Ohio Harmful Algal Bloom Workshop

Hosted by

NOAA Center of Excellence for Great Lakes and Human Health &

University of Toledo Lake Erie Center

NOAA Center of Excellence for Great Lakes and Human Health

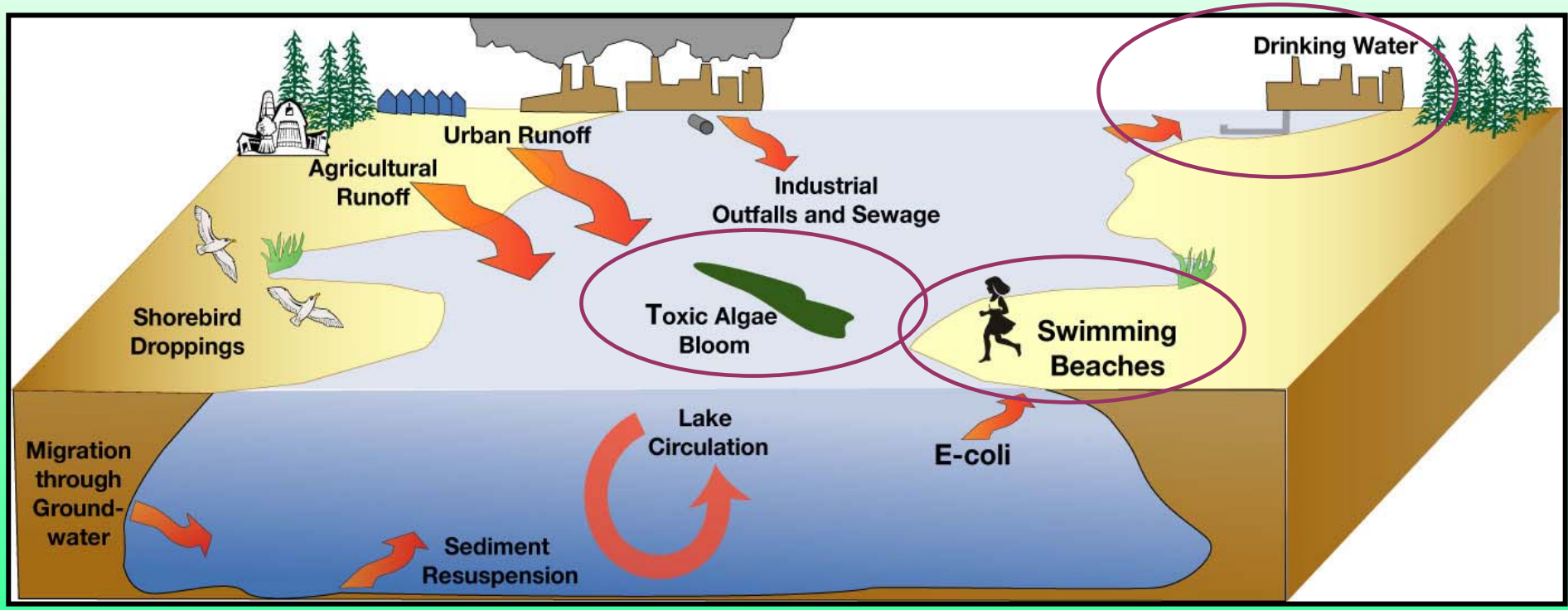
"The overall purpose of the Center is to use a multidisciplinary approach to understand and forecast coastal-related human health impacts for natural resource and public policy decision-making"

GLERL
Great Lakes Environmental Research Laboratory

OHH Overview

- 3 Centers competitively funded
  - Great Lakes Environmental Research Laboratory- Ann Arbor, MI
  - Northwest Fisheries Science Center- Seattle, WA
  - Hollings Marine Laboratory- Charleston, SC

Factors Contributing to Human Health in the Great Lakes



NOAA Center of Excellence for Great Lakes and Human Health

- Dr. Stephen Brandt, Director
- Steering Committee
  - Dr. Stephen Brandt- GLERL
  - Dr. David Schwab- GLERL
  - Dr. Joan Rose- Michigan State University

- GLERL is the lead of the Center
- Partnerships with Michigan State University, EPA Chicago, EPA Athens, USGS, Florida Institute of Oceanography, NOAA NOS Beaufort Laboratory, University of Michigan, NOAA NOS Silver Springs, Michigan Sea Grant and the Great Lakes Human Health Network

