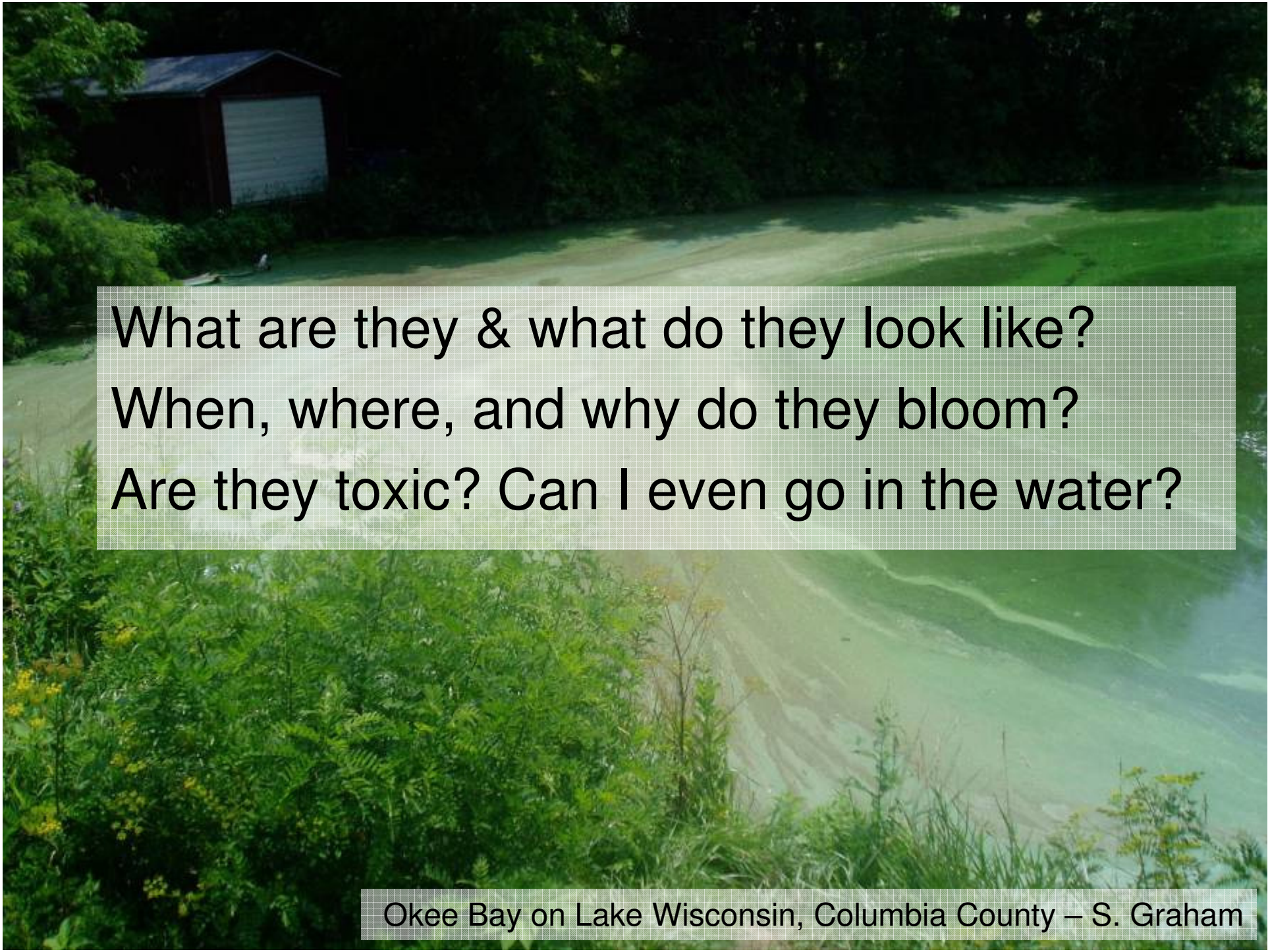
Blue-Green Algal Blooms in Wisconsin: Their Identification and Ecology

Lake Wisconsin Alliance
July 9, 2015

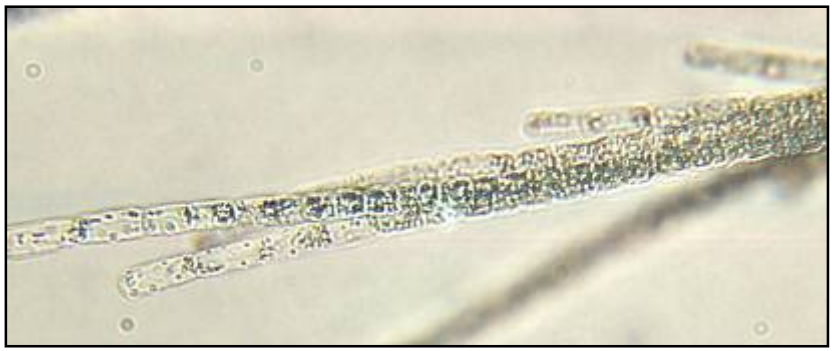
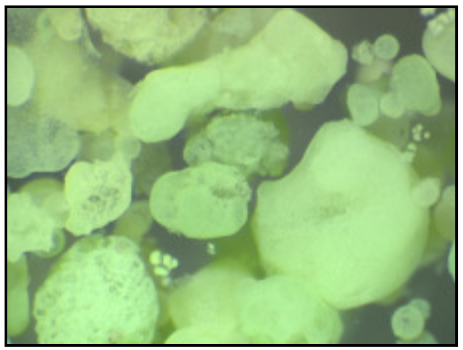
Gina LaLiberte
Wisconsin Department of Natural Resources

