

Harmful Algal Blooms in Wisconsin Waters 2009-2013

Gina LaLiberte

**Wisconsin Department of Natural Resources
Bureau of Science Services**

Project partners:



Project funded by:

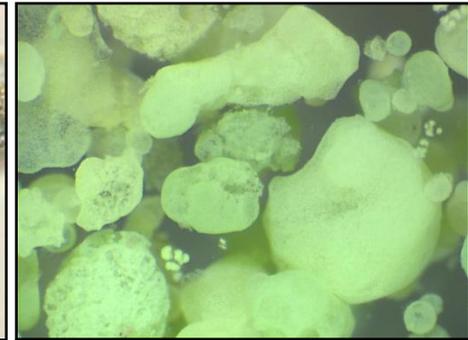


Blue-green algae in Wisconsin

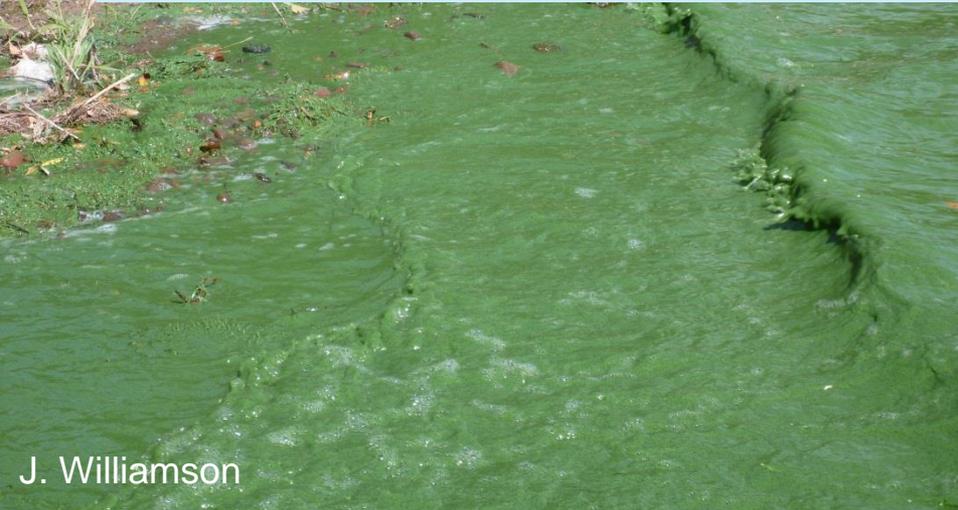
- What are they & what do they look like?
- When & why do they bloom?
- Where are they a problem?
- Are they toxic? Can I even go in the water?

What are blue-green algae?

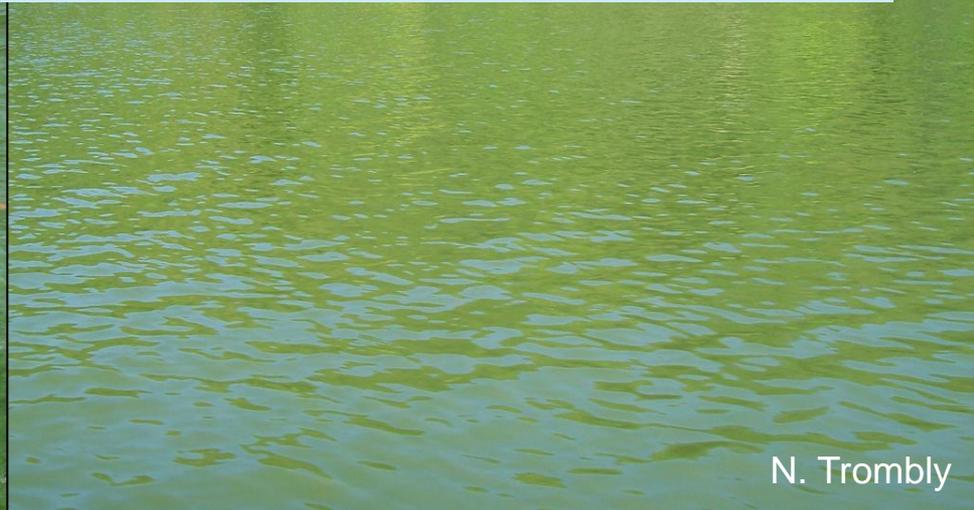
- Photosynthetic bacteria (cyanobacteria)
- Native to every lake & river in Wisconsin
- Buoyancy: they regulate position
- Temperatures: they like it hot
- Toxins: produced by some species



“Blue-green” can be misleading



J. Williamson



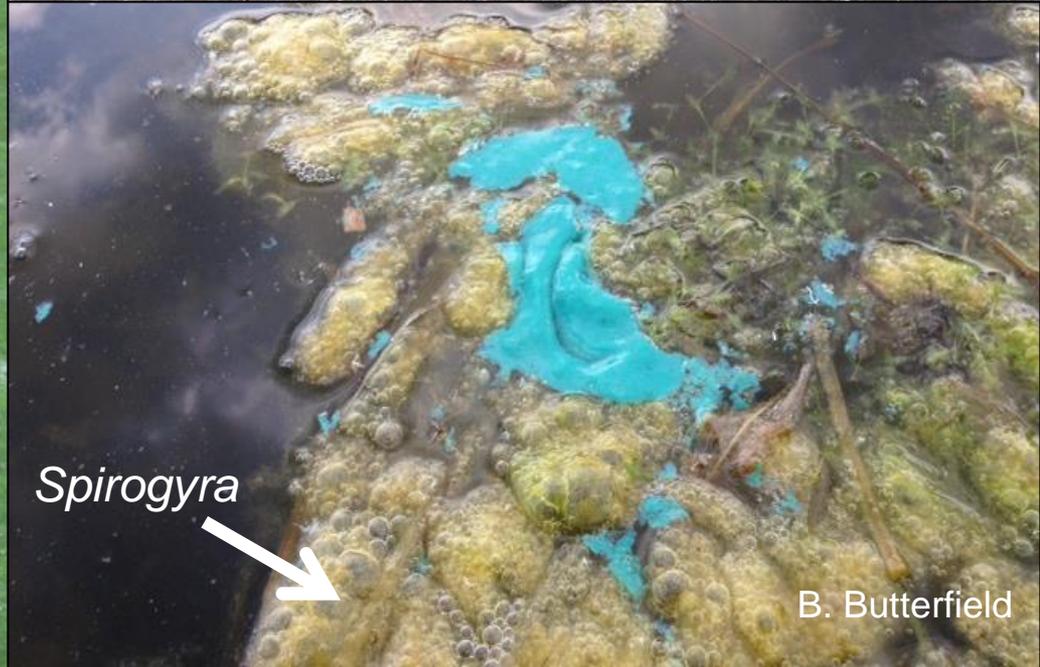
N. Trombly



Intact blooms are most often green in color.

