

# Great Lakes Center for Fresh Waters and Human Health - A Summary of Community Engagement Core Activities

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February 21, 2024  
Research Triangle Park, NC

# CEC activities

- Identification of vulnerable populations
  - Lake Erie and Saginaw Bay (MI) communities at risk
  - Vulnerable populations needs assessment for Michigan inland waters
- Community science enhancing ongoing research projects
  - Charter Boat Captains program, Ohio waters of Lake Erie
  - Winter sampling with US Coast Guard personnel

# Toledo Water Crisis: August 2014



Microcystins above 1 ppb in finished water

400,000 residents had no drinking water

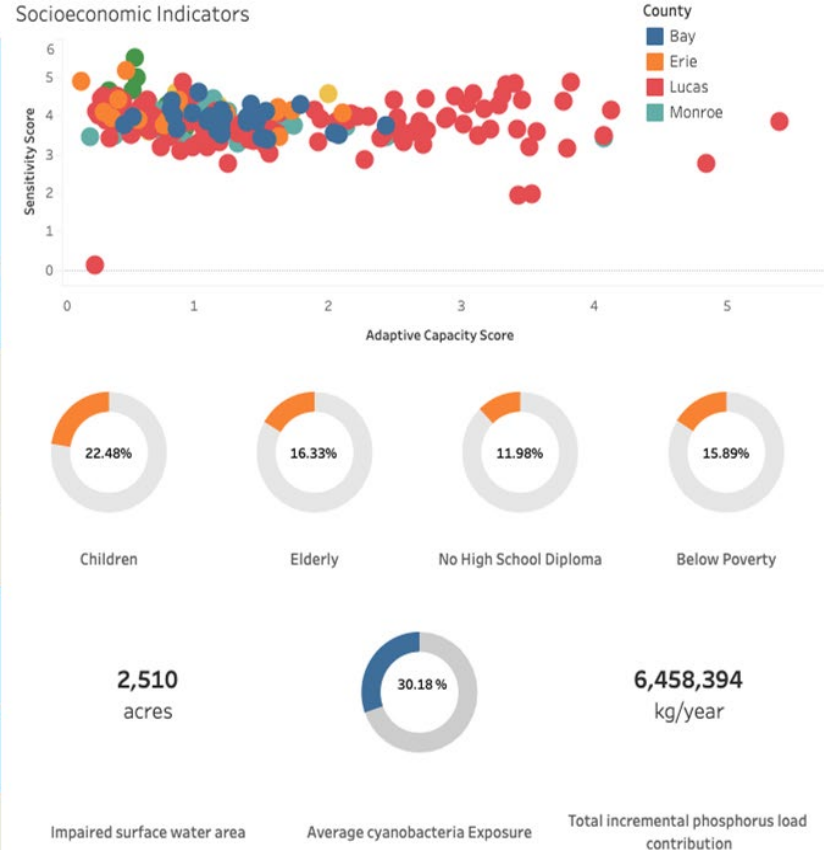
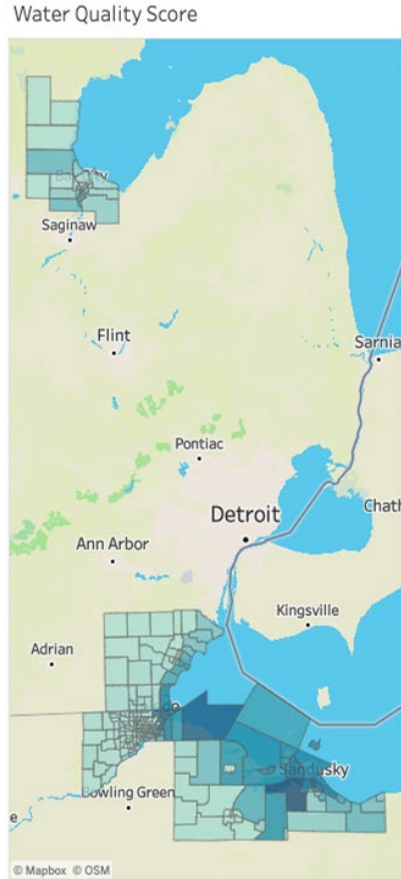
\$65M loss to City of Toledo in 3 days