MICHIGAN STATE UNIVERSITY

University of Michigan

GLERL Great Lakes Environmental Research Laboratory

STATE OF FLORIDA INSTITUTE OF OCEANOGRAPHY FIO

Sea Grant Michigan

NOAA Center for Coastal Fisheries and Habitat Research Beaufort, North Carolina

USGS science for a changing world

Specific Research Focus

- Water Quality (e.g. drinking water)
- Beach closures
- Harmful Algal Blooms

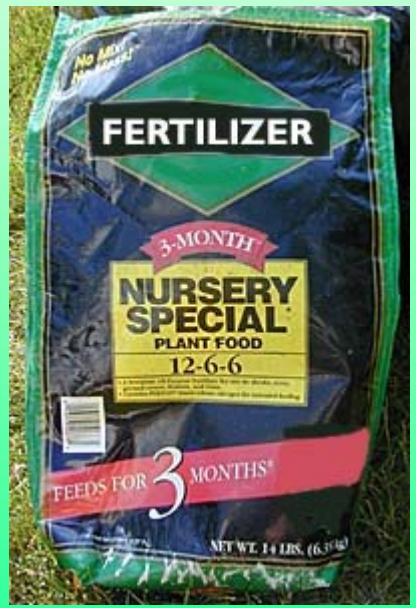
Climate –Meteorology –Hydrology – Hydrodynamics – Biology/Chemistry

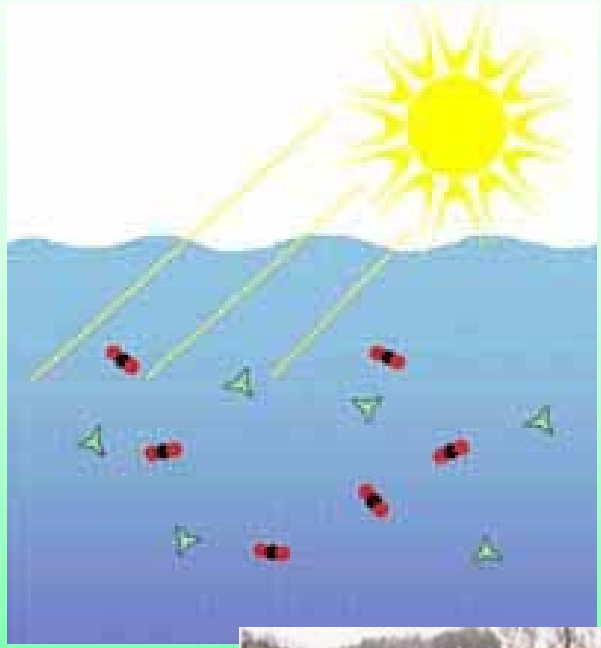
What are Harmful Algal Blooms (HABs)?

- Algal blooms are common
  - Dense population of cells
- Cyanobacteria or algae that produce toxins
  - Released as bacteria or algae dies
  - Harmful to aquatic life and humans
- Most algal blooms do not produce toxins

What causes an Algae Bloom?