S. Greb

E. Heath





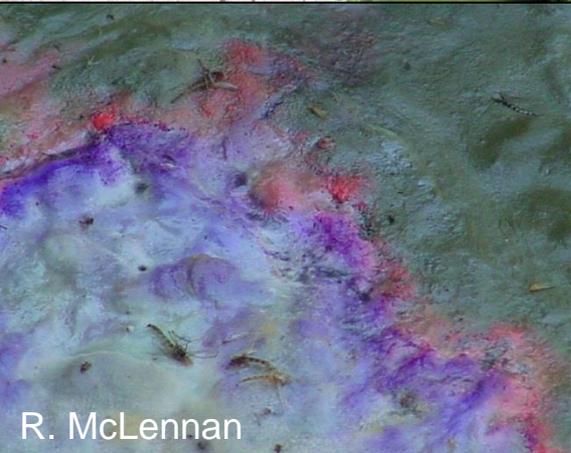
R. McLennan



N. Trombly



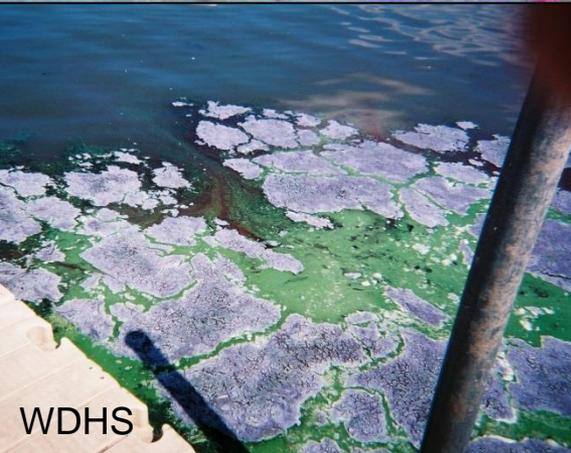
T. Moris



R. McLennan



J. Williamson



WDHS



J. Williamson

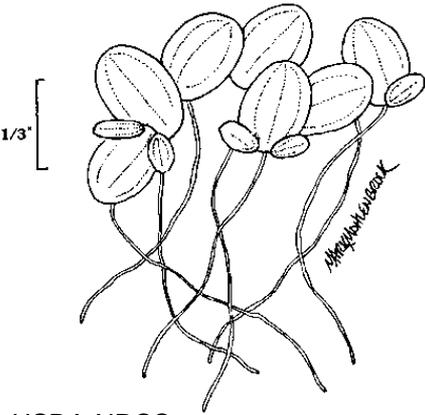


A. Dryja



Can be mistaken for duckweeds

Duckweeds (*Lemna*,
Spirodela) have roots



USDA-NRCS
PLANTS Database

Lemna, *Spirodela*, *Wolffia*



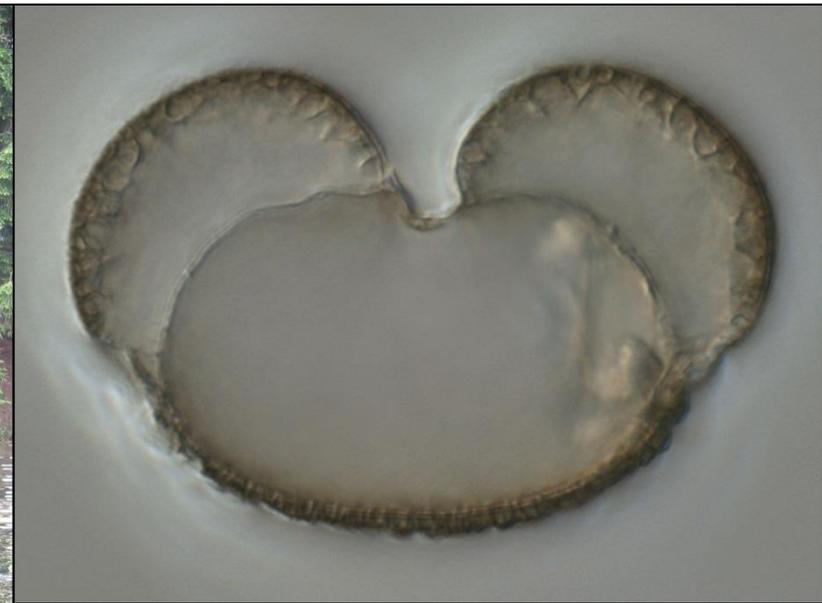
Virginia Tech Weed I.D. Guide

Watermeal (*Wolffia*)
Tiny, firm, grainy





Can be mistaken for pollen



Look for similar yellow “dust” on land

Can be mistaken for filamentous green algae

Spirogyra & relatives

slippery texture, hairlike, unbranched



Cladophora & relatives

wet cotton texture, usually branching



M. Sesing



S. Pfeiffer

Hazards of blue-green algae blooms

- They may form nuisance blooms.
- Blooms impact aquatic life.
- Some strains can make liver, cell, or nerve toxins if conditions are right.
- Toxins may irritate the skin in sensitive individuals; swallowing or inhaling them in water can cause illness.
- **Not all blue-green algae make toxins, and toxins are not made all the time.**



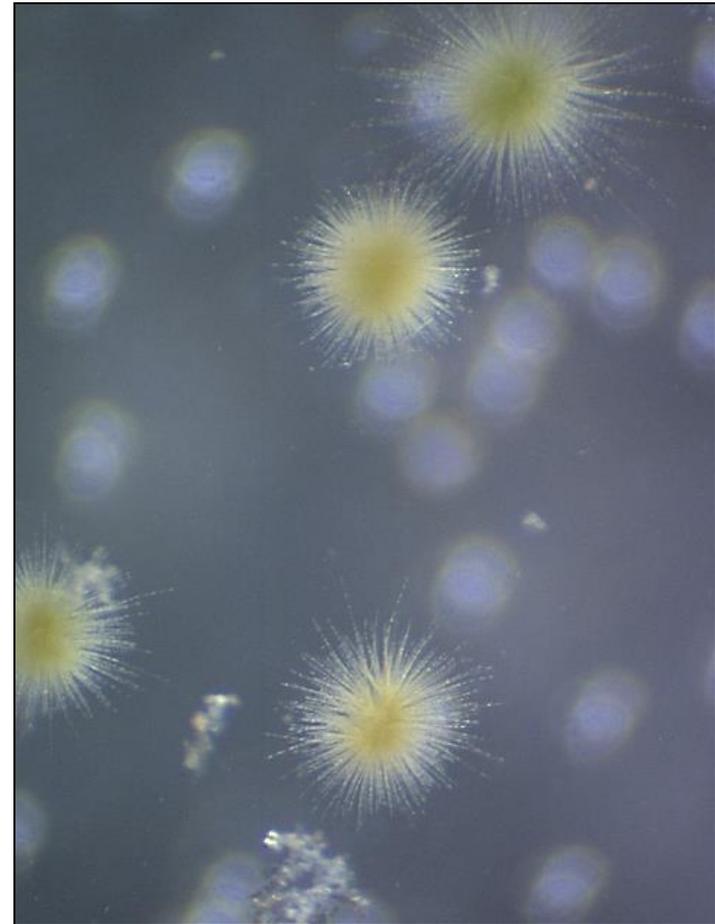
What causes harmful blooms?