Some people still drink bottled water

Yearly cost of cHABs in WLE approximately \$71M

- GIS analysis of vulnerable population needs assessment by census tract
  - 3-factor model:
    - underlying health conditions,
    - adaptive capacity,
    - water quality conditions
  - Available as Tableau Dashboard

## Vulnerable Populations Dashboard



- Complementary project with MSU Institute of Water Research (USGS funding) -
  - GIS analysis of vulnerable population needs assessment for Michigan's inland waters
    - Socio-economic and Health data MI Environmental Justice Screening Tool
    - Watershed scale USGS SPARROW model
    - Average weekly cyanobacteria loading EPA's CyanApp
  - Major risk factors:
    - High cyanobacteria loads
    - High % of children <5 years
    - High asthma likelihood
    - High nutrient loads from WWTPs
  - Top 10 risk areas

Categories	Environmental Exposure	Environmental Effects	Sensitive Populations	Socioeconomic Factors
Indicators	NATA Air Toxics Cancer Risk NATA Respiratory Hazard Index NATA Diesel Particulate Matter Particulate Matter (PM <sub>2.5</sub> ) Ozone Traffic Density	Proximity to Cleanup Sites Proximity to Hazardous Waste Facilities Impaired Water Bodies Proximity to Solid waste Sites and Facilities Lead Paint Indicator Proximity to RMP Sites Wastewater Discharge Indicator	Asthma Cardiovascular Disease Low Birth Weight Infants Blood Lead Level Life Expectancy	Low Income Population Black, Indigenous, People of Color Population Educational Attainment Linguistic Isolation Population Under Age 5 Population Over Age 64 Unemployment Housing Burden
Sub Scores	<b>Environmental Conditions</b> (Average percentile of Environmental Exposure indicators + 0.5 x average percentile of Environmental Effects indicators) <u>1.5</u>		<b>Population Characteristics</b> (Average percentile of Sensitive Population indicators + average percentile of Socioeconomic Factor indicators) <u>2</u>	
Score	<b>Final Composite Score = Environmental Conditions score x Population Characteristics score</b> <b>MiEJScreen Score</b>			

