino community readily use this notification system
- High, persistent *E. coli* levels at Pike and Center Lake swimming beaches needs to be fixed
  - Stagnant, wind-blown water up against piers
  - Inflowing storm sewer connected to sanitary sewer ?
  - Waterfowl
- We have already been talking with Health Dept about how to act on these items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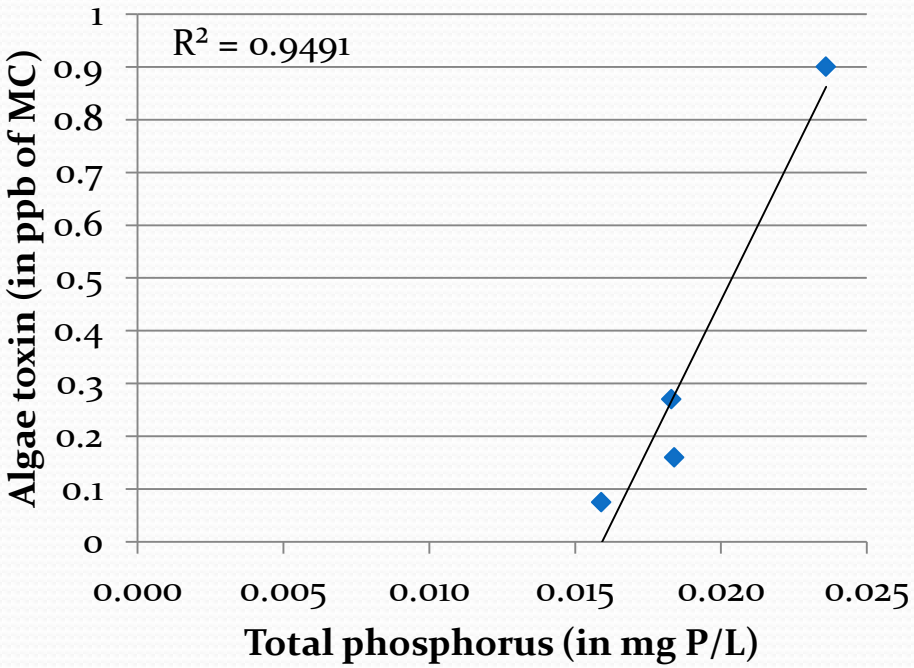
Lake Township

Algae toxin results

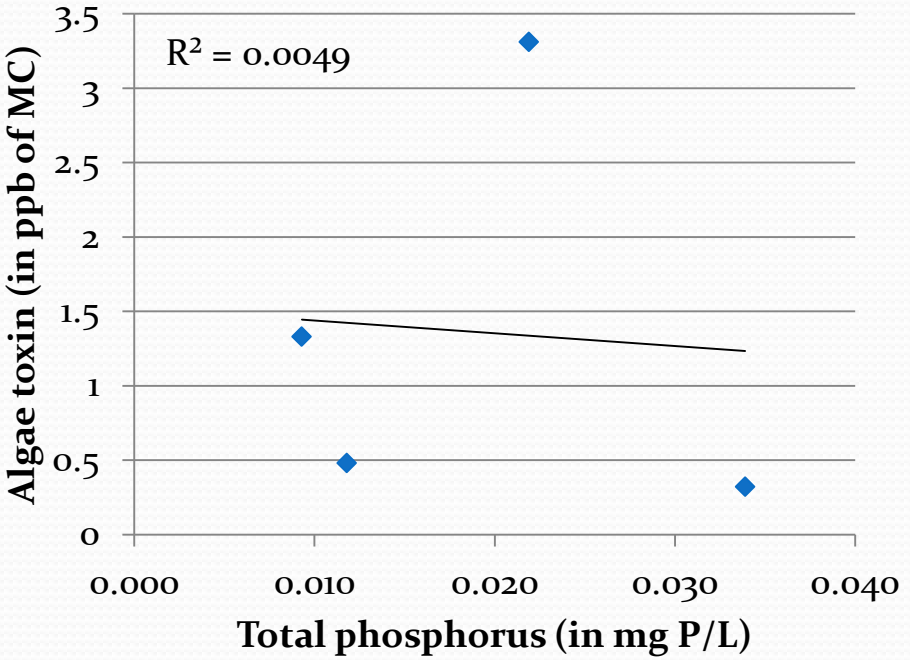
- Higher concentrations on average in June and July
- Big Chapman, Dewart, Muskellunge, and Wawasee all had toxin concentrations above 4 ppb during the study
  - IDEM recommends limiting exposure to water
  - Looks can be deceiving
- Toxin concentrations mostly related inversely to secchi depths, with some exceptions like Winona
- Nutrients – importance of phosphorus and N/P
  - N/P ratios always lower when toxin levels high – reverse?
  - Relationships seem to differ between lakes - why?