- Excess nutrients are fertilizer for growth
- Primarily P, but N can be important too
- Warm water and calm weather



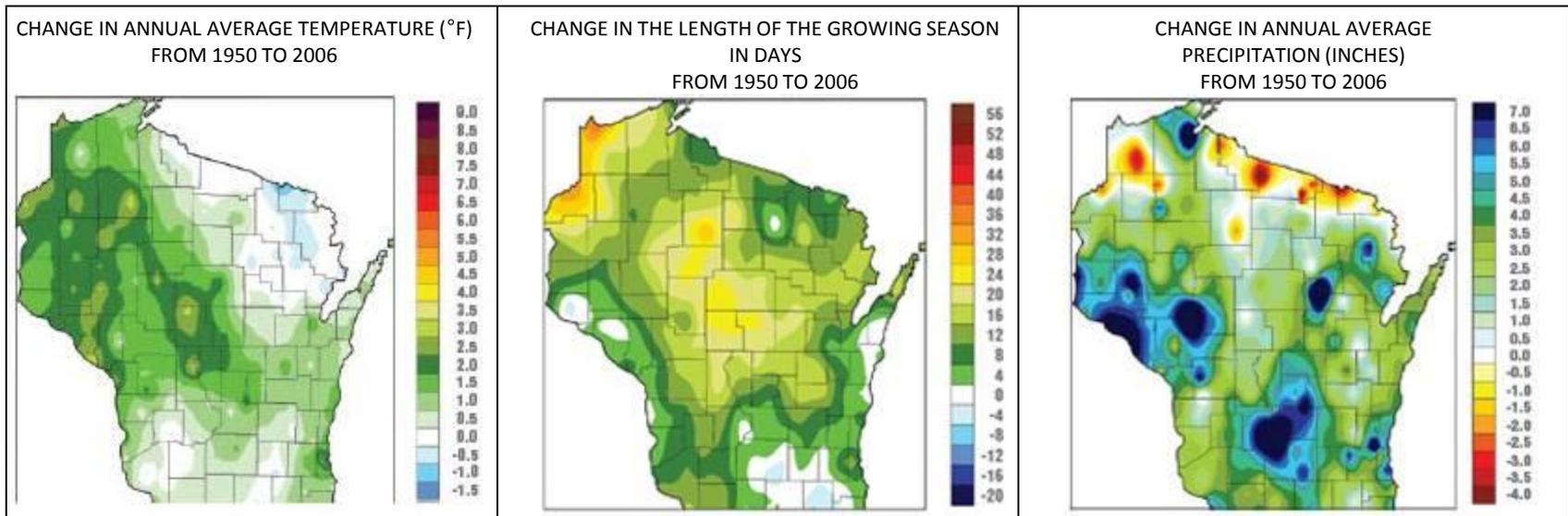
The details are more complicated...

- Species and strains
- Cell biochemistry
- Micronutrients (iron)
- Dissolved carbon
- Zebra & quagga mussels
- Nutrients & cells from lake sediments



“Favorable environmental conditions”
– Mark Vander Borgh, NCDENR

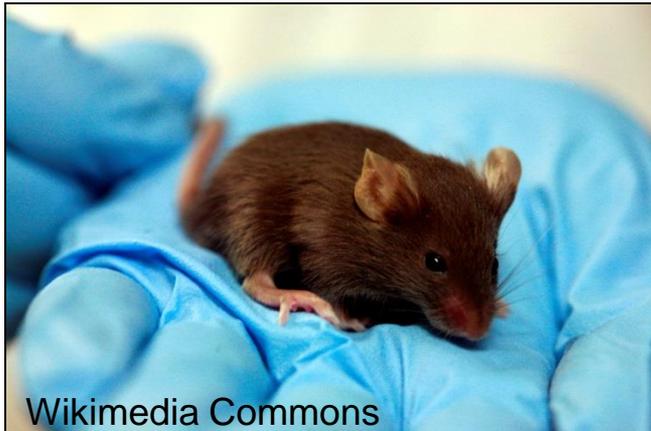
Are blooms more frequent?



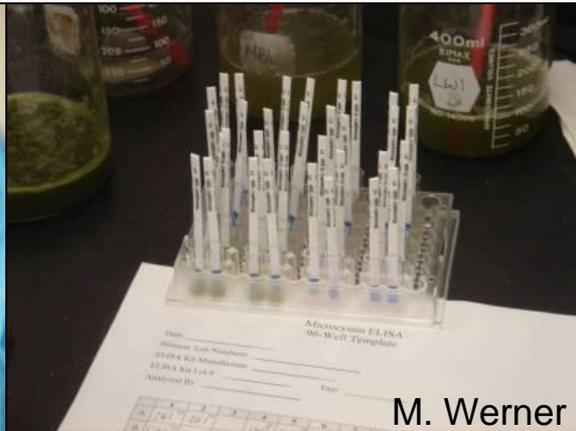
- Yes – worldwide evidence
- Heavy rains & snowmelt: extra nutrients
- Earlier warming & extended warming may lead to blooms

Are blooms more toxic?

- New technology means we continue to learn more
- Ongoing research to identify toxins and their production pathways



Wikimedia Commons



M. Werner



Agilent.com

How can we prevent blooms?

Keep nutrients out of rivers and lakes!

THE WIRE
what matters now

APR 14, 2014 11:50AM ET / POLITICS

The Main **Cyanobacteria** Question: When Do You Want to Pay For It, And How?