Gina.LaLiberte@wisconsin.gov


What are they & what do they look like?
When, where, and why do they bloom?
Are they toxic? Can I even go in the water?
Okee Bay on Lake Wisconsin, Columbia County – S. Graham

Blue-green algae are different from true algae

- Photosynthetic bacteria (cyanobacteria)
- Native to every lake & river in Wisconsin
- Buoyancy: they regulate depth in water
- Temperatures: they like it hot
- Toxins: produced by some species. Not all blue-green algae make toxins, and toxins are not made all the time.

“Blue-green” is misleading

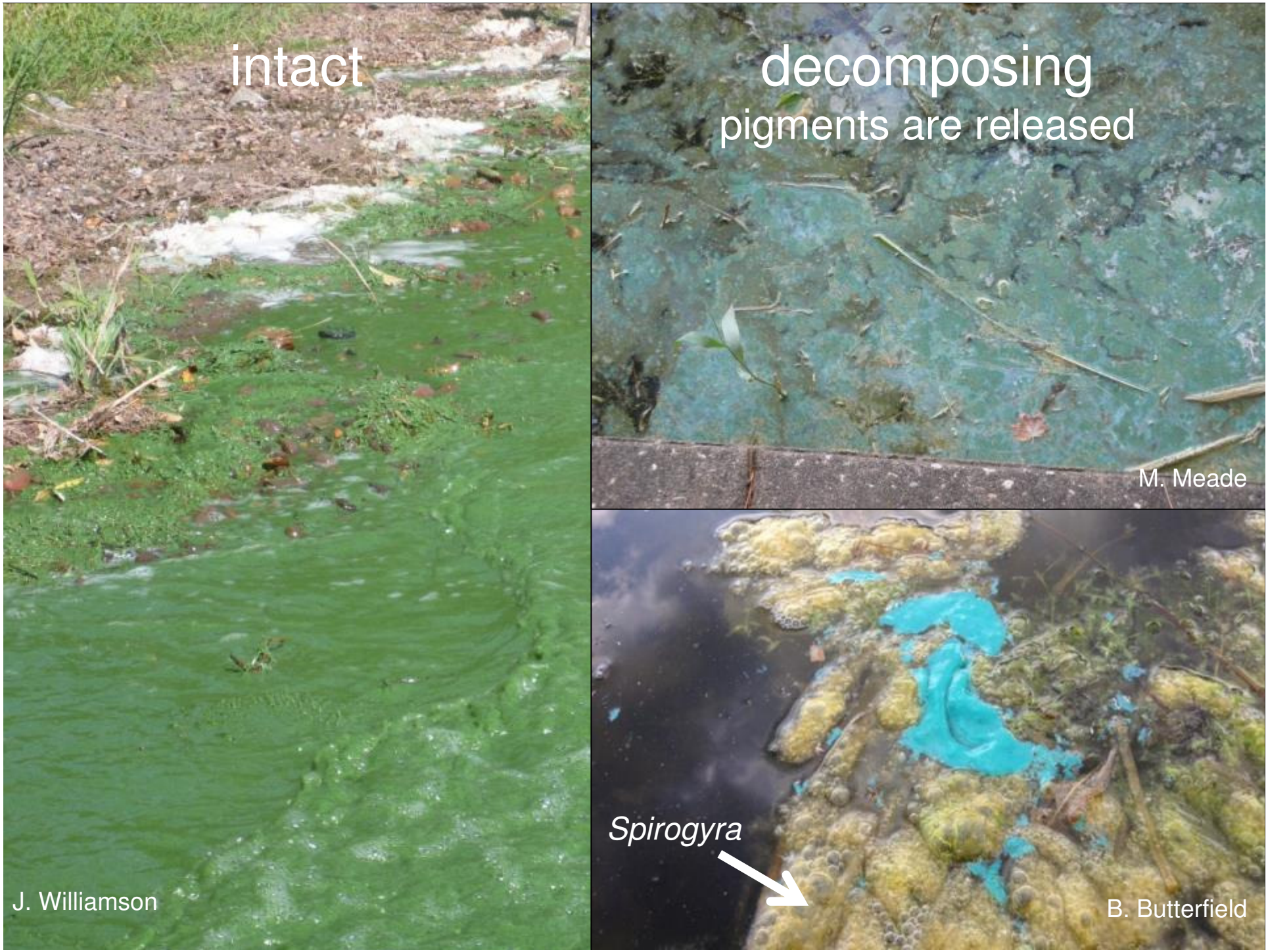
J. Williamson

N. Trombly

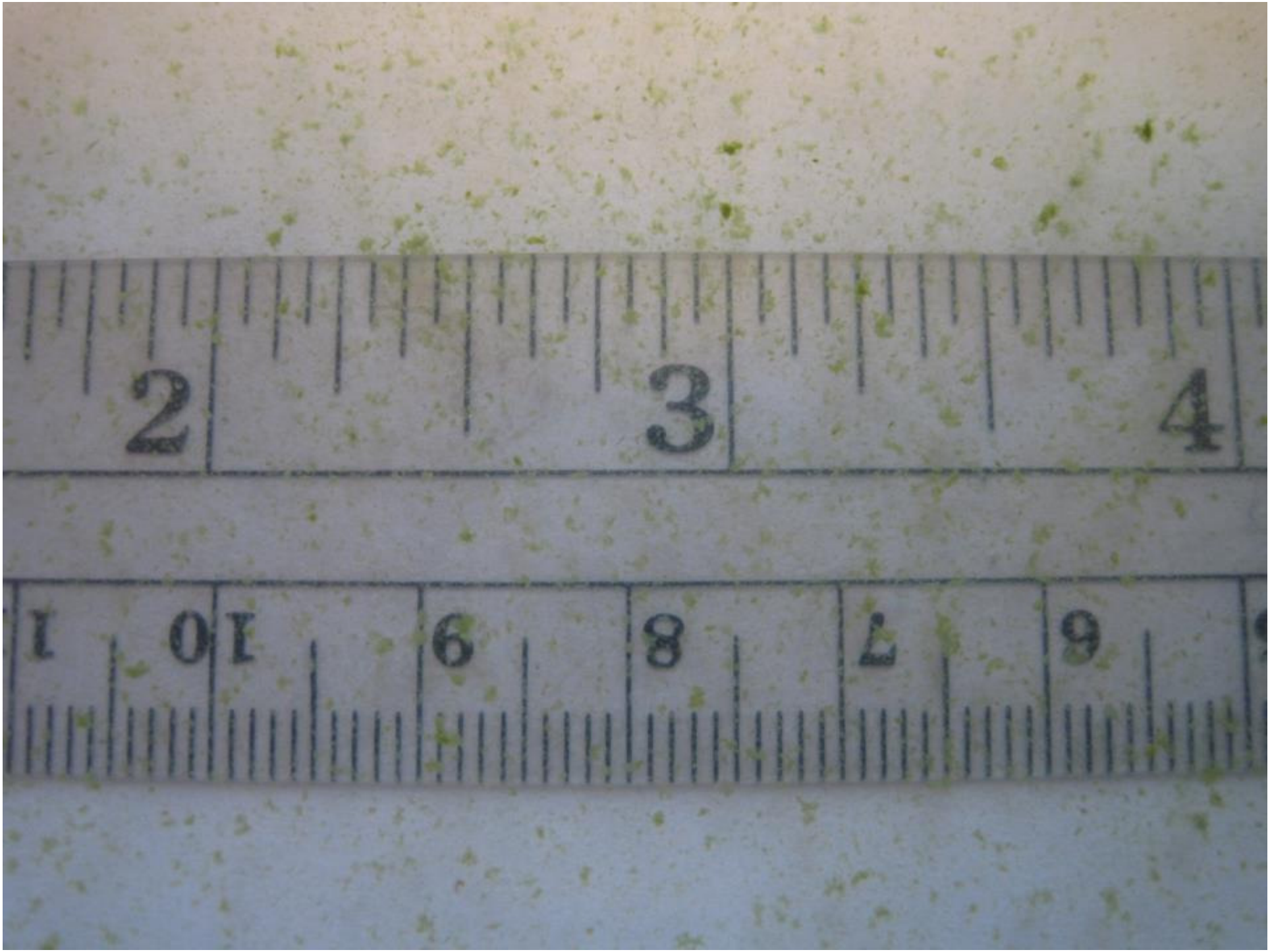
S. Greb

E. Heath

Intact blooms are most often green in color.


intact
J. Williamson
decomposing
pigments are released
M. Meade
Spirogyra
B. Butterfield

R. McLennan
N. Trombly
J. Williamson
T. Moris
R. McLennan
WDHS
J. Williamson
A. Dryja


2
3
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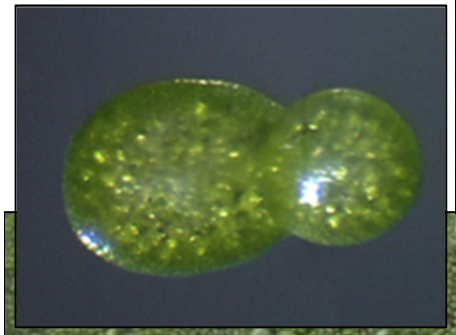
9