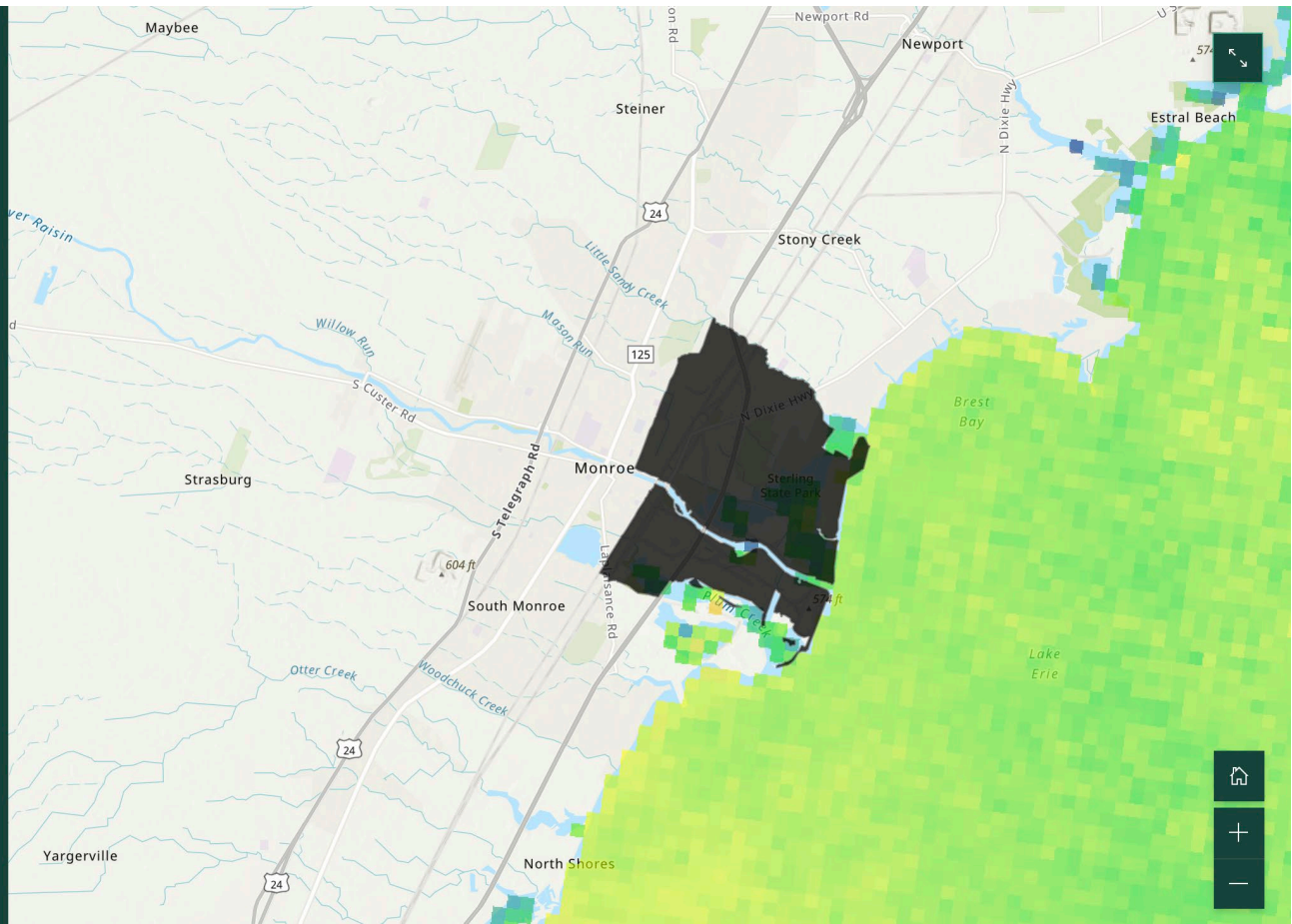
<https://storymaps.arcgis.com/stories/2ca2f8e82c8441d8905ffd8a11da806b>

# Top two census tracts

## The Top 10

The maps in this section highlight the ten census tracts with the highest scores on the HAB Vulnerability Index, including the leading contributors for each score.

These two tracts, each sharing a bank at the mouth of the River Raisin as it enters Lake Erie, have the two highest scores on the index; 92.3 for the southern tract and 89.1 for the northern one. Each of those scores are mainly driven by the tracts' proximity to the high cyanobacteria loads that plague the western Lake Erie basin.





# Surveys of vulnerable populations (Alexandra Benitez, MSU)

- Surveys conducted in a few communities identified in GIS analysis
- Three questions addressed (Lake Erie, Ford Lake, Belleville Lake)
  - Access to populations largely through public events (n= 115)
- Q1: How are vulnerable populations learning about HABs and its effects?
  - Word of mouth, local media; existing postings provide little information regarding risk
  - Variability in trust among the population
- Q2: How do different communication styles (cognitive vs. emotional) shape risk perception about HABs?
  - Fact sheets making an emotional connection are more effective
  - 77% of respondents had experienced HAB events, only 10% were aware of causes/effects
- Q3: What type of factors shape people's risk perception about HABs?
  - Knowing an individual's attitude toward HABs is important to learn how to effectively communicate risk

# Fact sheet comparison, Cognitive vs. Emotional

## Freshwater Harmful algal blooms (HABs): Health risks & Vulnerable populations

**"I would give anything to have one more day with them..."<sup>1</sup>**

*"...My dogs contracted blue green algae poisoning in the lake and there was nothing they could do. I wish I could do today over. We are gutted."*

