Blue-green Algae Blooms and Volunteer Monitoring

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What are Harmful Algal Blooms (HABs)?

- Algae 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 algae blooms do not produce toxins

Toxins and their Effect

Blue green algae can produce a wide array of toxins:

Neurotoxins	*Anabaena* and *Oscillatoria*
Hepatotoxins	*Microcystis* and *Cylindrospermopsis*
Dermatoxins	nearly all blue-green algae

Microcystis

- Degrade water quality
  - Taste/odor issues
  - Aesthetics
- Toxin production: hepatotoxin microcystin
  - Human health effects (OHH)
  - Ecosystem effects
    - reduced grazing
    - altered food web
    - bioaccumulation

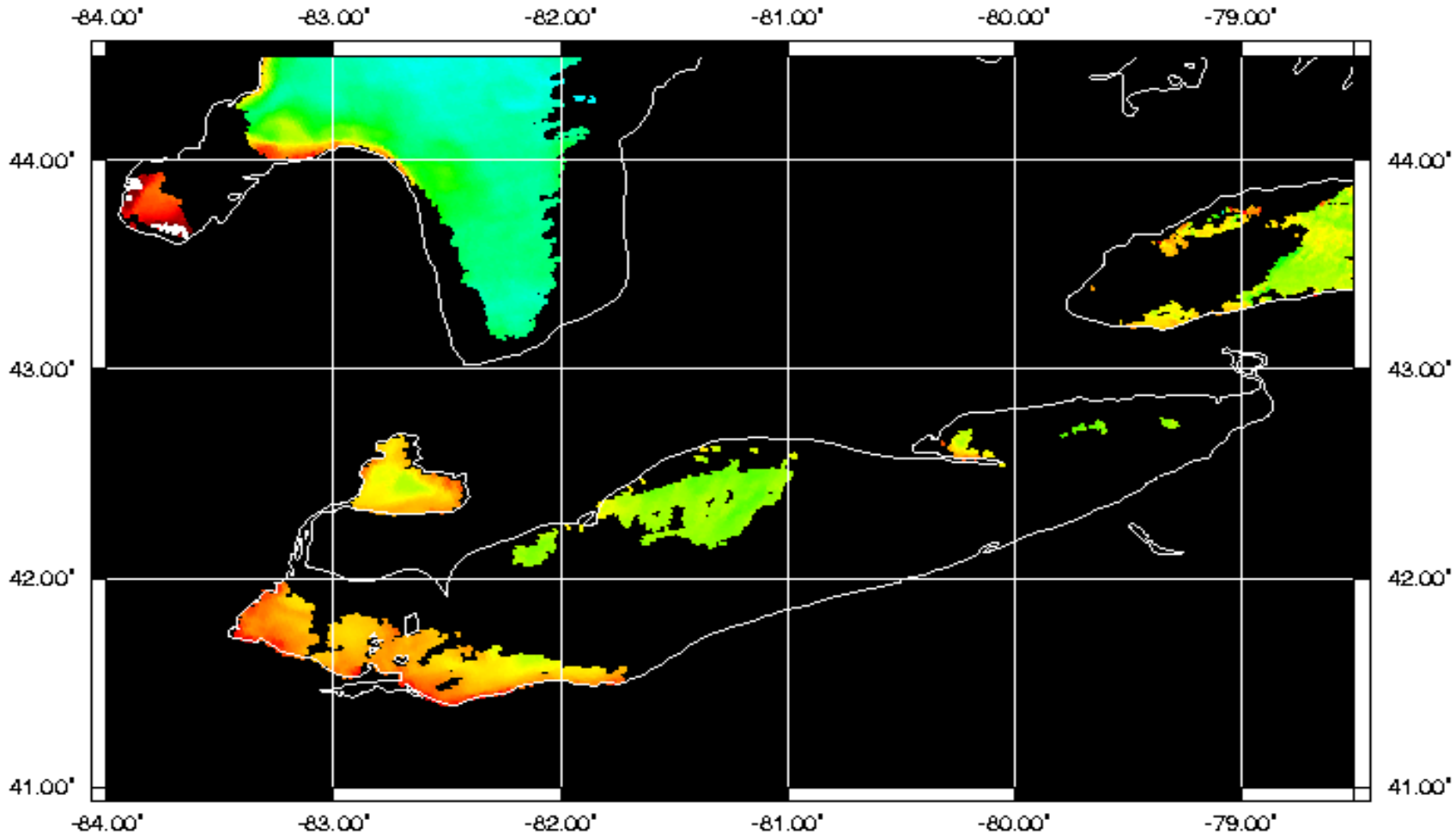
HAB Research

- GOAL: Develop predictive capabilities for presence of toxic cyanobacterial blooms in Great Lakes recreational and drinking water supplies

Courtesy of Wisconsin DNR

Harmful Algal Blooms: Projects

- Ecosystem factors which control production of toxics by *cyanobacteria*
- Predict water quality and beach closures based on ecosystem variables and *microcystis* abundance


