Introduction to Cyanobacteria: Identification, Ecology, Health Effects, and Tracking

Wisconsin Waters 2020:
Focusing on Resilient Lakes & Rivers

Gina LaLiberte
Wisconsin Department of Natural Resources

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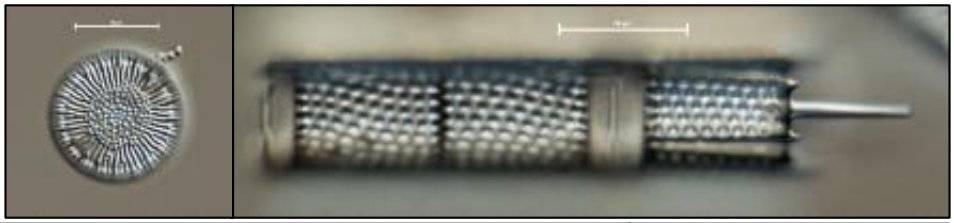
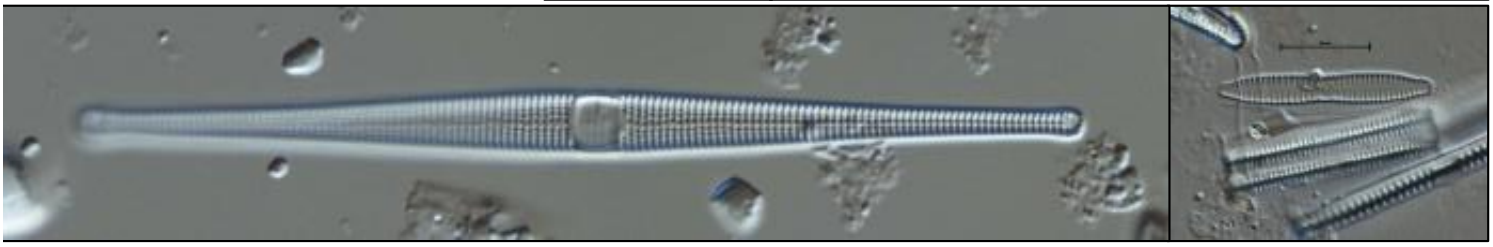
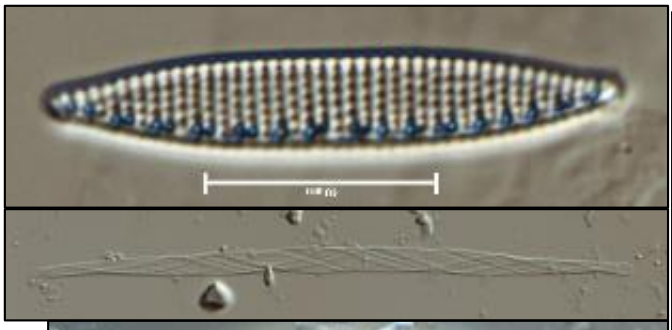
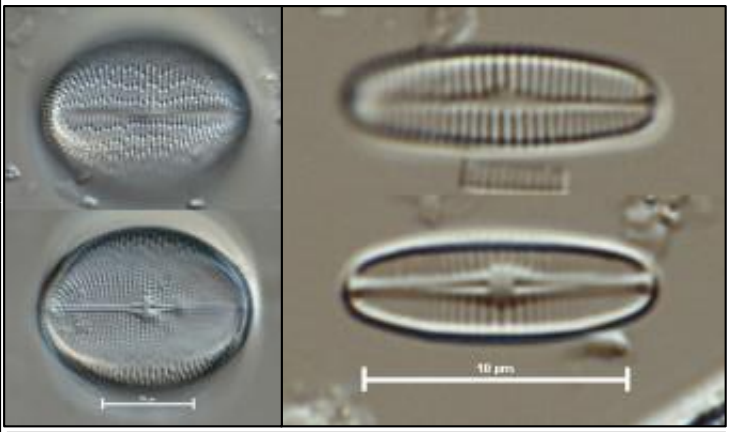
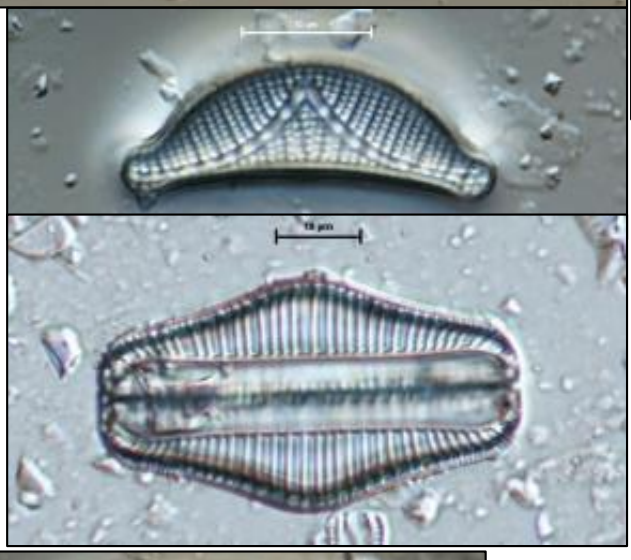
All photos by Gina LaLiberte unless otherwise attributed.