- Melissa Martin posted on Twitter after losing her two dogs after ingesting blue-green algae blooms



### Loved ones that have higher health risks if exposed to HABs:



- Dogs
- Children under the age of 6
- Pregnant & nursing women
- Pre-existing liver or kidney conditions
- Those receiving dialysis treatment
- Elderly or sensitive populations

### Routes of exposure:



**Swallowing:**  
contaminated water or eating seafood contaminated with toxins

**Breathing:**  
aerosolized toxins

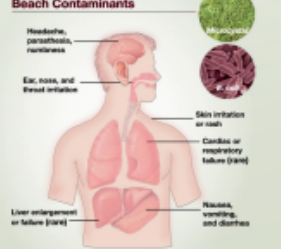


**Touching:**  
contaminated water when swimming or boating

**Protect your family, think before you swim!**

## Health Risks Associated with HABs:

### Health Risks Associated with Beach Contaminants



If you experience any of these symptoms, call your physician or the National Emergency Poison Control Hotline IMMEDIATELY.

POISON CONTROL HOTLINE 1-800-222-1222

Source: Michigan Sea Grant, NOAA Center of Excellence for Great Lakes and Human Health, 2009

### Do's and Don'ts: with HABs in the lake

- **Do** avoid contact with water when blue-green algae is visible
- **Don't** drink untreated surface water when blooms are present
- **Do** rinse yourself and your pet after swimming in any lake, regardless of presence of visible algal blooms
- **Don't** allow children or pets to play in or drink water when scum is present

### Reported signs and symptoms after HABs exposure:

- **Skin contact:** severe rash, dermatitis, blisters
- **Neurological:** headache & dizziness
- **Eye exposure:** swelling, conjunctivitis, lacrimation
- **Ingestion:** stomach pain, nausea, vomiting, diarrhea, liver damage
- **Respiratory / Inhalation:** atypical pneumonia, rhinitis, sore throat, bronchospasm, pneumonia

If experience any of these symptoms after exposure with HABs, call:  
**Poison Control**  
1-800-222-1222

### If exposed, what should I do about it?

- **To report suspicious-looking algae:**
  - Call EGLE & the Environmental Assistance Center at 1-800-662-9278
  - Send an e-mail to: [AlgaeBloom@Michigan.gov](mailto:AlgaeBloom@Michigan.gov)
- **To learn about illnesses caused by cyanobacteria**
  - Call poison control center external icon hotline at 1-800-222-1222



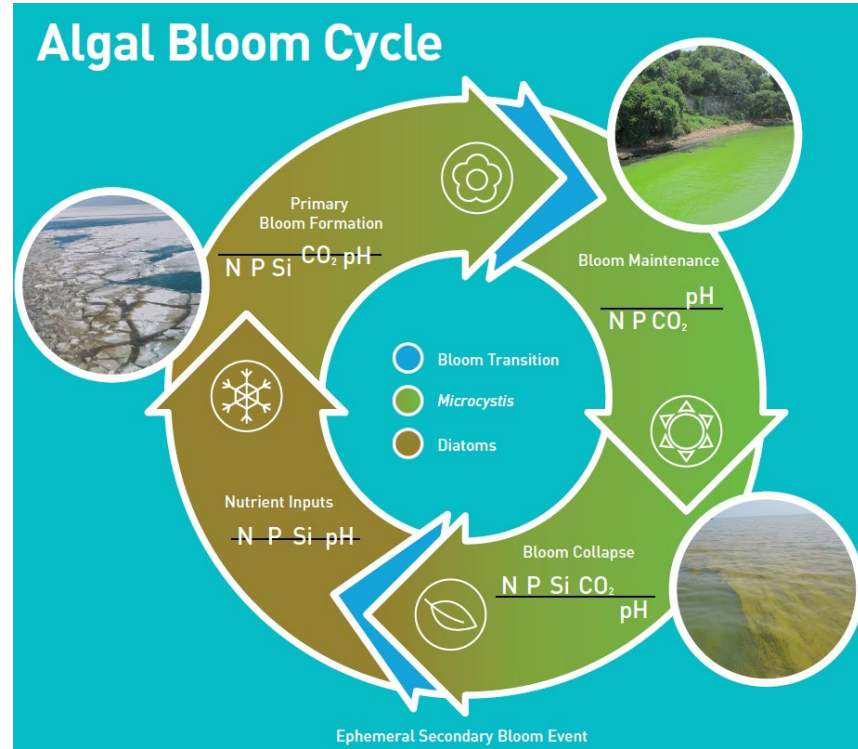
# Community science enhancing ongoing research projects