34

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8+1

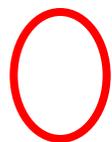
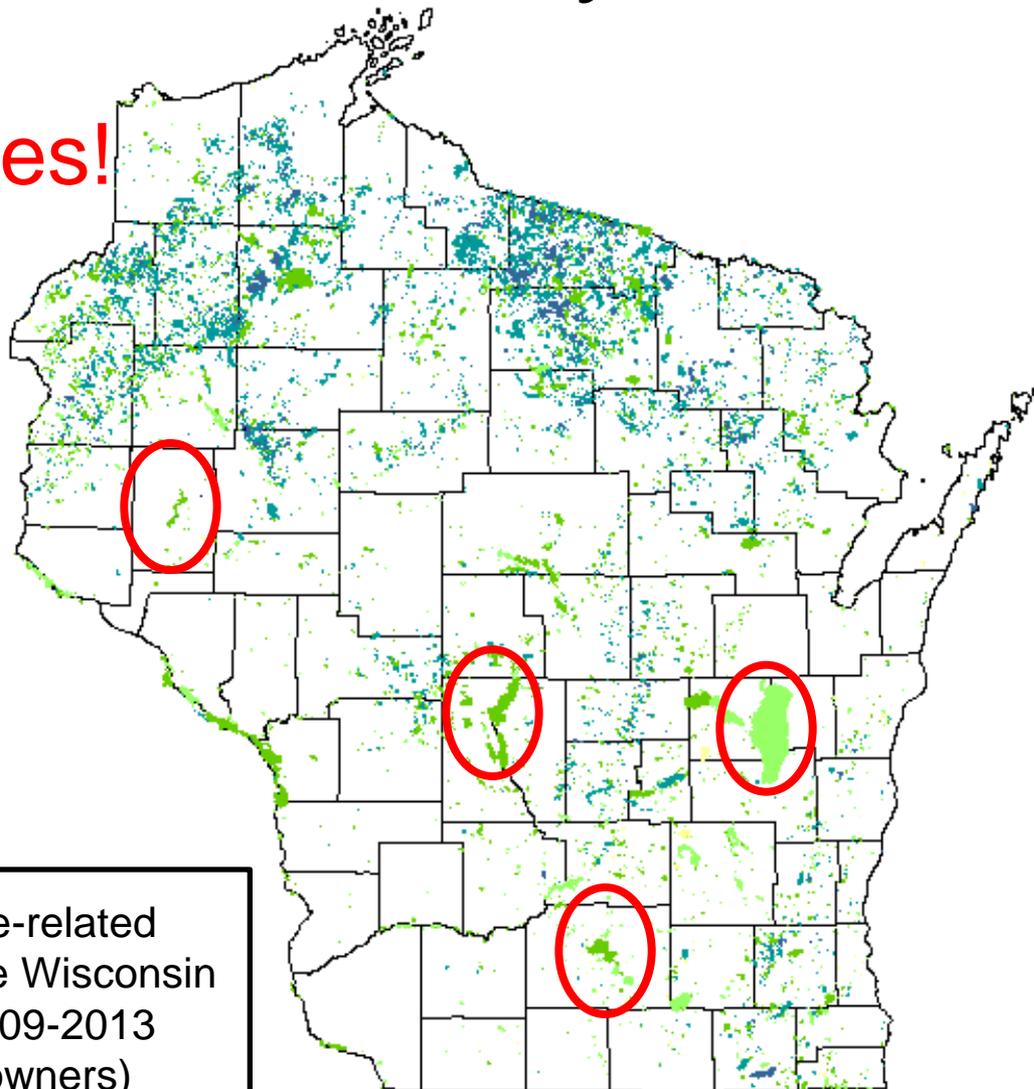
N. Trombly

What lakes have blue-green algae? Where are blooms most likely to occur?

They are in ALL lakes!

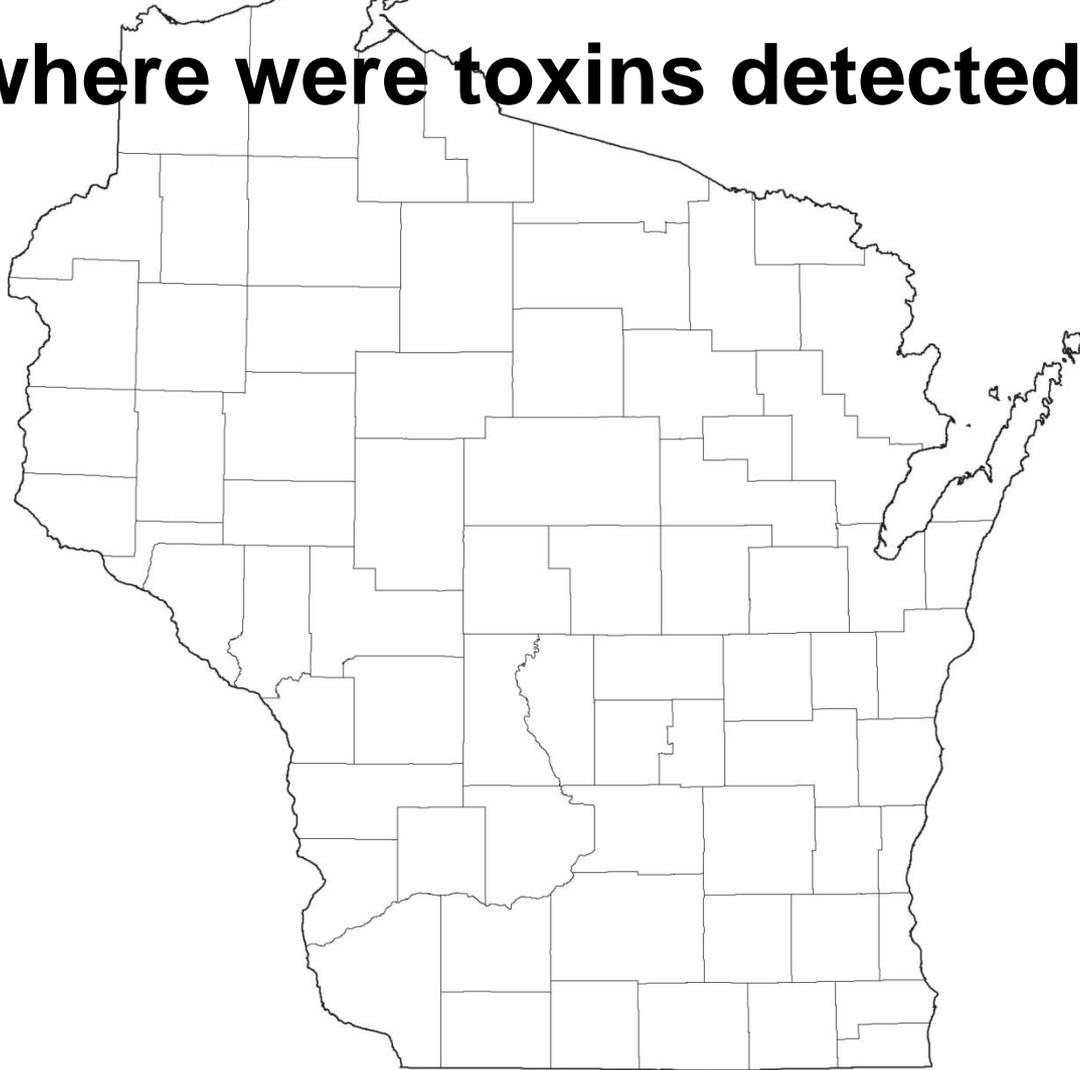
Blooms likeliest in:

- Lakes with large watersheds
- Impoundments
- Shallow lakes



Lakes with most numerous algae-related health complaints reported to the Wisconsin HAB Surveillance Program in 2009-2013 (lakes with many users & homeowners)

Historical harmful algal blooms in Wisconsin (where were toxins detected?)