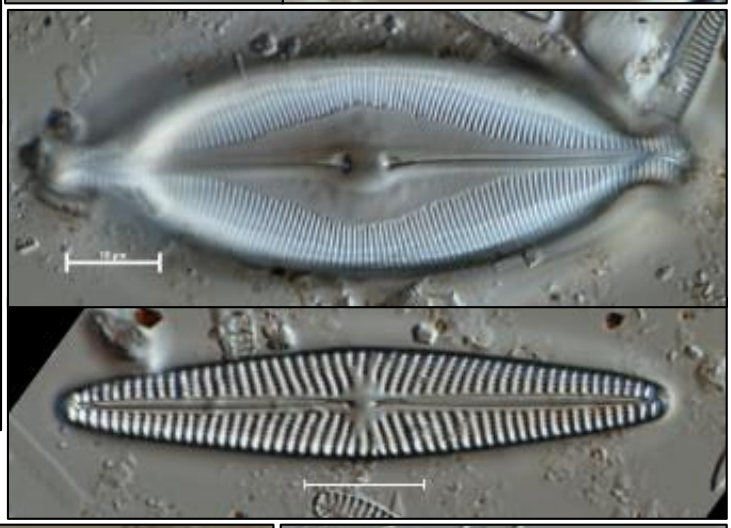


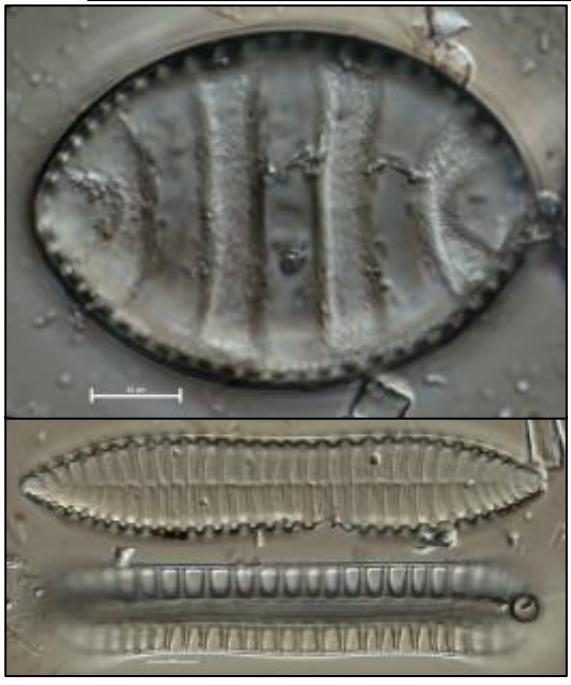


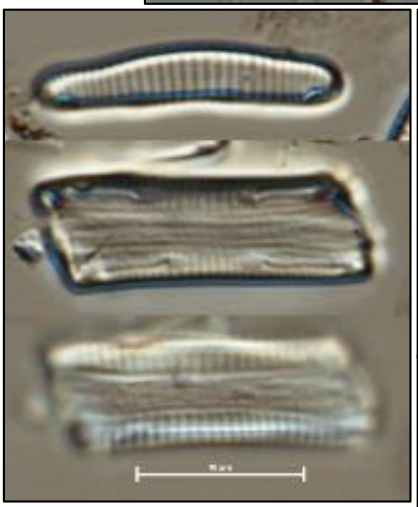


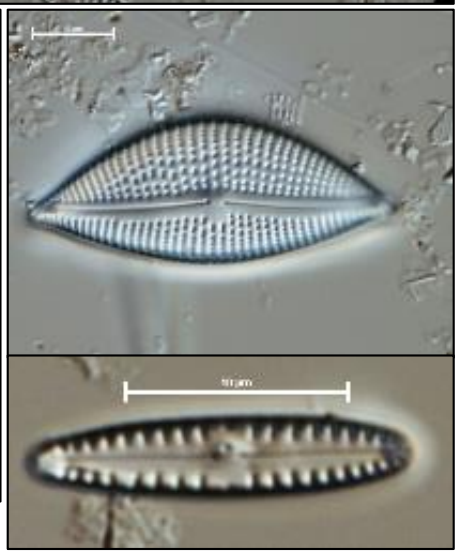










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Workshop Agenda