Charter Boat Captains program  
Winter sampling with US Coast Guard personnel

(Science done by non-scientists who are trained to work on the water)

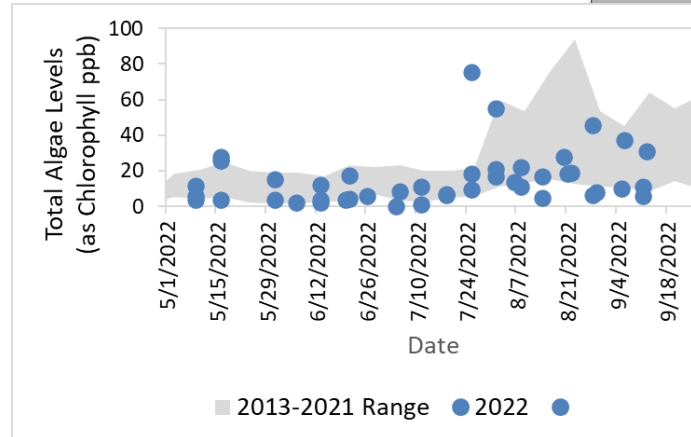
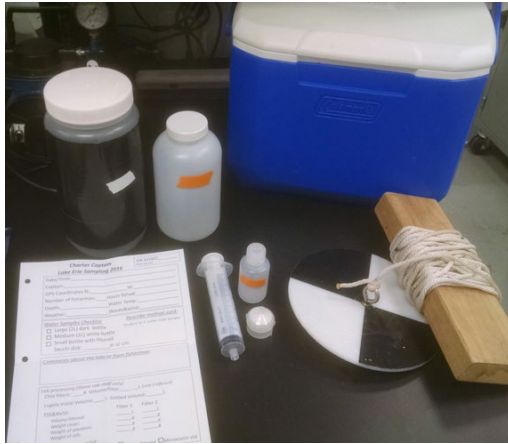
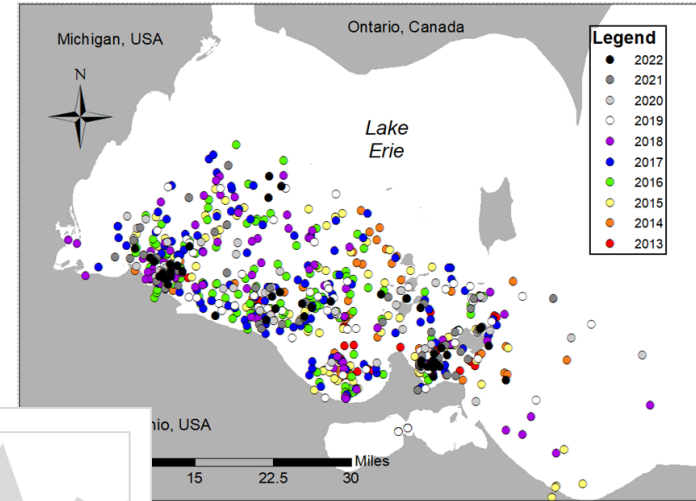
# Overview – Great Lakes: demand for year-round sampling

- Diatoms, winter-spring
- Cyanobacteria, summer-fall
- Seasonal nutrient and pH changes
- pH > 9.5 during HAB
- Temperature influences toxin quota
- Also need to consider:
  - Phycosphere
  - Genetic diversity of HAB taxa
  - Loss of ice cover due to climate change
    - 1-2 day increase in HAB growing season per year