www.optec.com



Oswego Lake

Lake Wawasee



Addressing Concerns About Blue-Green Algae

Blue-Green Algae Home
About Blue-Green Algae
Newsroom
Resources
Test Results
Contact Us

Indiana State Department of Health

BOAH

DNR

IDEM

Welcome

The Indiana Department of Environmental Management, in coordination with the Center for Earth and Environmental Science at Indiana University-Purdue University Indianapolis, the Indiana State Department of Health and the Indiana Department of Natural Resources are working to provide information about blue-green algae in our waterways.

The effort formed due to concerns over blue-green algae in Indiana and a general lack of understanding regarding the threat they actually pose. Algae are commonly found in Indiana lakes and streams without concern, however the concentrated presence of blue-green algae can be linked to some health effects and has prompted this project.

This website will be updated regularly to provide information about blue-green algae levels in central Indiana, as well as links to other websites such as the World Health Organization, the USGS Kansas Water Science Center, and assorted information available through other states.

Indiana Reservoir and Lake Update

Online Services
FIRST IN LINE EVERY TIME

- Virtual File Cabinet
- Real-Time Monitoring
- Publication Catalog
- Wastewater Certification Renewal
- Acronyms List
- Online Air Permit Search
- Enforcement Database
- Safe Drinking Water Information Search
- Forms.IN.gov

More Online Services »
Account Center »

Top FAQs | I Want To...

1. What should I do with my old computers and electronics?
2. Where can I recycle?
3. How do I file an IDEM complaint?
4. How do I get rid of electronic waste?
5. What are "Pay-as-You-Throw" programs?
6. What is "household hazardous waste"?

More FAQs »

Algae toxin future work

- KLAS will continue to use IDEM website notification
- Each lake needs to be managed individually and uniquely – no single "silver bullet" solution
- Continuing this research is important
  - Continued monitoring of human health threat
  - Identification of other causative/predictive factors
  - Confirm tentative relationships
  - New chronic exposure research
- Make recommendations to lakes for steps to take to minimize risk

Acknowledgments

- Funding: 

Grace College, and private donations
- In-kind donors: boat owners/operators
- Co-authors
- Analytical labs: IUPUI CEES, Heidelberg University, Kosciusko County Health Department

Lake food chain

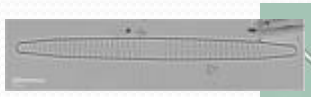
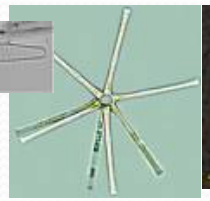
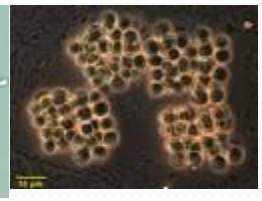
- Piscivorous fish
- Planktivorous fish
- Zooplankton
- Phytoplankton
- Nutrients