- Resources
- Cyanobacteria identification basics
- Algae identification basics
- Cyanobacteria health impacts & recreational guidelines

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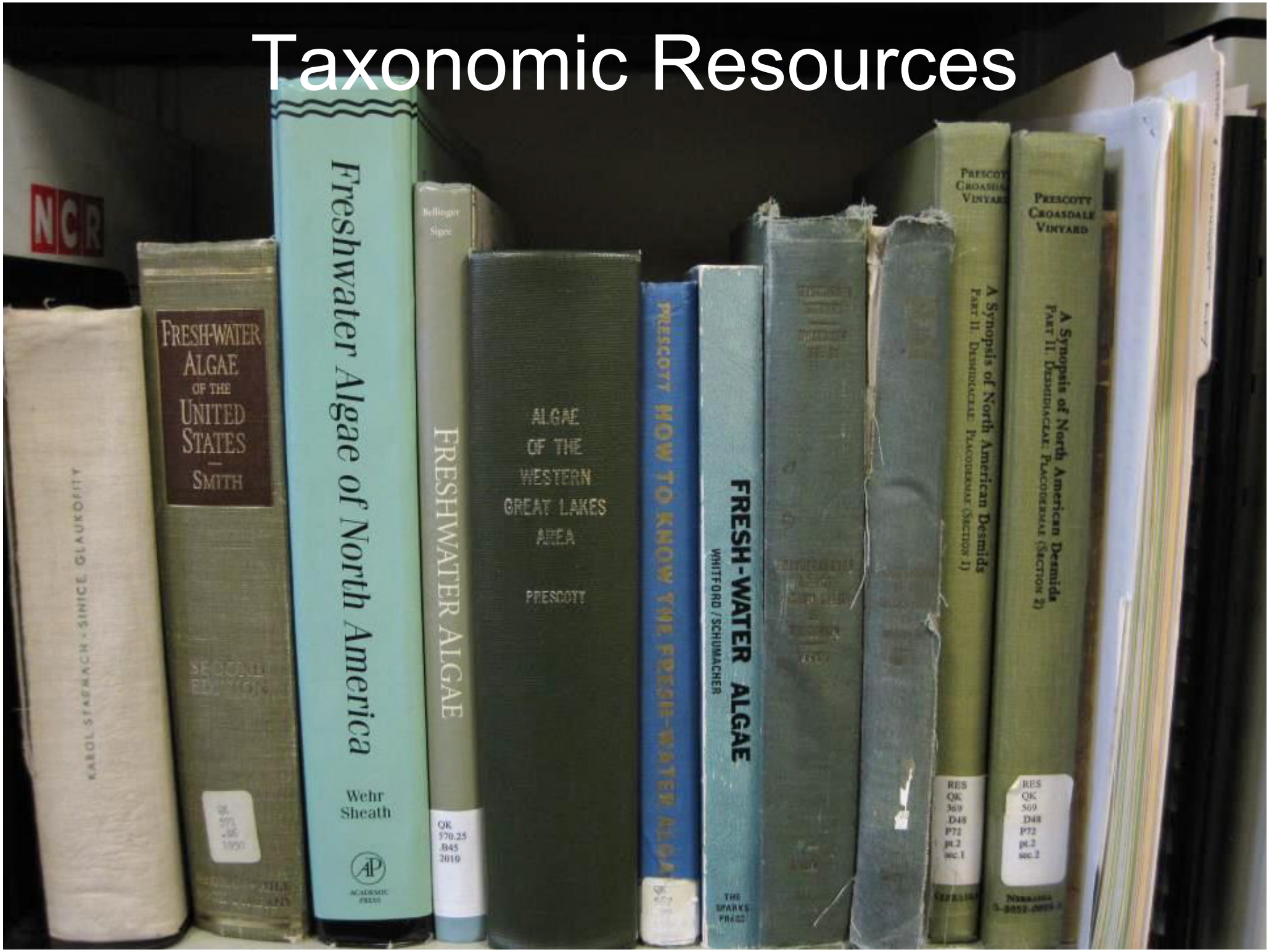
Taxonomic Resources