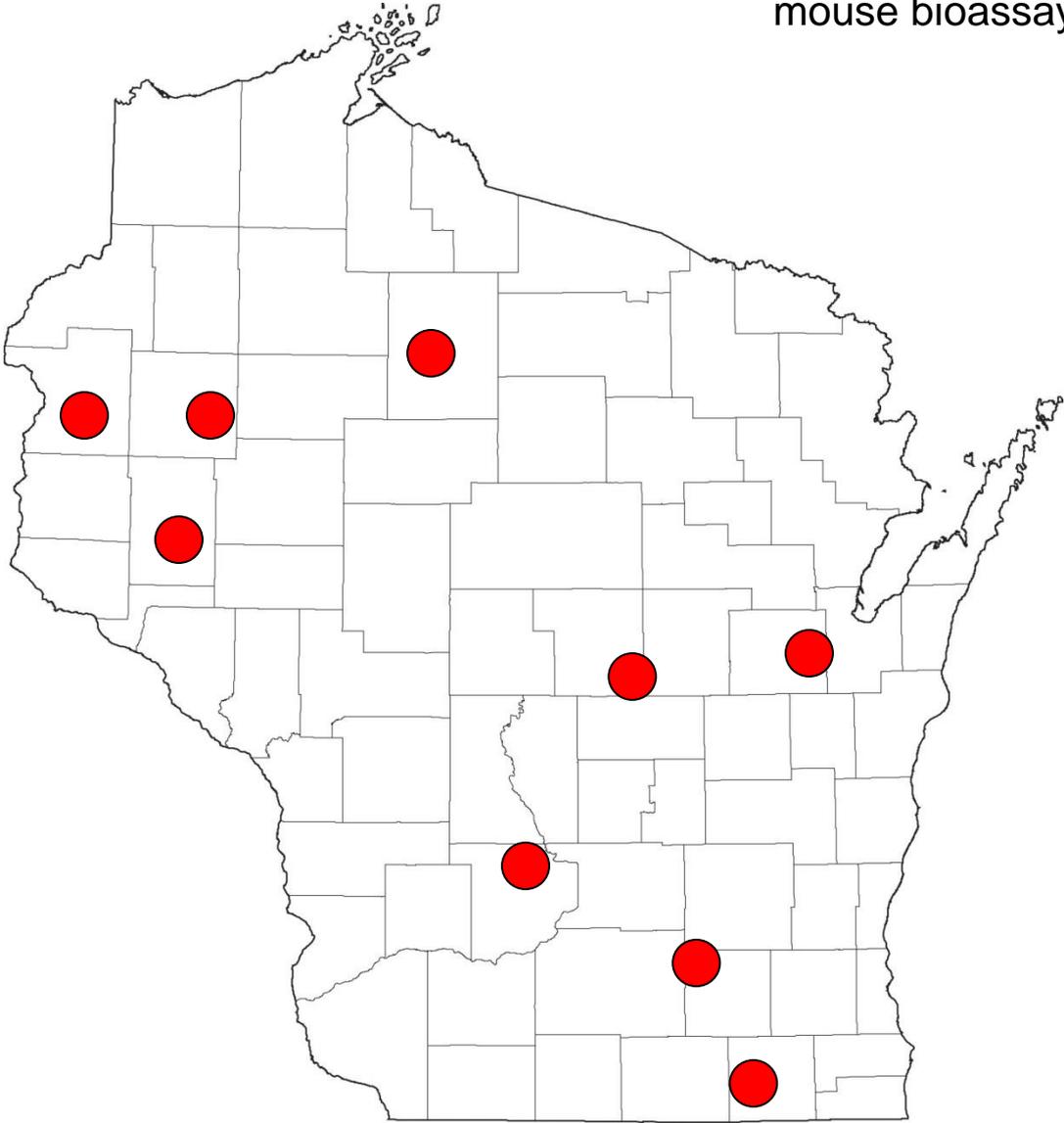


Cyanobacterial Toxins 1967-1969

Karl 1970

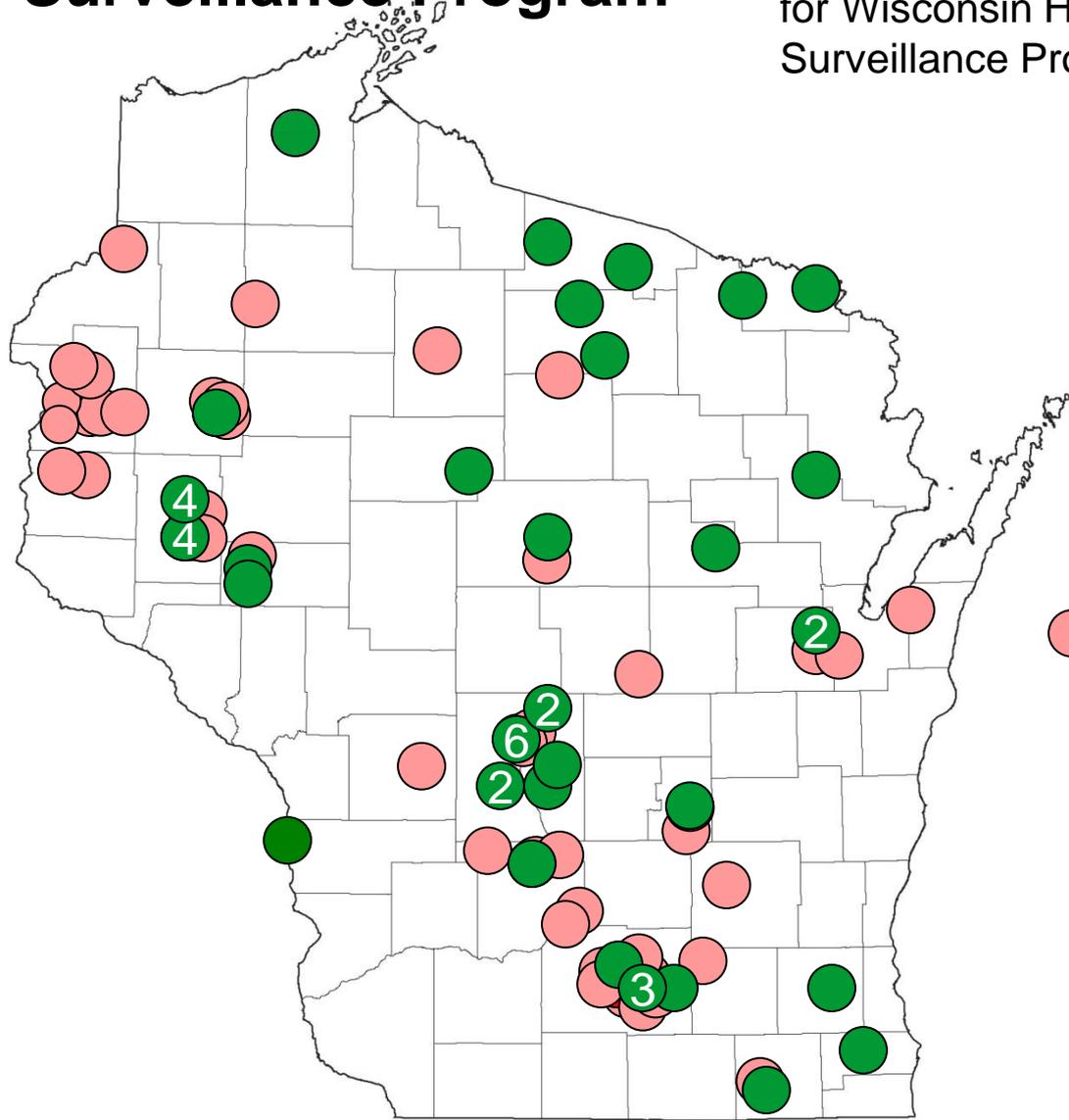
20 sites

● Toxicity determined via mouse bioassay



2009-2013 HAB Surveillance Program

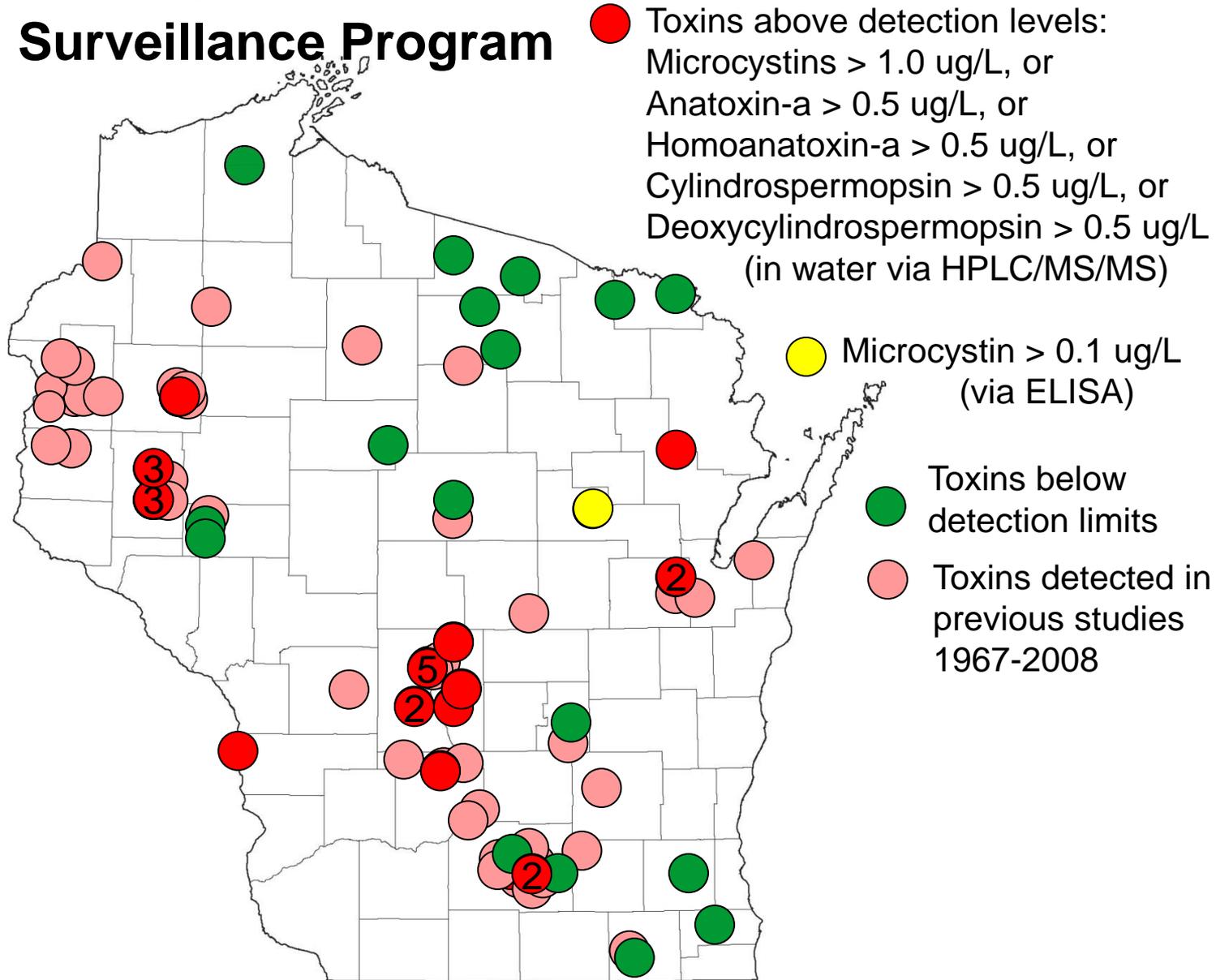
● Sites at which algae was sampled for Wisconsin Harmful Algal Bloom Surveillance Program



● Toxins detected in previous studies 1967-2008

Numbers indicate multiple sampling dates for a single water body.

2009-2013 HAB Surveillance Program



Numbers indicate multiple sampling dates for a single water body.

World Health Organization Guidelines

Probability of Adverse Health Effects	Cell Density (cells/ml)	Microcystin-LR (ug/L)	Chlorophyll (ug/L)
Low	< 20,000	< 10	< 10
Moderate	20,000-100,000	10 – 20	10 – 50
High	100,000-10,000,000	20 – 2,000	50 – 5,000
Very High	> 10,000,000	> 2,000	> 5,000

Graham *et al.* 2009, based on World Health Organization's 2003 *Guidelines for Safe Recreational Water Environments*

CAUTION

WATER QUALITY ADVISORY

This water may contain blue-green algae capable of producing toxins that can be dangerous to humans and pets.



FOR YOUR SAFETY

- If water is cloudy, looks like green paint or pea soup, or has a floating scum layer or floating clumps
 - Do not swim or swallow water
 - Do not allow pets to swim or drink
 - Do not allow children to play in scum layer from shoreline
- Rinse off after swimming