WATERSHED

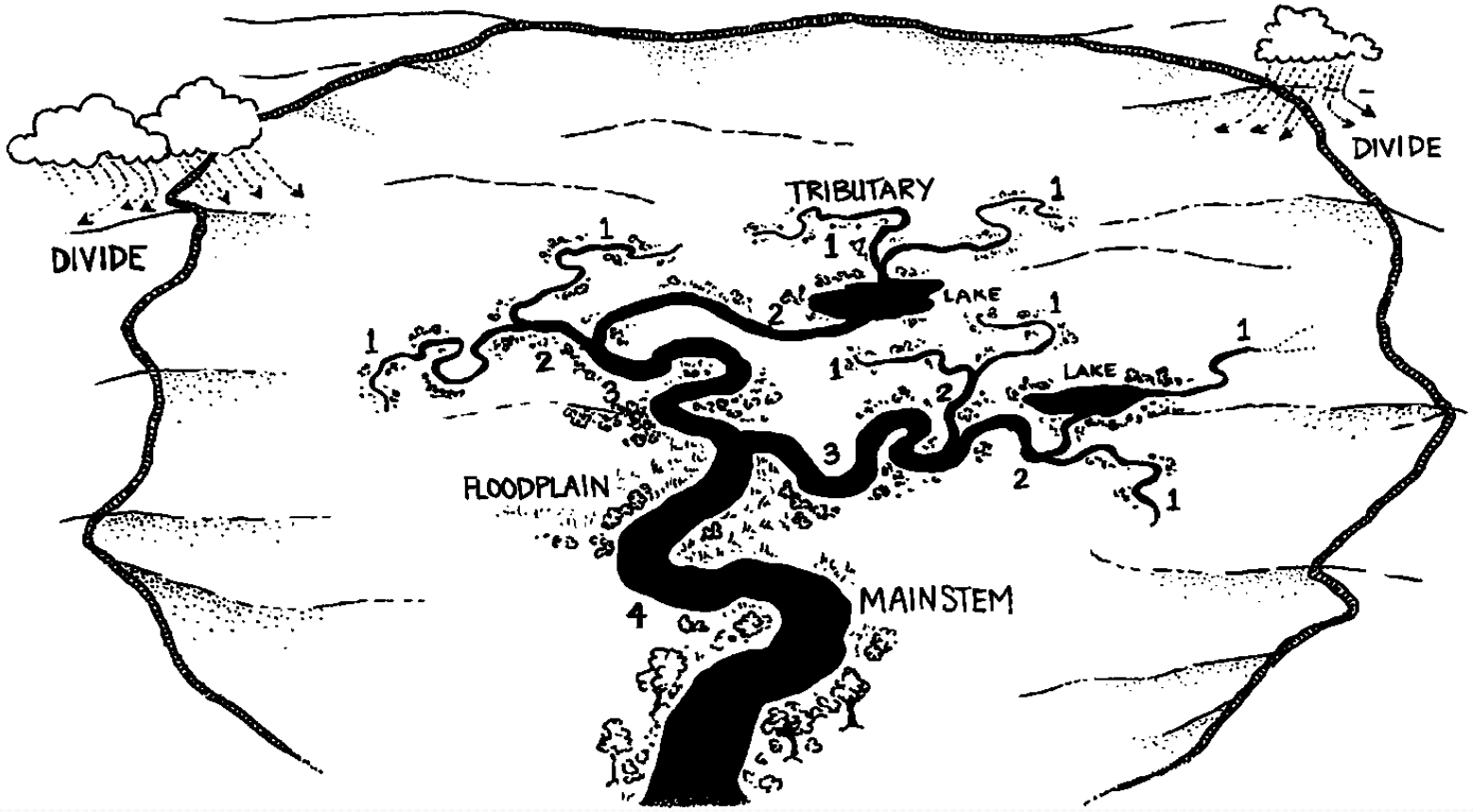