How To Know

THE FRESH-WATER ALGAE

An illustrated key for identifying the more common Fresh-water Algae to genus, with hundreds of species named and pictured and with numerous aids for their study.

by

G. W. PRESCOTT, Ph.D.
Professor of Botany
Michigan State University

Pictured Key Nature Series

WM. C. BROWN COMPANY
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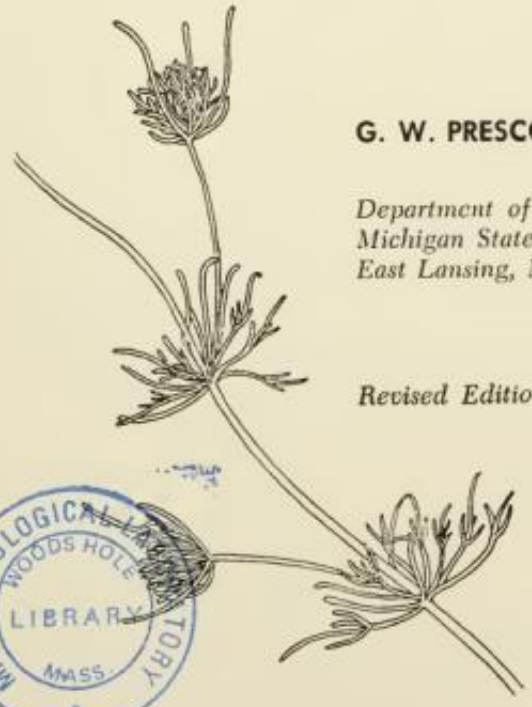
ALGAE

OF THE WESTERN GREAT LAKES AREA

With an Illustrated Key to the Genera of Desmids and Freshwater Diatoms



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Revised Edition

WM. C. BROWN COMPANY PUBLISHERS
Dubuque, Iowa

Freshwater Algae

Identification, Enumeration and Use as Bioindicators

Second Edition

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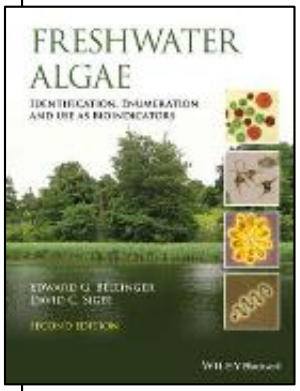
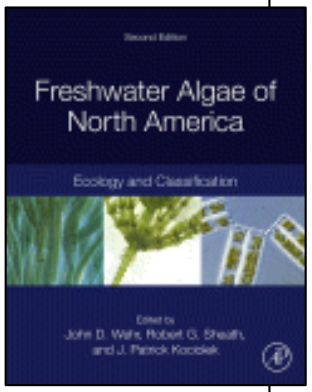