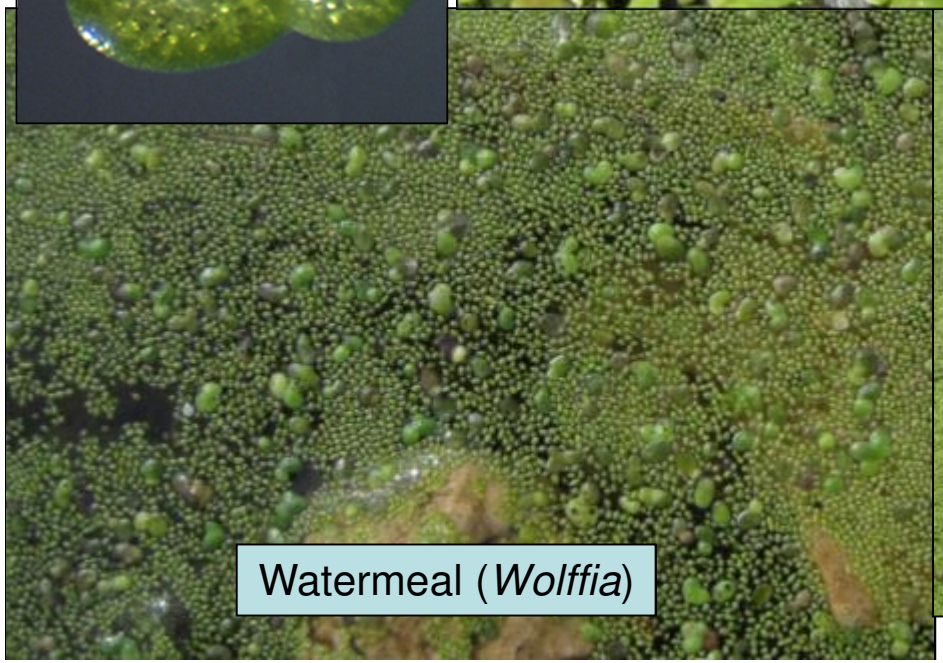
Can be mistaken for duckweeds

Duckweeds (*Lemna*, *Spirodela*) have roots

Watermeal (*Wolffia*) is tiny, firm, and grainy in texture. *Wolffia* are oval or doubled ovals in shape.

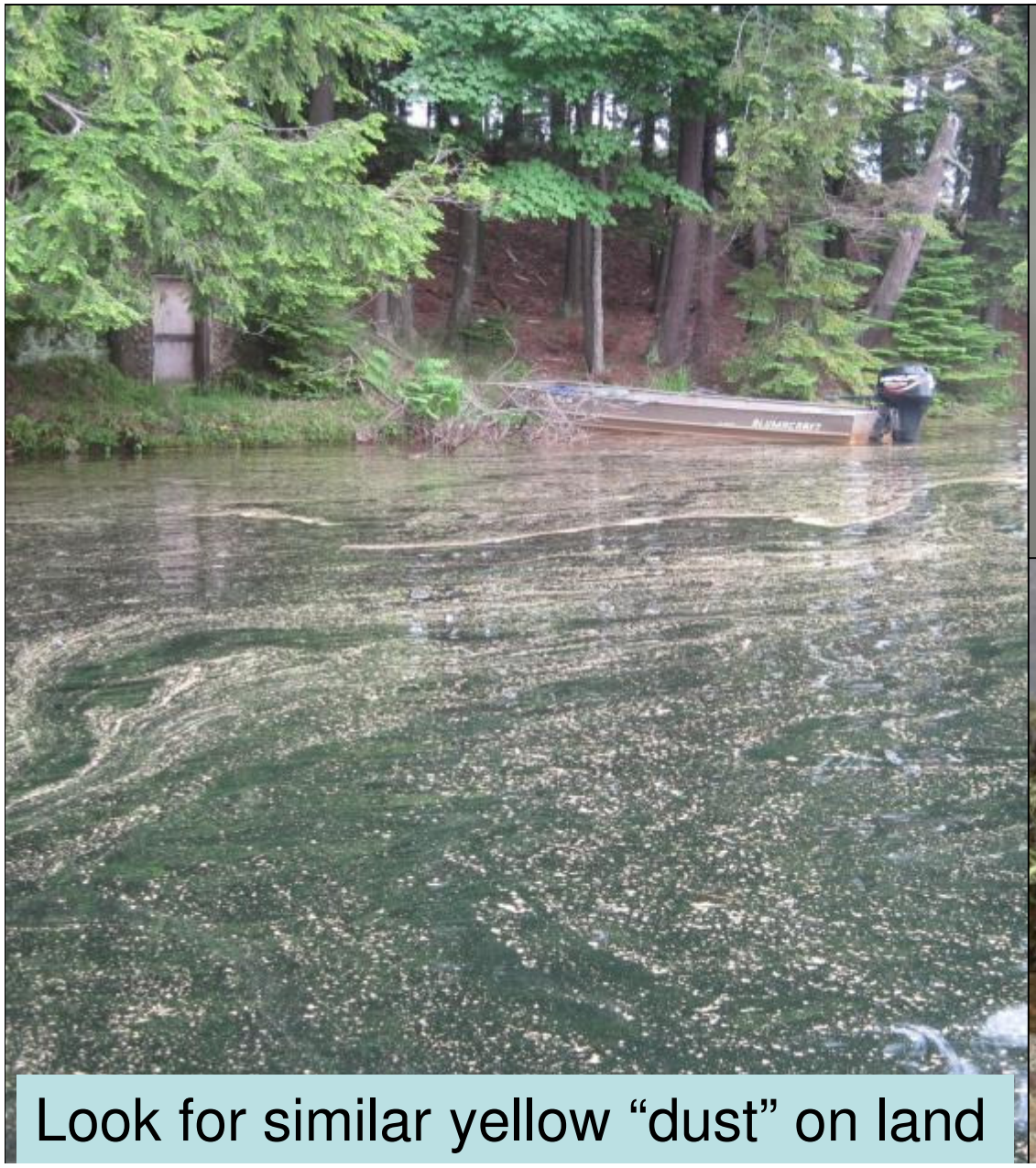


Lemna, *Spirodela*, *Wolffia*



Watermeal (*Wolffia*)