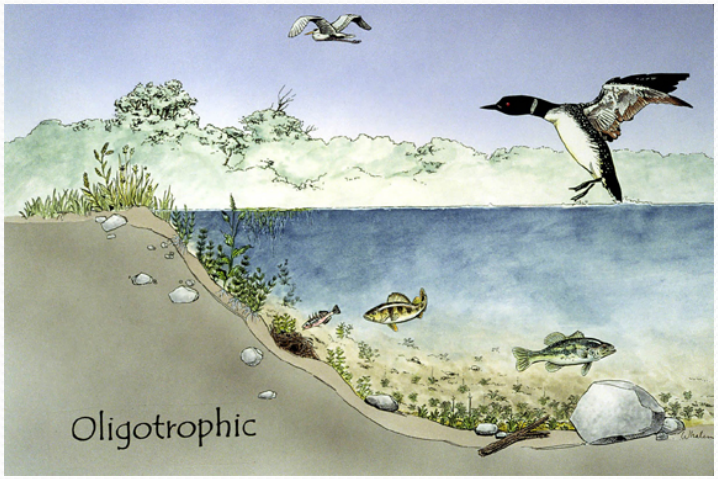
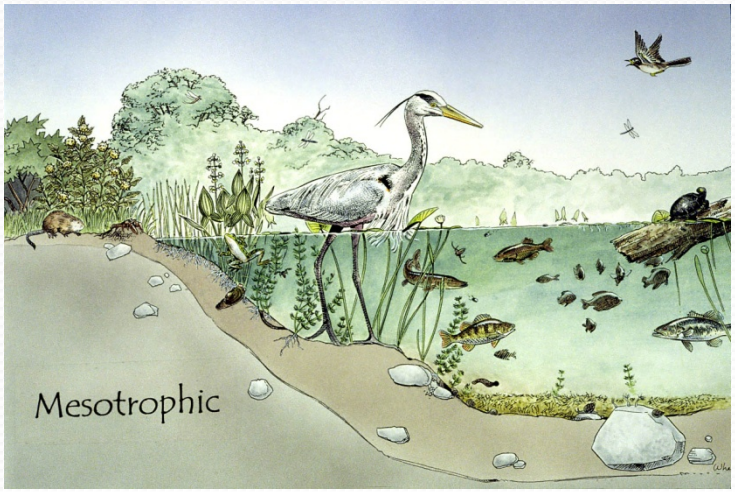