WILEY Blackwell

Freshwater Algae of North America

Ecology and Classification



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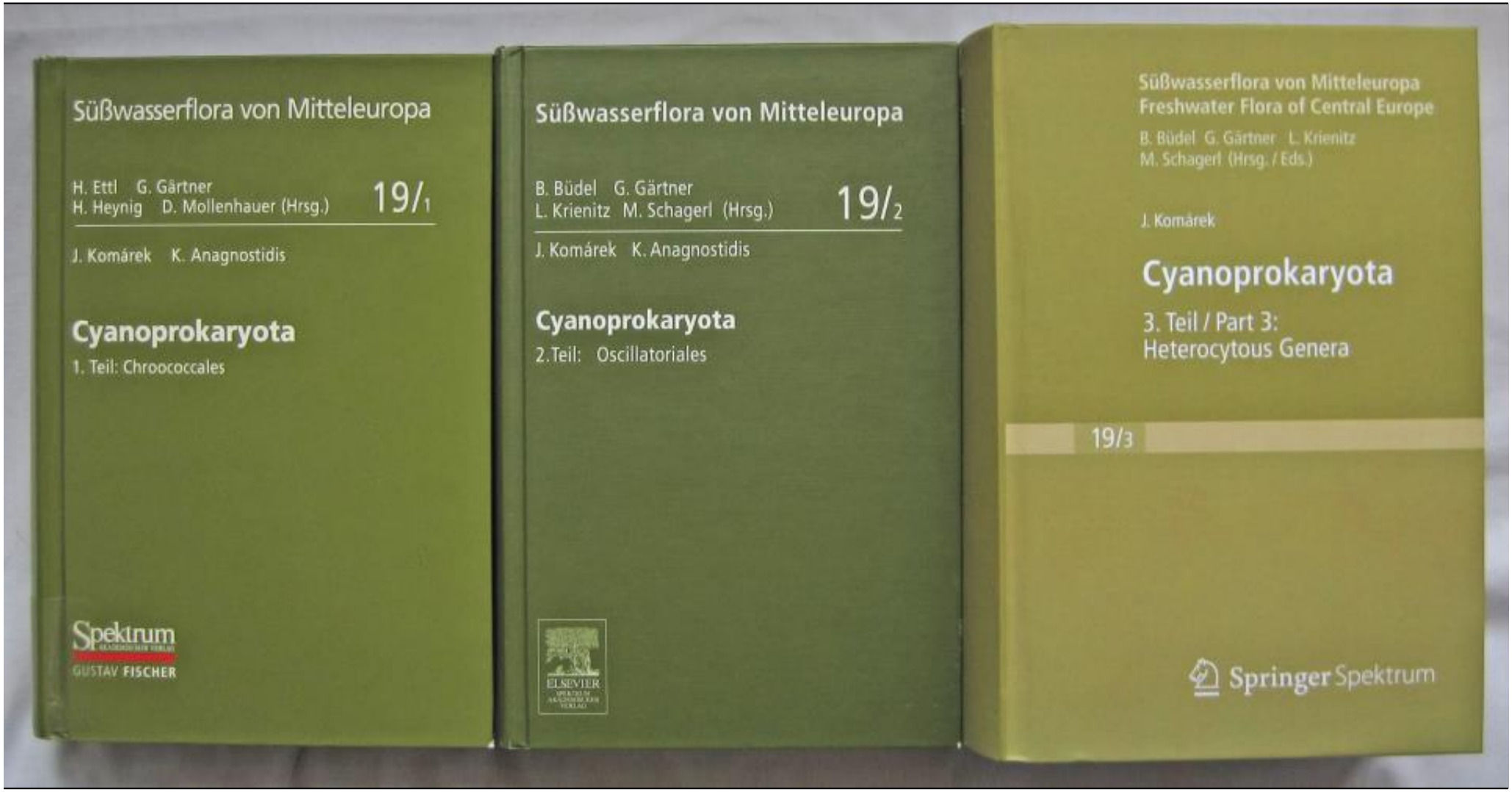
USGS
science for a changing world