- Sunlight
- Nutrients
- Temperature



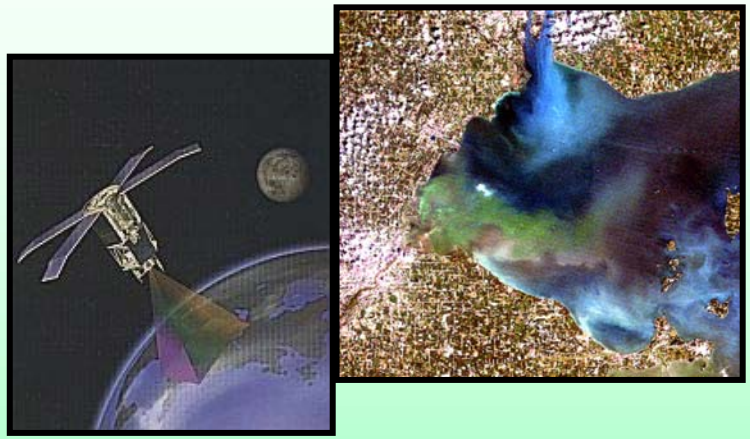


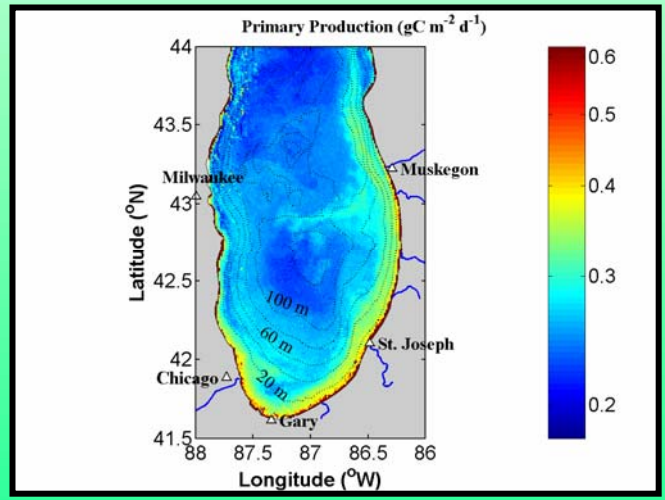
Toxins produced by freshwater planktonic cyanobacteria

Toxin type	Primary organ affected	Produced by
microcystins	**liver**	***Microcystis*** ***Anabaena*** ***Oscillatoria***
anatoxins	**nervous system**	***Anabaena*** ***Aphanizomenon*** ***Oscillatoria***
saxitoxins	**nervous system**	***Anabaena*** ***Aphanizomenon*** ***Cylindrospermopsis***
cylindrospermopsins	**liver**	***Cylindrospermopsis*** ***Aphanizomenon***
LPS	**skin irritant**	**all of the above**

Harmful Algal Blooms: Goals

1. Increase understanding of causes and consequences of cyanobacteria (e.g. ZM effect, toxin production etc.)
   - Regulation of toxin gene
   - Determine role of environmental factors
2. Develop models for cyanobacteria/toxins using hydrodynamics
3. Develop remote sensing – All platforms
4. Integrate into ecological forecasting models





HAB Projects

- Focus: Determining factors that influence *Microcystis* blooms
- 6 different CEGLHH research projects associated with *Microcystis* and microcystin
- Includes research partnerships and collaborations with 5 different institutions

Saginaw Bay Project

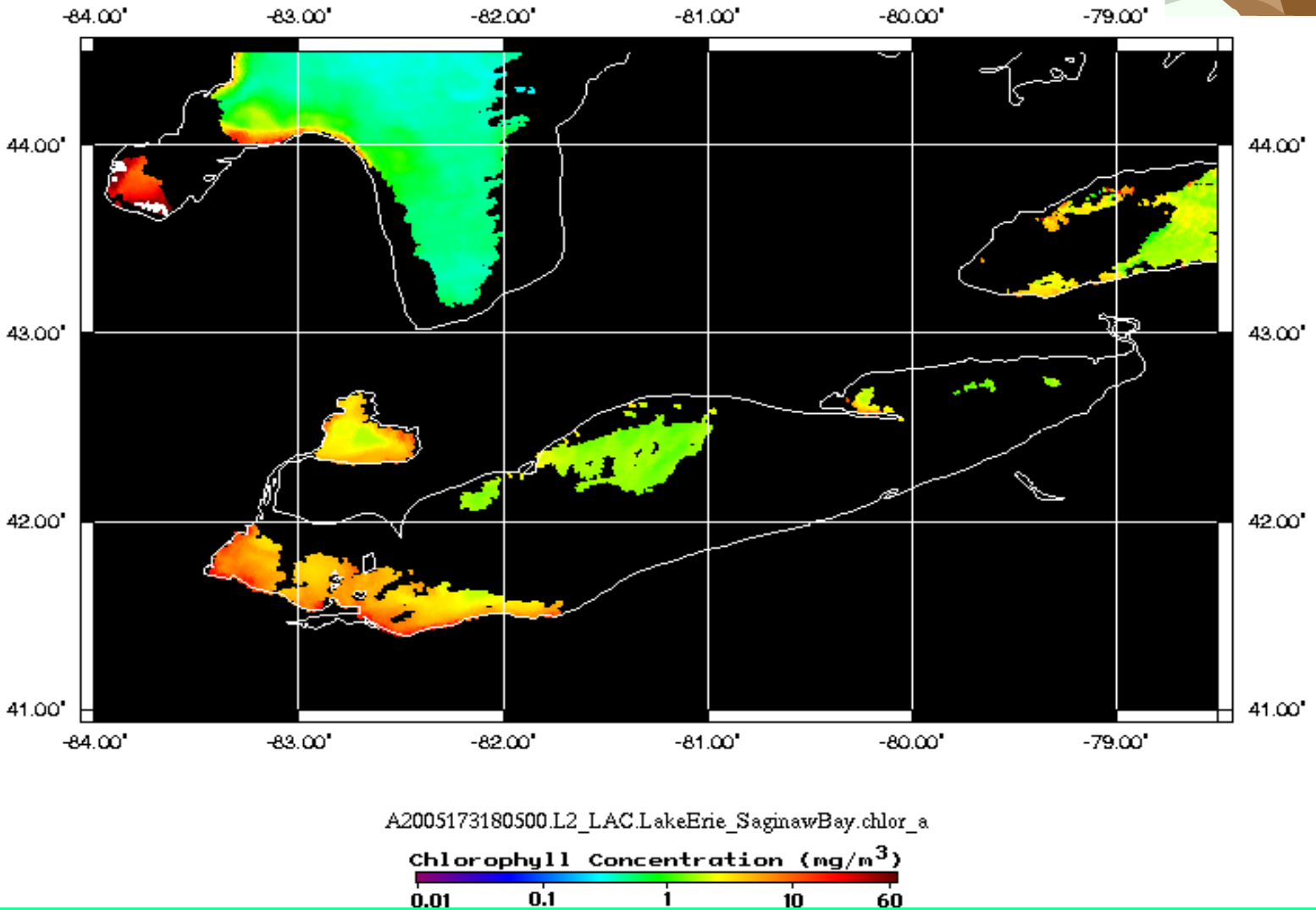
"Microcystin Concentrations in *Microcystis* in Saginaw Bay and Western Lake Erie and Factors Controlling Microcystin Production"