Can be mistaken for pollen



Look for similar yellow “dust” on land

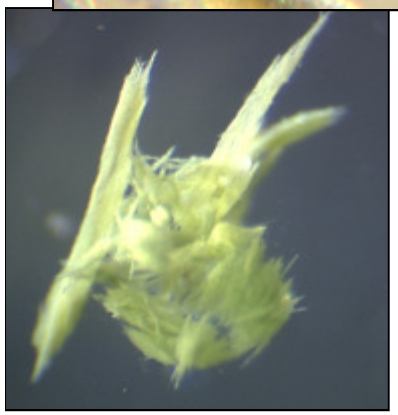
Can be mistaken for filamentous green algae

Filamentous green algae are long and hair-like.

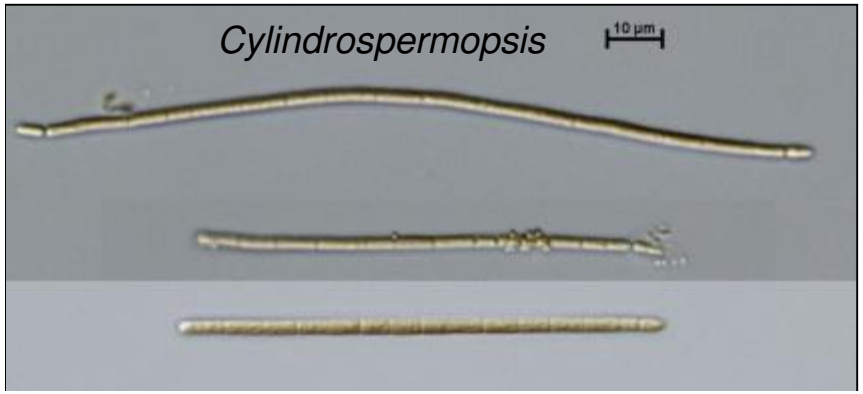
Planktonic blue-green algae

Aphanizomenon

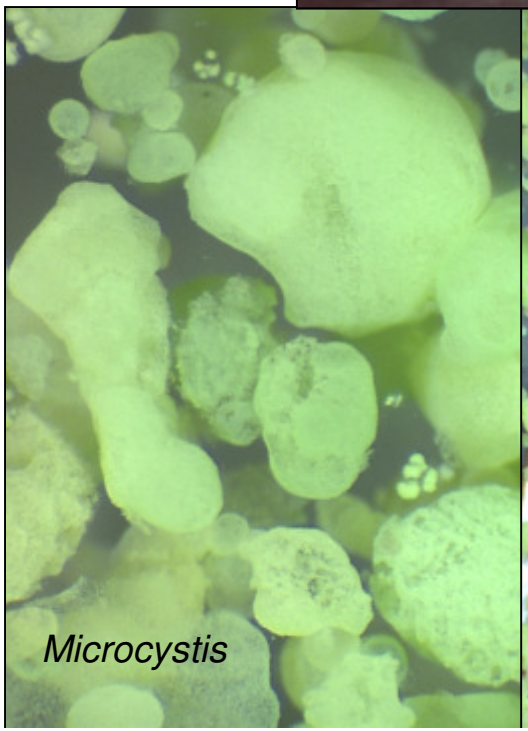
Gloeotrichia

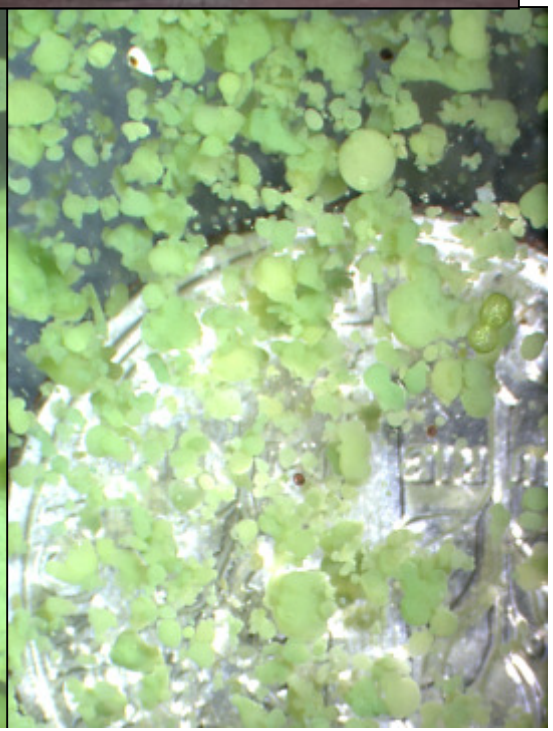


Anabaena

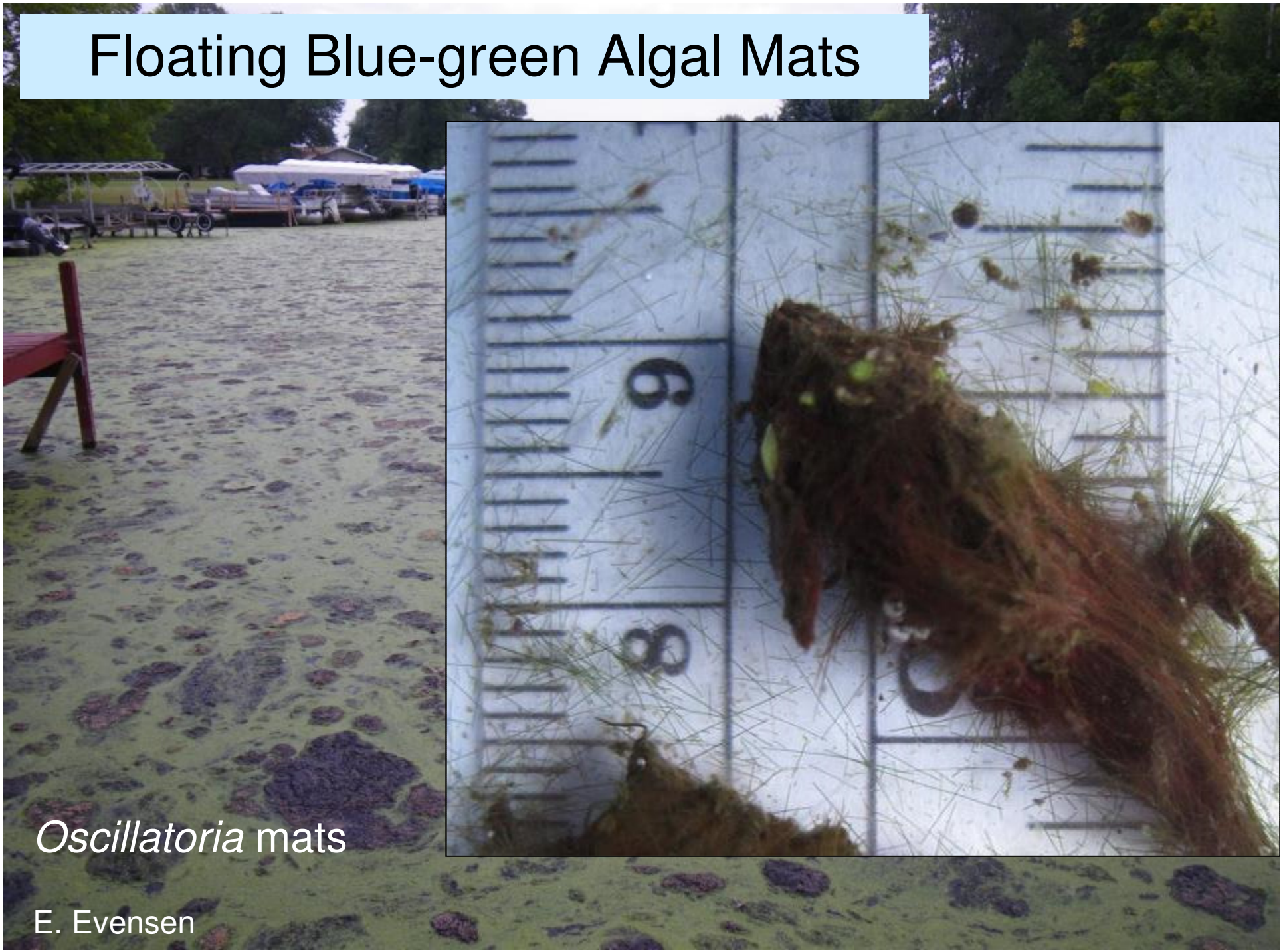


Cylindrospermopsis


Microcystis



Floating Blue-green Algal Mats



Oscillatoria mats

E. Evensen

What causes harmful blooms?

- Excess nutrients are fertilizer for growth of plants and algae
- Primarily P, but N is important too
- Warm water and calm weather

M. Meade

WDNR

The details are more complicated…

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

"Favorable environmental conditions"
– Mark Vander Borgh, NCDENR

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

Blooms likeliest in:

- Lakes with large watersheds
- Shallow lakes
- Impoundments

They are in ALL lakes!