# Charter captains monitor water quality (Justin Chaffin, OSU)

- Expands our sampling reach beyond established sites
- 10<sup>th</sup> year (5<sup>th</sup> under OHH)
- 842 total samples
- New captains to participated in 2023
- Unexpected result - educating fishing clients about HABs
  - Client informed us about a *Raphidiopsis* bloom at his HOA
  - *Planktothrix rubescens* bloom in small lake in Norwalk, OH





  
**GREAT LAKES CENTER**  
FOR FRESH WATERS AND HUMAN HEALTH  
AT BOWLING GREEN STATE UNIVERSITY

**BGSU.**



## ‘Citizen Science’ with the U.S. Coast Guard – Mike McKay, BGSU and GLIER

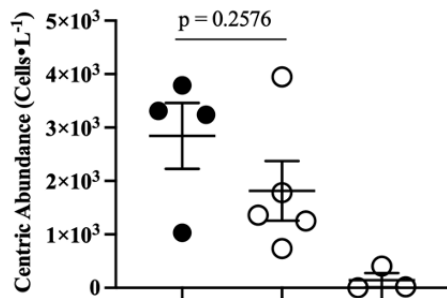
Winters 2020/2023: 6 USCG students enrolled in BGSU BIOL 1010  
>50 winter samples collected

Coast Guard student co-author on BCO-DMO dataset and article:  
Zepernick BN,.....Anderson JT et al. 2022. Microbiol Res Announce 11(7)

Bullerjahn GS, Anderson JT, McKay RM. 2022. Biological and Chemical  
Oceanography Data Management Office (BCO-DMO), Woods Hole, MA

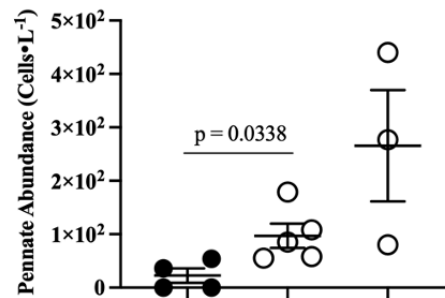
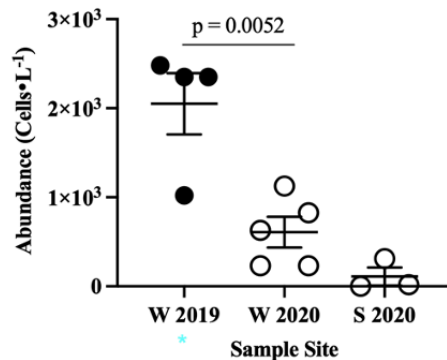
More pennate diatoms in low ice year, average 30% less chl a

Food web implications?



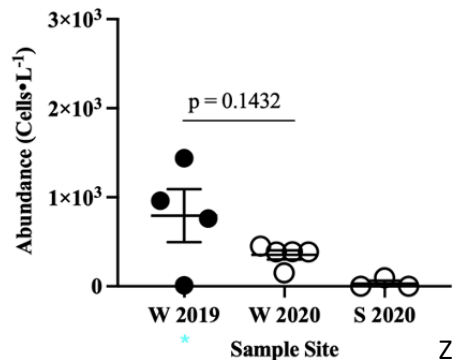
E.

*Stephanodiscus* spp.



F.

*A. islandica*



# Summary

- Needs assessment on vulnerable populations led to discussions on HABs regarding
  - Causes and threats posed by HABs in Lake Erie and the GL watershed (Michigan)
  - Risks of exposure to HABs
  - Awareness of such risks
- Non-scientists expanding our capacity to study the lake and HABs year-round
  - Understanding seasonal changes in Lake Erie due to climate change
  - Broadening HAB sampling beyond established fixed sites
    - Educating the public (fishing clients) about HABs

# Funding sources and staff



National Science Foundation (NSF OCE-1840715) and the National Institute of Environmental Health Sciences (NIH 1P01ES028939-01)



Extension



University Outreach  
and Engagement