Image courtesy of IDNR Division of Fish and Wildlife

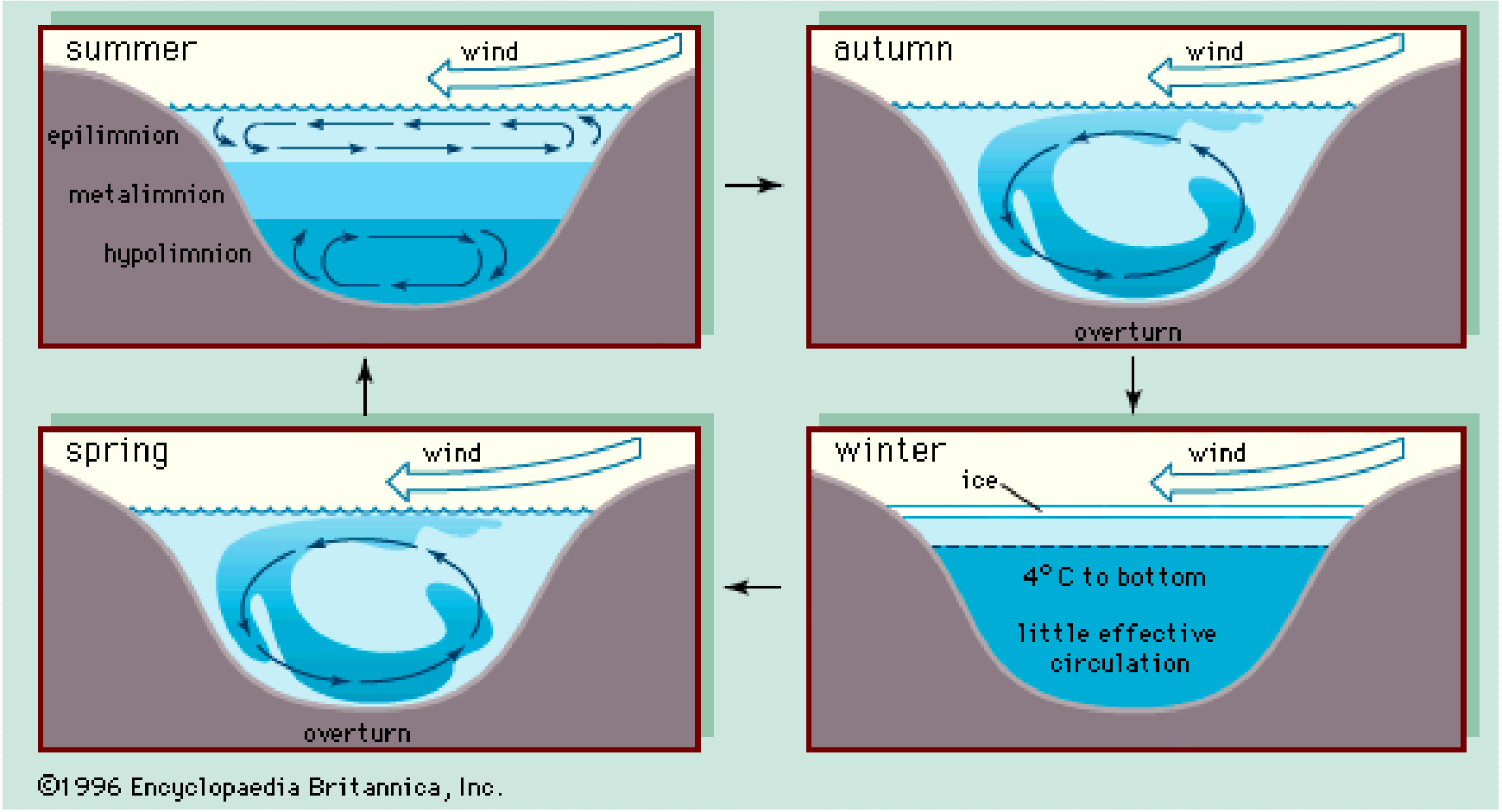
Lake Aging (Eutrophication)