For more information please contact the
LOCAL HEALTH DEPARTMENT at () - -

31,000 cells/ml



S. Graham

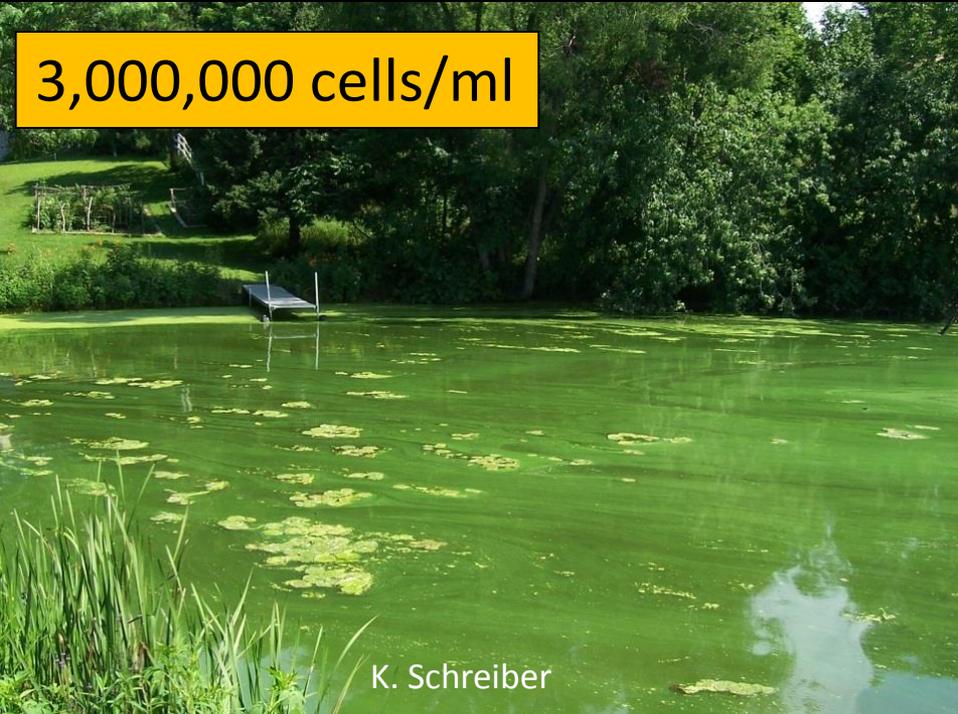
255,000 cells/ml

Cylindrospermopsis



N. Trombly

3,000,000 cells/ml



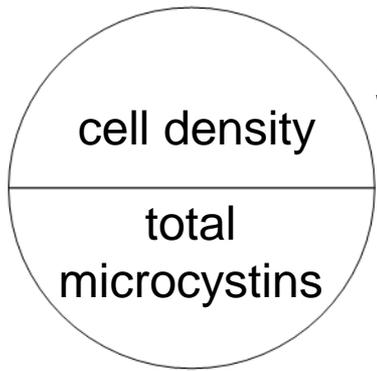
K. Schreiber

51,000,000 cells/ml



C. Fitzgibbon

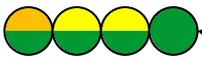
2009-2013 HAB Surveillance Program



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Graham et al. 2009, based on World Health Organization, 2003 *Guidelines for Safe Recreational Water Environments*

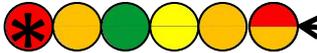
Tainter



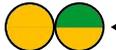
Menomin



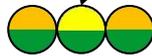
Petenwell



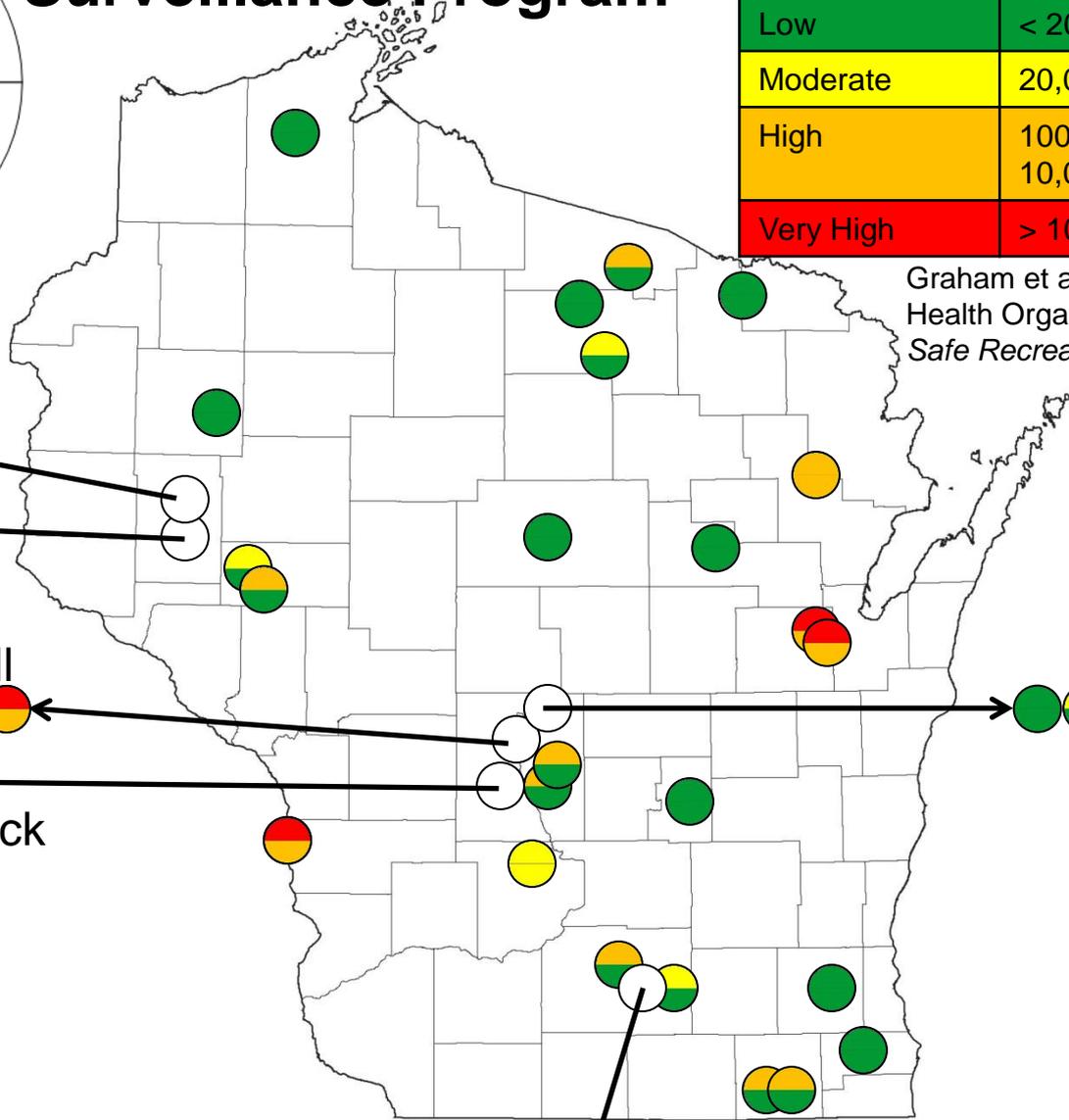
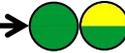
Castle Rock



Kegonsa

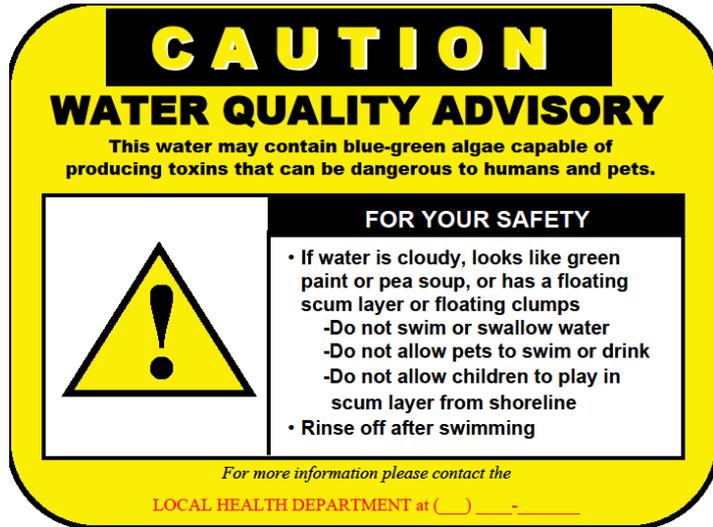


Camelot



*may not be accurate – flagged at lab

Are they toxic? Can I even go in the water?