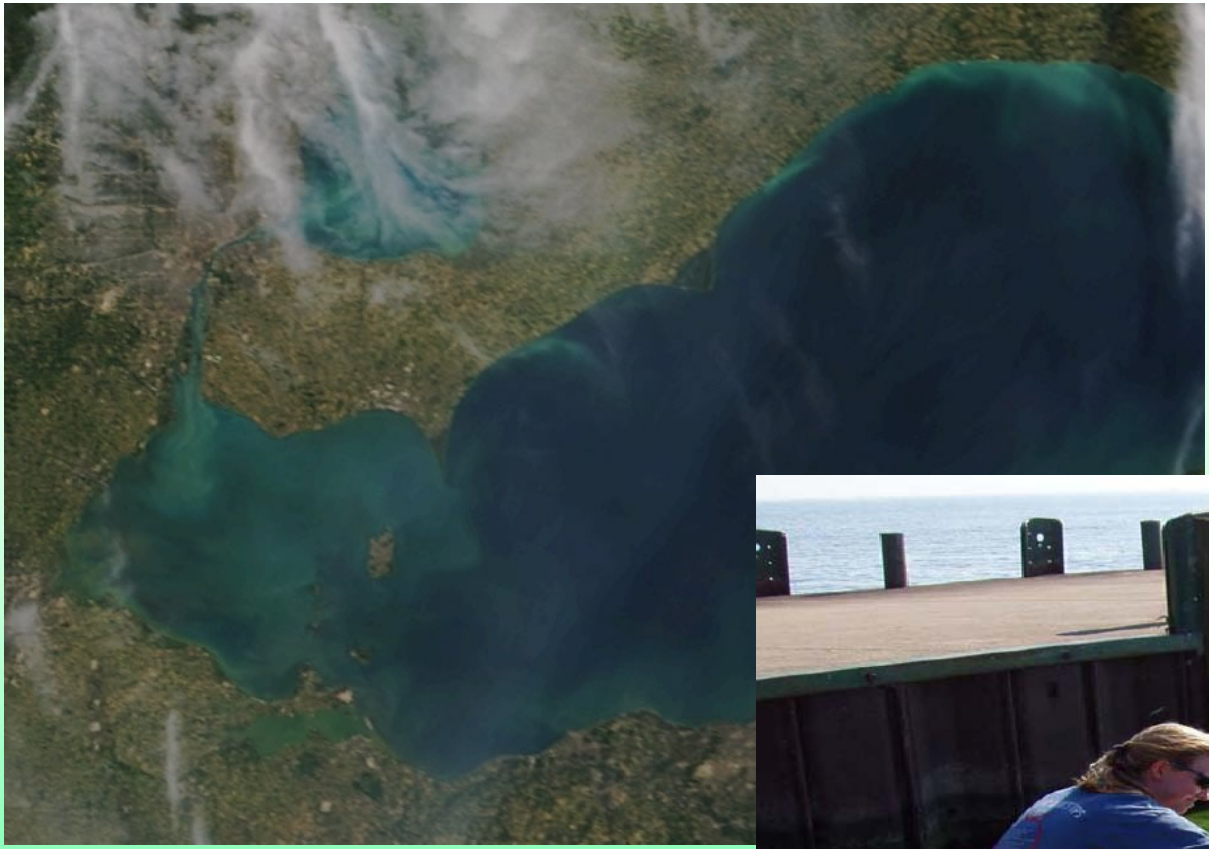
- Led by Dr. Gary Fahnenstiel , GLERL
- Designed to answer research questions relating to the community dynamics of algal blooms in the Great Lakes