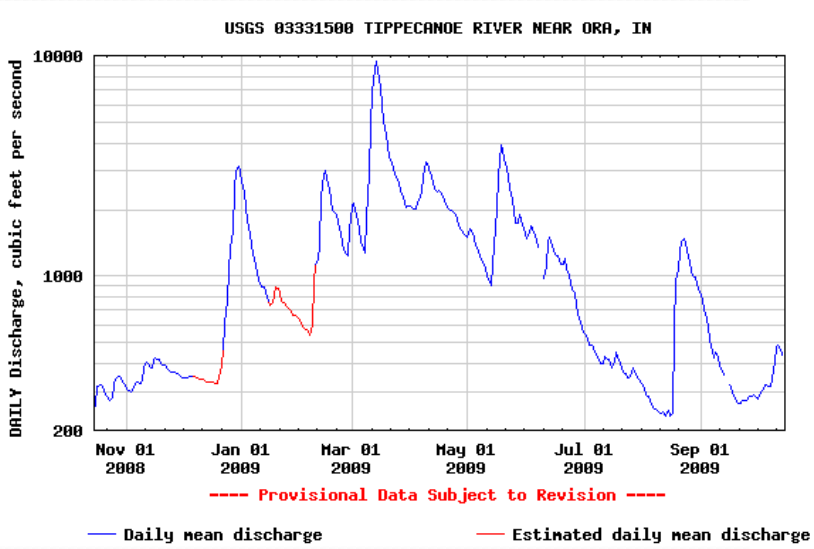


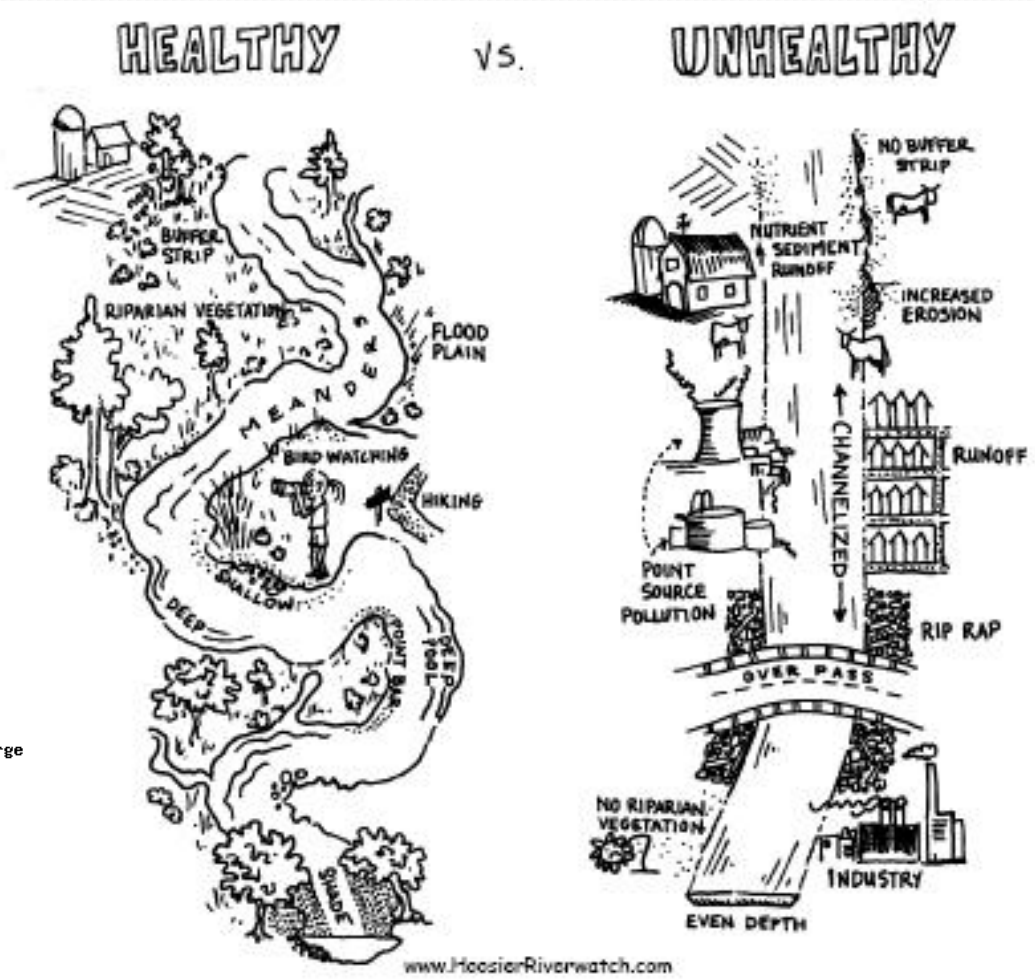
Images courtesy of UW-Extension Lakes Program