Look for advisory signs

Posted by public health officials

Lack of posted advisory does not mean that algal blooms will not occur in that lake!

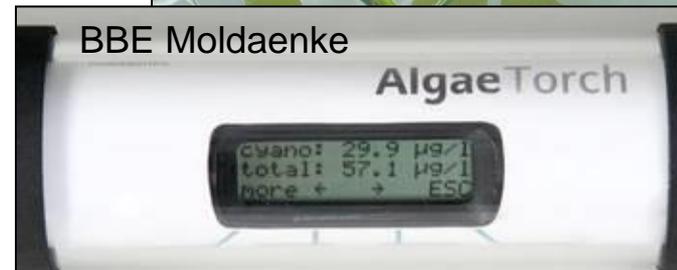
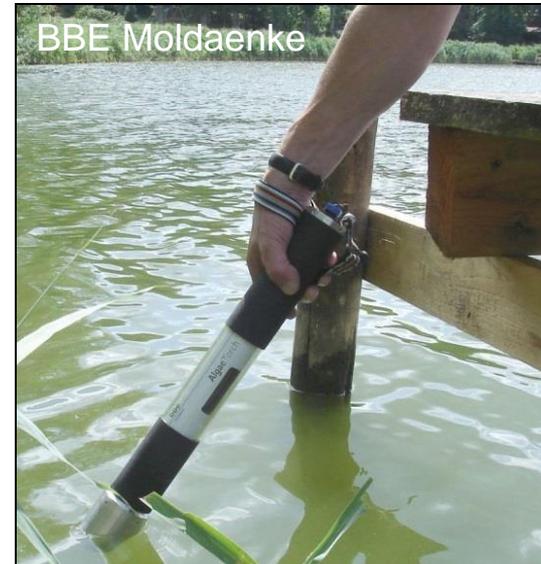


Can't we test more?

Blooms change rapidly

Results can be slow

Expensive!



<http://bit.ly/1bF5YwK>

(Does not imply endorsement by presenters, WDNR, or WDHS)

Are they toxic? Can I even go in the water?



Does the water smell?

Damp soil - beets = geosmin

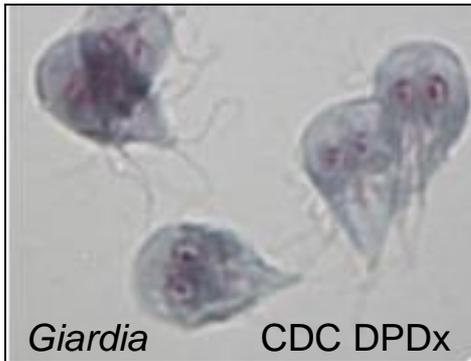
Musty-moldy-earthy = 2-methylisoborneol (MIB)

Graham et al. 2010: geosmin & MIB co-occurred with toxins <http://bit.ly/1dPjZGC>

Cyanotoxins can be present without noticeable odors

Try to avoid swallowing water,
no matter how clean it looks
(especially after a rainstorm!)

E. coli, *Giardia*, *Cryptosporidium*,
Shigella, Norovirus, other pathogens...



Do you have a lot of allergic sensitivities?
Skin exposure might affect you.

How to be safe?

- Avoid swimming in and boating through blue-green algal scums and “pea soup” water.
- **Can you see your feet in knee-deep water?** If not, avoid ingesting any water.
- Always shower after swimming in a lake, river, or pond.
- Keep pets out of scummy water, and wash them off immediately if they swim or wade in during a bloom.



K. Schreiber, WDNR



**When in doubt,
keep out!**

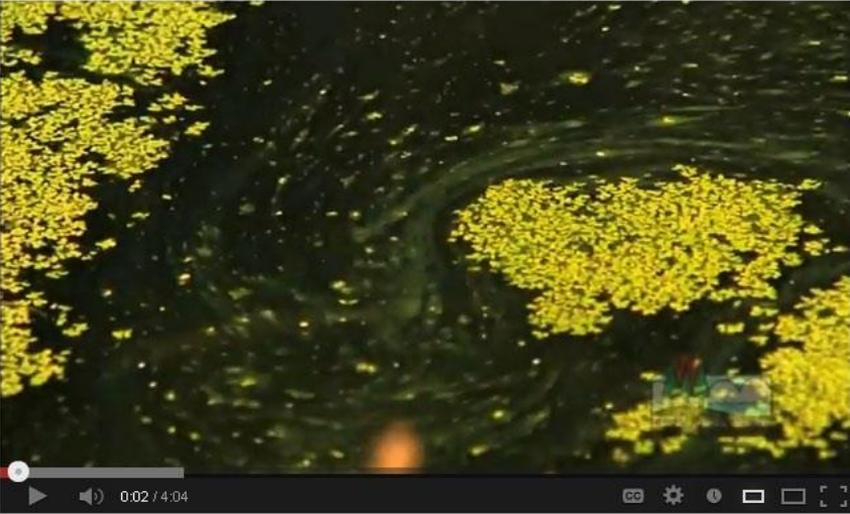
Blue-green algae - YouTube - Windows Internet Explorer

http://www.youtube.com/watch?v=CGG50pFBEl8&feature=player_embedded

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Blue-green algae

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Blue-Green Algae

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Wisconsin's Harmful Algal Blooms Program

Wisconsin's Harmful Algal Blooms program collects information about human and animal illness and death resulting from exposure to blue-green algae. Tracking illness information will help the Wisconsin Division of Public Health measure the problem of blue-green algae in our lakes and rivers.

If you get sick after swimming in a Wisconsin lake or river, please [report possible algae-related illness](#). This program does not provide medical treatment, so if you are experiencing severe symptoms seek medical attention immediately.

When in doubt, best keep out!



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Last revised: March 03, 2011

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Protecting and promoting the health and safety of the people of Wisconsin
The Official Internet site of the Wisconsin Department of Health Services

<http://dnr.wi.gov/lakes/bluegreenalgae>

<http://www.dhs.wisconsin.gov/eh/bluegreenalgae/>