Management & Monitoring Challenges

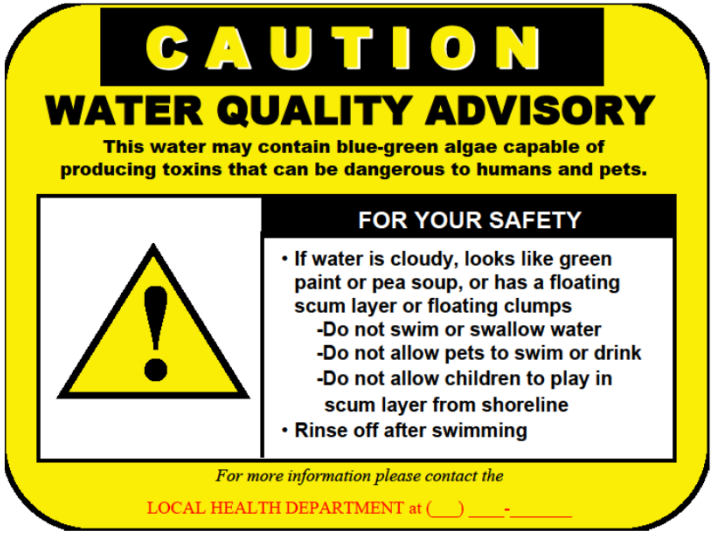
- Grow better in high water temperatures
- Store phosphorus for later use
- Nitrogen fixation in some species
- Blooms are dynamic in space & time

Lake Monona, Dane County. June 2, 2015. Sites 4.5 km (2.8 miles) apart.

World Health Organization Guidelines

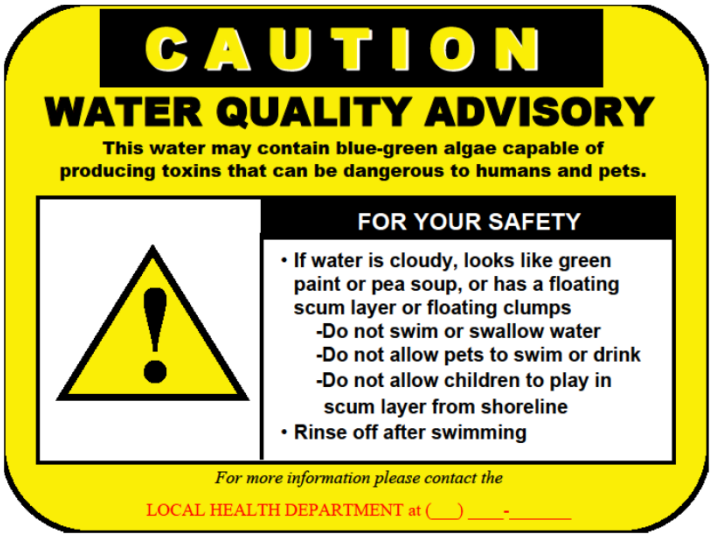
Probability of Adverse Health Effects	Cell Density (cells/ml)	Microcystin-LR (ug/L)	Chlorophyll (ug/L)
Low	< 20,000	< 10	< 10
Moderate	20,000-100,000	10 – 20	10 – 50
High	100,000-10,000,000	20 – 2,000	50 – 5,000
Very High	> 10,000,000	> 2,000	> 5,000

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



31,000 cells/ml
S. Graham
255,000 cells/ml
N. Trombly
3,000,000 cells/ml
K. Schreiber
51,000,000 cells/ml
C. Fitzgibbon

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



Look for advisory signs

Posted by public health officials

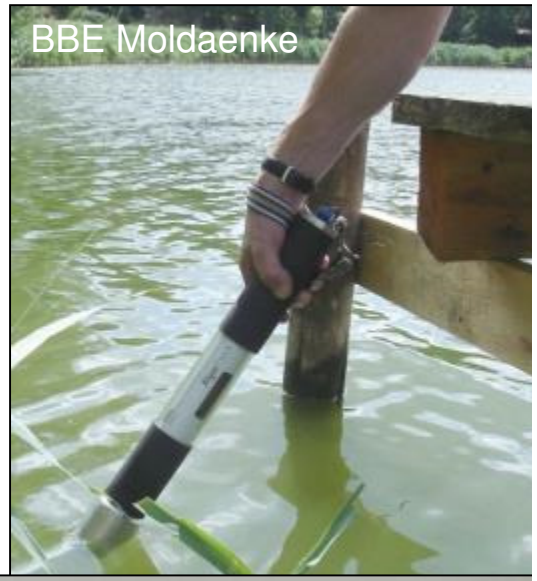
Lack of posted advisory does not mean that algal blooms will not occur in that lake!

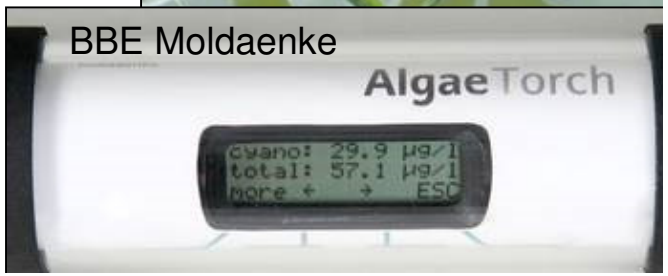
Can't we test more?

Blooms change rapidly

Results can be slow

Expensive!





http://bit.ly/1bF5YwK

(Does not imply endorsement by WDNR or WDHS)

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

How does the water look?

Can you see your feet in knee-deep water?

Milkshake, pea soup, or paint?