Lake seasonal mixing



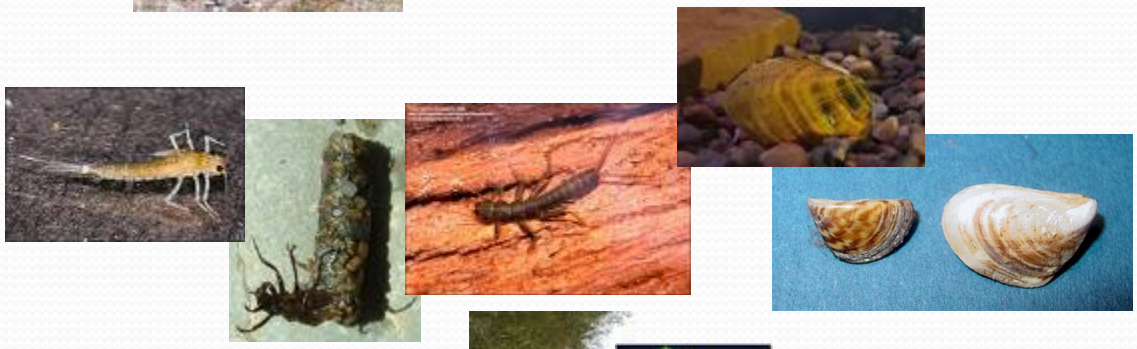
Stream flow and organization

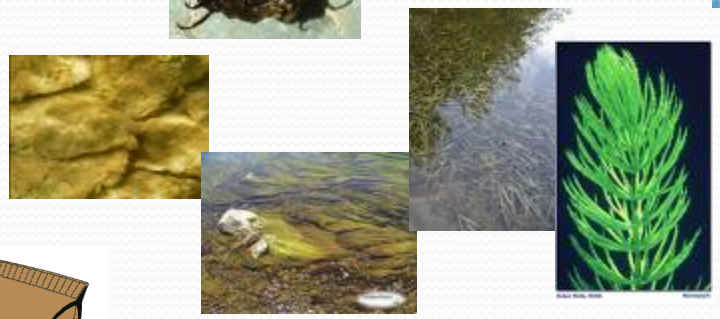


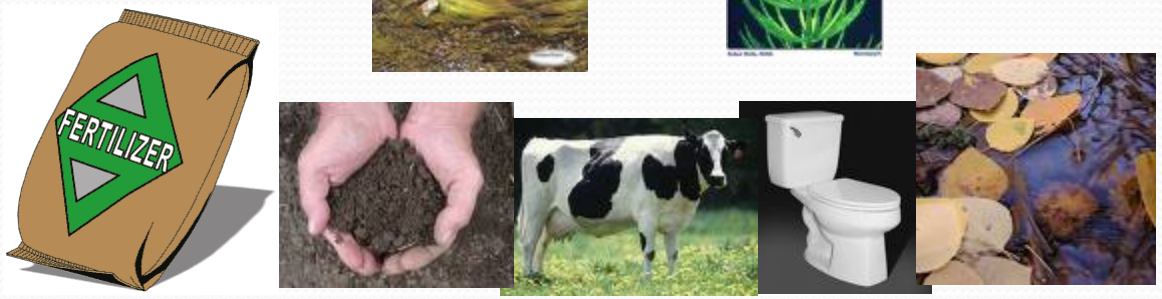


Stream ecology

- Fish
- Insects and mussels
- Periphyton and macrophytes
- Nutrients







More research ideas:

- Where are all the nutrients coming from?
- Modeling watersheds to understand how best to reduce nutrients
- We have scientific lake data going back to 1875; how can we compare to current data?
  - Species present, climate, vegetation
- How fast are lakes filling in with sediment?
- How might lake cleanliness impact property values?

Lake Tippecanoe sedimentation

- Indiana University Biological Station
- Lake Tippecanoe was filling in at a rate of 1 ft every 60 years in 1916 when study was conducted
- In 1937, there was 46 ft of sediment that had accumulated in bottom of lake since its beginning
  - 32% of its original volume was filled in
  - Enough sediment to fill over

    2 million dump trucks!

Photo taken from: www.truckpaper.us

What can you do?

- Individual donor
- Presentation partner
  - Opportunities to promote your business/organization
- Volunteer
  - Northern Indiana Lakes Festival
- Educate yourself and perform sustainable practices
  - Website
  - E-Newsletter
  - Social media

- Please feel free to contact me with questions:
  - Nathan Bosch
  - 574-372-5100 ext6447
  - boschns@grace.edu

KOSCIUSKO LAKES AND STREAMS

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