Project Dynamics

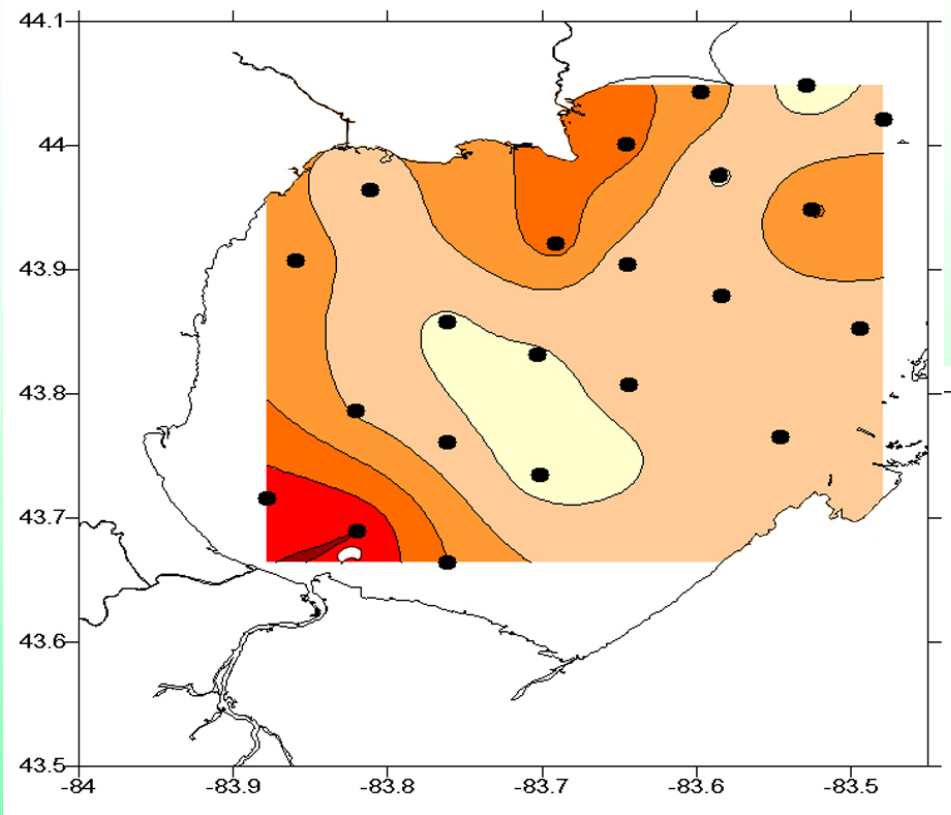
- Regular sampling of four sites
  - Bear Lake, Muskegon Lake, Saginaw Bay, western Lake Erie
- Satellite images (experimental MODIS chlorophyll products) are used to guide sampling
- Samples subjected to an initial screening based on an ELISA technique for microcystin quantification