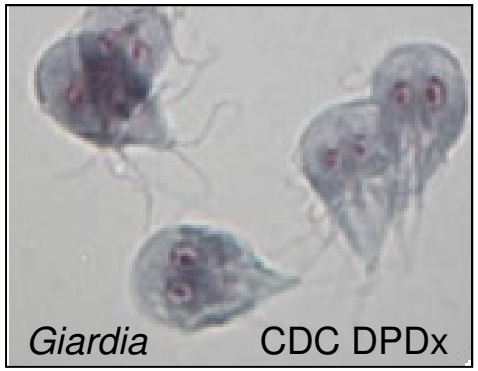
Do you have a lot of allergic sensitivities?
Skin exposure might affect you.

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

Does the water smell?

Geosmin, 2-methylisoborneol (MIB) – earthy, musty odors
Graham et al. 2010: geosmin & MIB co-occurred with toxins http://bit.ly/1dPjZGC

Cyanotoxins can still be present without odors



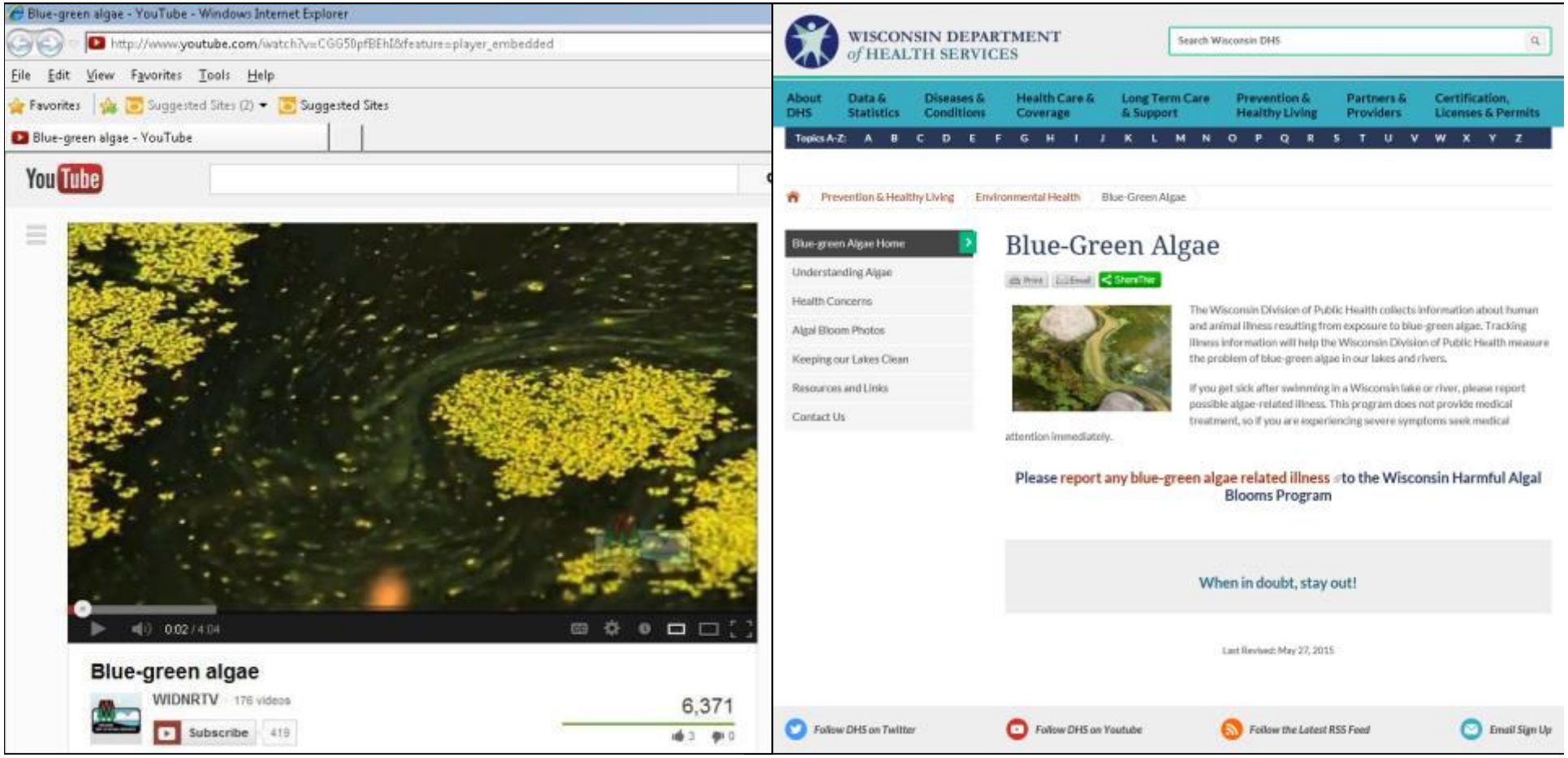
Try to avoid swallowing water, no matter how clean it looks (especially after a rainstorm!)

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

How to be safe?

- **Can you see your feet in knee-deep water?** If not, avoid ingesting any water; keep kids & pets out!
- Avoid swimming in and boating through blue-green algal scums and “pea soup” 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 water with lots of algae.

K. Schreiber, WDNR



dnr.wi.gov and dhs.wisconsin.gov
Search for “algae”