-84.00'
-83.00'
-82.00'
-81.00'
-80.00'
-79.00'
44.00'
43.00'
42.00'
41.00'
A2005173180500.L2_LAC.LakeErie_SaginawBay.chlor_a
Chlorophyll Concentration (mg/m3)
0.01
0.1
1
10
60

HAB Event Response Project

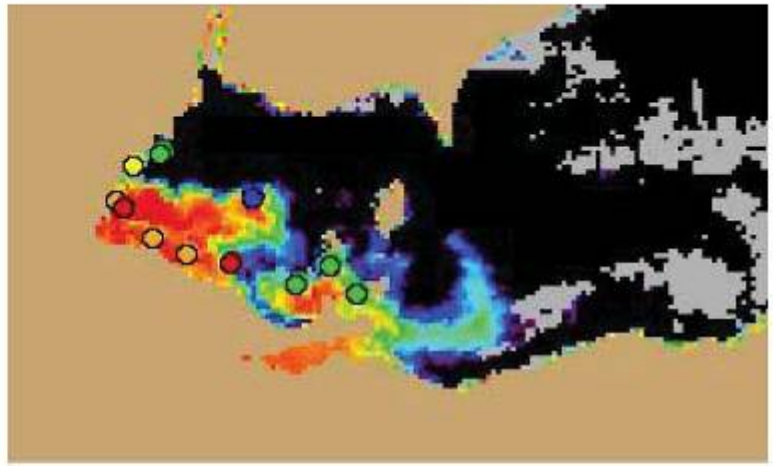
- Regular sampling of four sites
  - Bear Lake, Muskegon Lake, Lake Michigan, western Lake Erie
- Satellite images (experimental MODIS chlorophyll products) are used to guide sampling
- ELISA technique for microcystin quantification

EXPERIMENTAL
Lake Erie Harmful Algal Bloom Bulletin
4 September 2008
National Ocean Service
Great Lakes Environmental Research Laboratory
Last bulletin:

Conditions: A *Microcystis aeruginosa* bloom has been identified in western Lake Erie from the Maumee River mouth eastward, along the south shore.

Analysis: A *Microcystis aeruginosa* bloom was identified on August 26, 2008 through the use of MERIS imagery. The bloom was confirmed through sampling on August 28, 2008 and extends from the Maumee Bay eastward and along the southern shore of western Lake Erie. Concentrations range from very high to low, with the greatest concentration at the Maumee Bay in the far SW corner of the basin (41.7919N, -83.3925W) along the southern shoreline almost to the Bass Islands (41.6602N, -83.0780W). Satellite chlorophyll levels have exceeded 40 ug/L. A cyanobacteria bloom is also present in Sandusky Bay, however the majority of the bloom was primarily comprised of *Planktothrix spp.* and some *Anabaena spp.* *M. aeruginosa*, *Anabaena spp.* and *Planktothrix spp.* are known to produce toxins. Strong winds and thunderstorms are expected through Friday, which may cause the bloom to disperse, become mixed within the water column or possibly concentrate along the southern shore of Lake Erie. Further sampling is recommended.

-Tomlinson, Wynne



Imagery shows the spectral shape at 681 nm from September 2, 2008, where colored pixels indicate the likelihood of *Microcystis* (with red being most likely). *Microcystis* concentration sampling data from August 28, 2008 are shown as red circles (very high), orange circles (high), yellow circles (medium) green circles (low) and blue circles (very low) and purple circles (not present).

Wind conditions from South Bass Island, OH

Lake Erie: Strong northeasterly winds (10-20 knots) are expected through tonight, and are expected to shift southwesterly on Friday. Northwesterly winds of 5-15 knots are expected Saturday and Sunday, with a decrease in storm activity.

Please note:
1. MERIS Imagery was distributed by the NOAA Coastwatch Program and provided by the European Space Agency
2. Cell counts were collected by the Great Lakes Environmental Research Laboratory
3. The wind data is available throught the National Data Buoy Center

2008 Volunteer Monitoring

- Weekly sampling
  - Bear Lake
  - Muskegon Lake
- GLERL staff trained students
  - Field
  - Lab
- Sample results posted on HAB Event Response Website
- Muskegon Cty Health Dept
  - Notification Letter
  - WHO exceedances

Harmful Algal Bloom Event Response

Bear Lake Samples

July 29, 2008

Station Location	Microcystin Concentration µg/L	SECCHI (m)	TEMP
Beach	15.48474201		26.7
Mid-Lake	5.272004112		26.9

July 22, 2008

Station Location	Microcystin Concentration µg/L	SECCHI (m)	TEMP
Beach	49.95476437	0.7	27.5
Mid-Lake	38.18885363	0.7	27.5

WHO Recommended Guidelines

Drinking water = 1µg/L

Low risk recreational = 2-4µg/L

Moderate risk recreational - 20µg/L

High risk recreational = avoid visible scums

2009 Volunteer Monitoring

- Expand the Volunteer Monitoring Program to Ottawa County
  - Train in sample collection & preservation
- Sample 3 inland lakes
- Develop an educational program and materials for Ottawa County?

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.

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