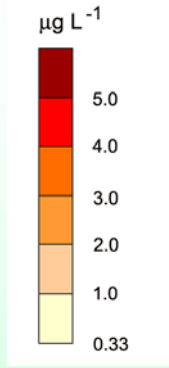
Detecting HABs





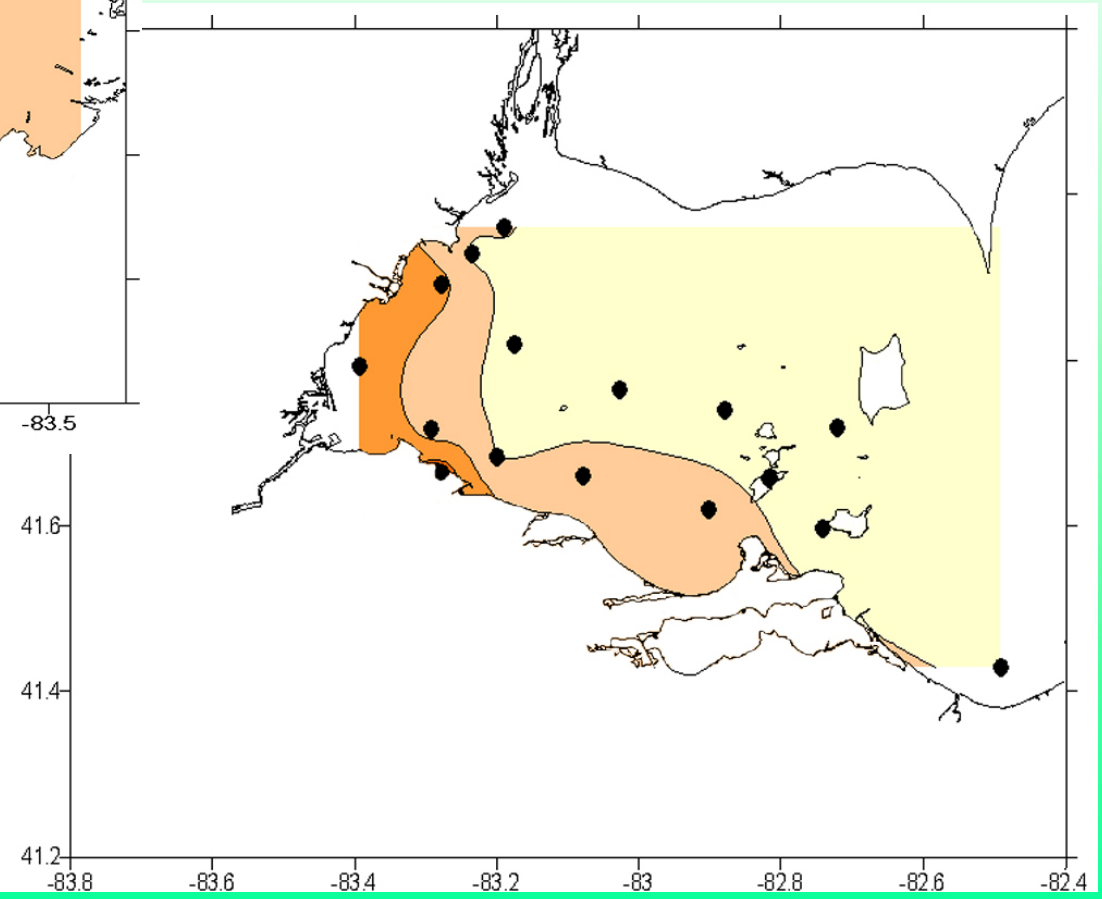
Intracellular total microcystin by HPLC





August
2004

Saginaw Bay



western Lake Erie

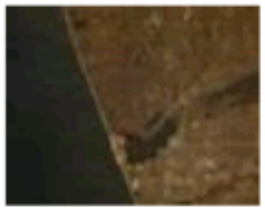
HAB Event Response Website

Click on photos to link to microcystin concentrations.

Bear Lake

Located just east of Lake Michigan...

Muskegon Lake



Located just east of Lake Michigan...

Saginaw Bay

Located just west of Lake Huron...

Western Lake Erie

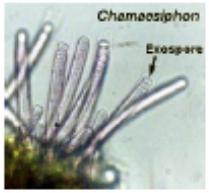
The data appearing on these pages is generated based on an event response research program. The project was not designed to monitor waters for potential human health impacts - it was designed to answer research questions relating to the community dynamics of algal blooms in the Great Lakes. However, the project leaders and the Center of Excellence for Great Lakes and Human Health feel strongly that when research reveals human health implications, the responsible course of action is to make that data as publicly available as possible.

Web Features

- State Public Health Directory
- Algal FAQs
- Information on other HAB research projects
- Newsroom
- Algae Photo Gallery
- Links to other HABs programs

Great Lakes Blue-Green Algae Genera

Unicells and small colonies (<8 cells)

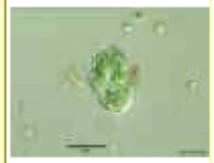


Chamaesiphon

Chroococcus

NA

Gloeochaete



Glaucocystis

Synechococcus

Spirulina

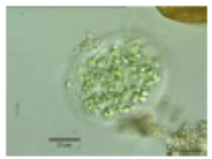
Globular colonies

Coelosphaerium

Gomphosphaeria

Aphanocapsa

Coccochloris



Aphanothece

NA

Rhabdoderma

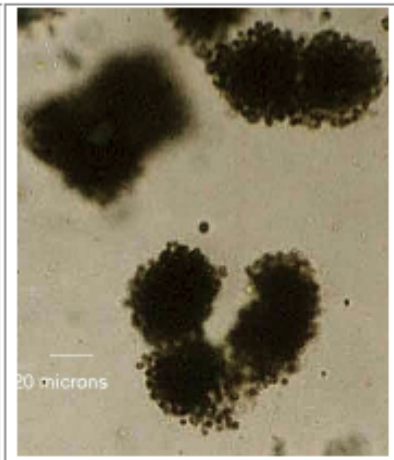
Microcystis spp.

M. aeruginosa (aka M. flos-aquae, M. ichthyoblade, M. novacekii, M. viridis, and M. wesenbergii), M. incerta (aka M. pulverea), M. smithii

Taxonomy and Scientific Profile: Cyanodb

Irregular colonies enclosed in mucilage - *M. flos-aquae* occurs in globular colonies. Cells may appear black, brown or purple and are very dense. May float and produce surface scums. Some species/strains may produce toxins (microcystins and lipopolysaccharides).

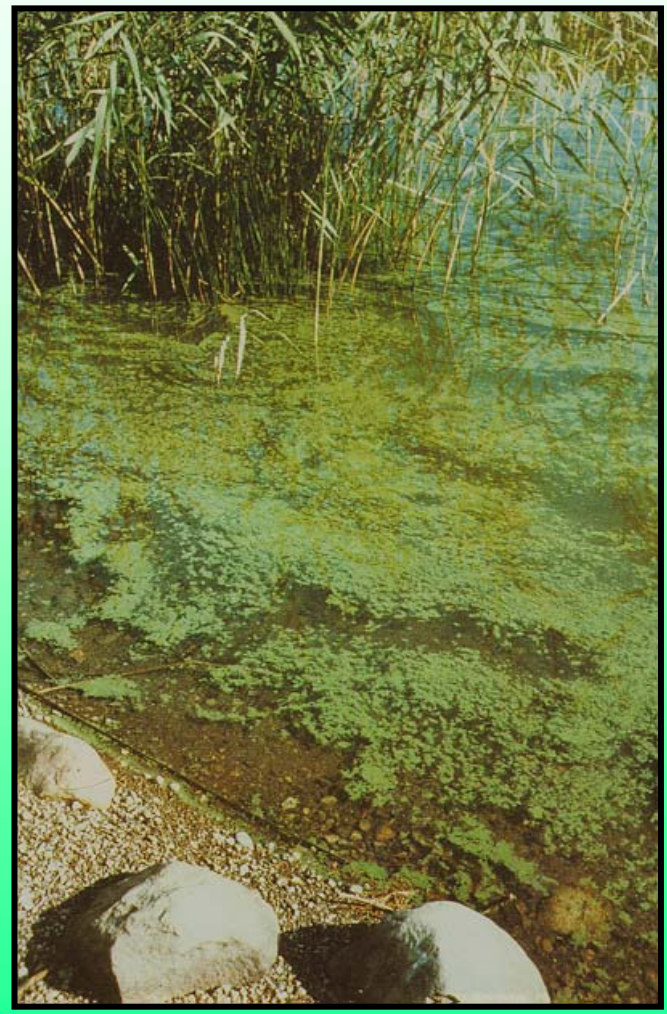
D- Microcystis is a dominant member of the summer phytoplankton assemblage in Lake Erie.



Cyanosite - Purdue University

Should we be concerned?

- Have we underestimated toxin concentrations?
  - **We measured toxin in particles only**
  - **We sampled out in the middle of each lake**
  - **We sample at 0-1m depth**



WHO Recommended Guidelines

Drinking water = 1µg/L

Recreational = 20µg/L

Please visit us on the web!

http://www.glerl.noaa.gov/res/Centers/HumanHealth/

Join HABCOMM listserv to foster communication between diverse groups interested in HABs.

To join, send email:
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