Field and Laboratory Guide to Freshwater Cyanobacteria Harmful Algal Blooms for Native American and Alaska Native Communities

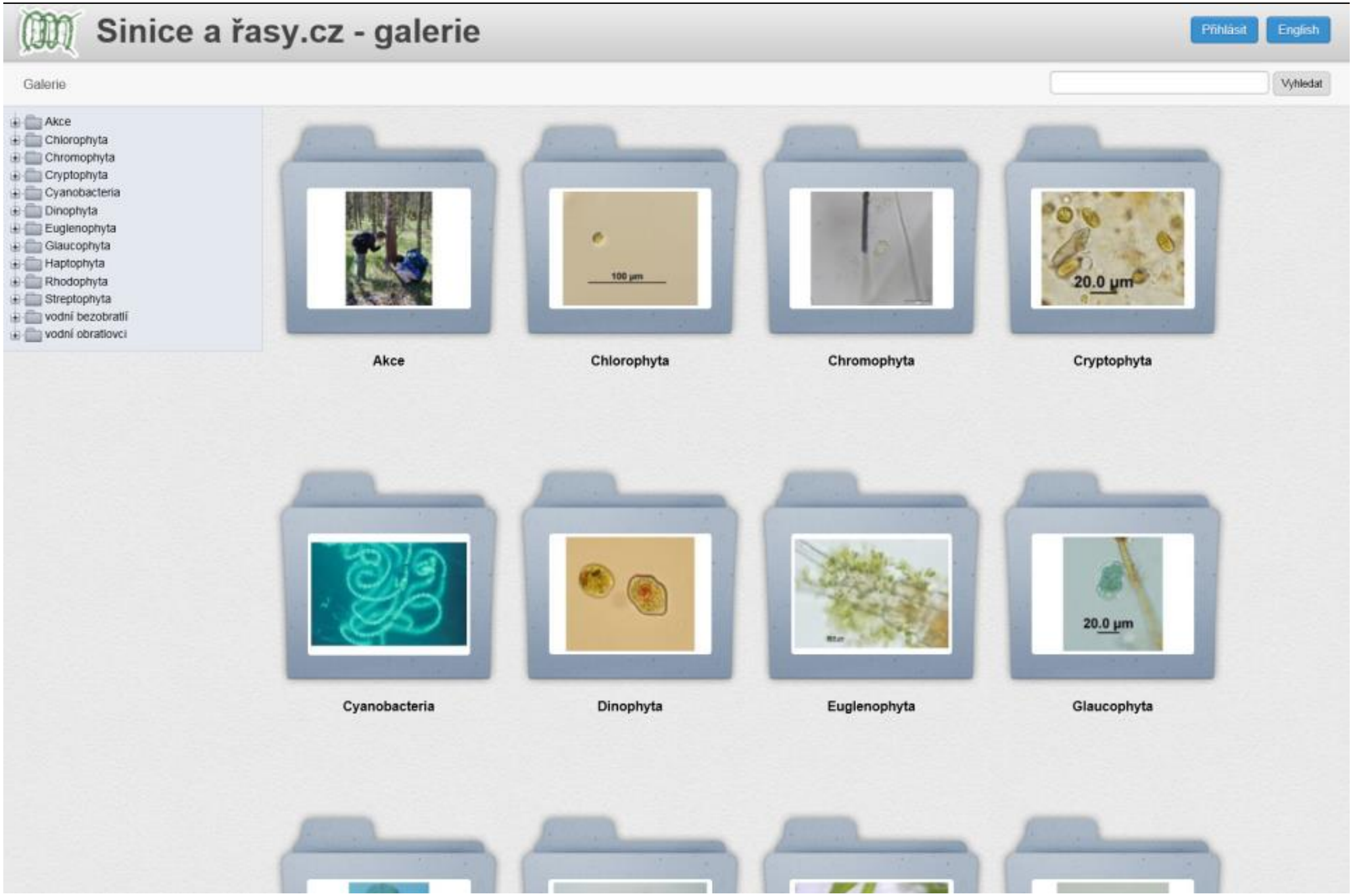
Open-File Report 2015–1164

U.S. Department of the Interior
U.S. Geological Survey

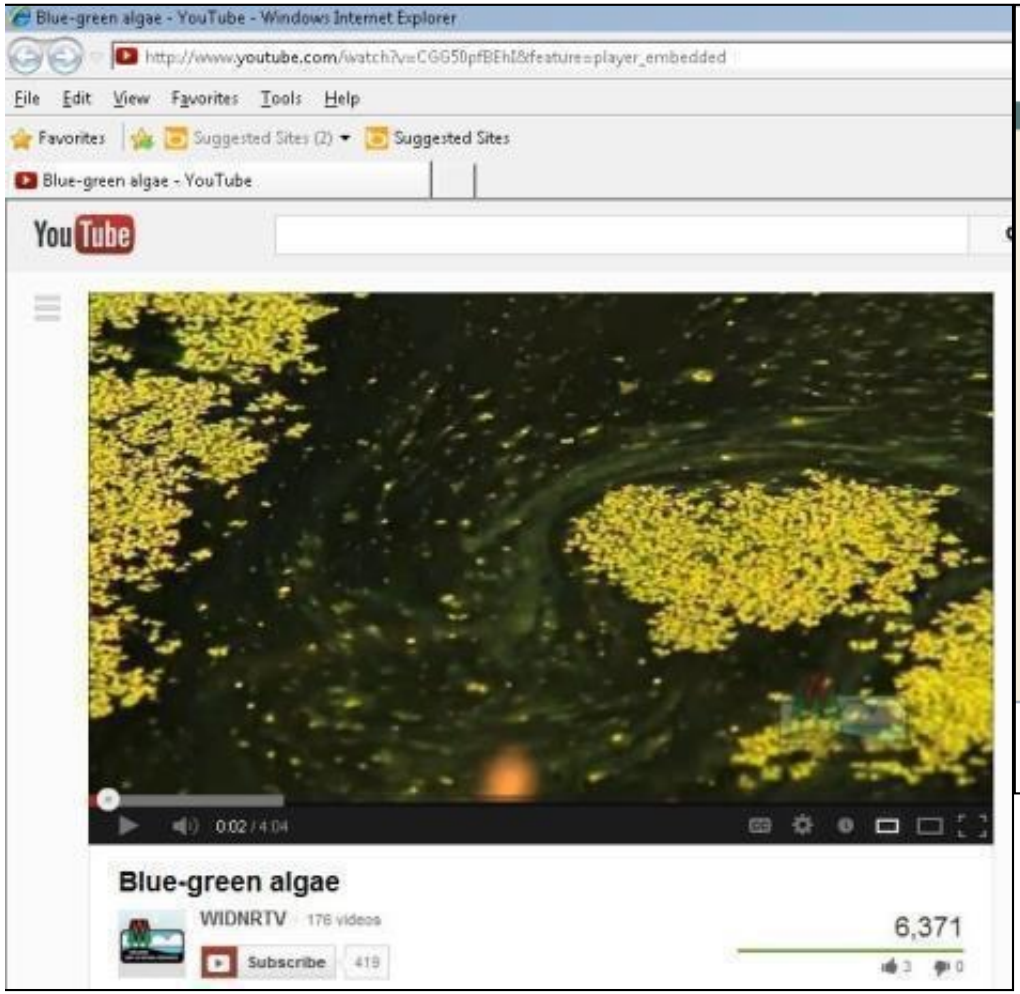
Süßwasserflora von Mitteleuropa: Cyanoprokaryota
Komárek & Anagnostidis 2008-2013



Online Resources



WI Cyanobacteria Resources



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

Caveats

- Introduction to cyanobacteria
- Tools to ID cyanobacteria *vs*. other algae
- Resources for accurate communication

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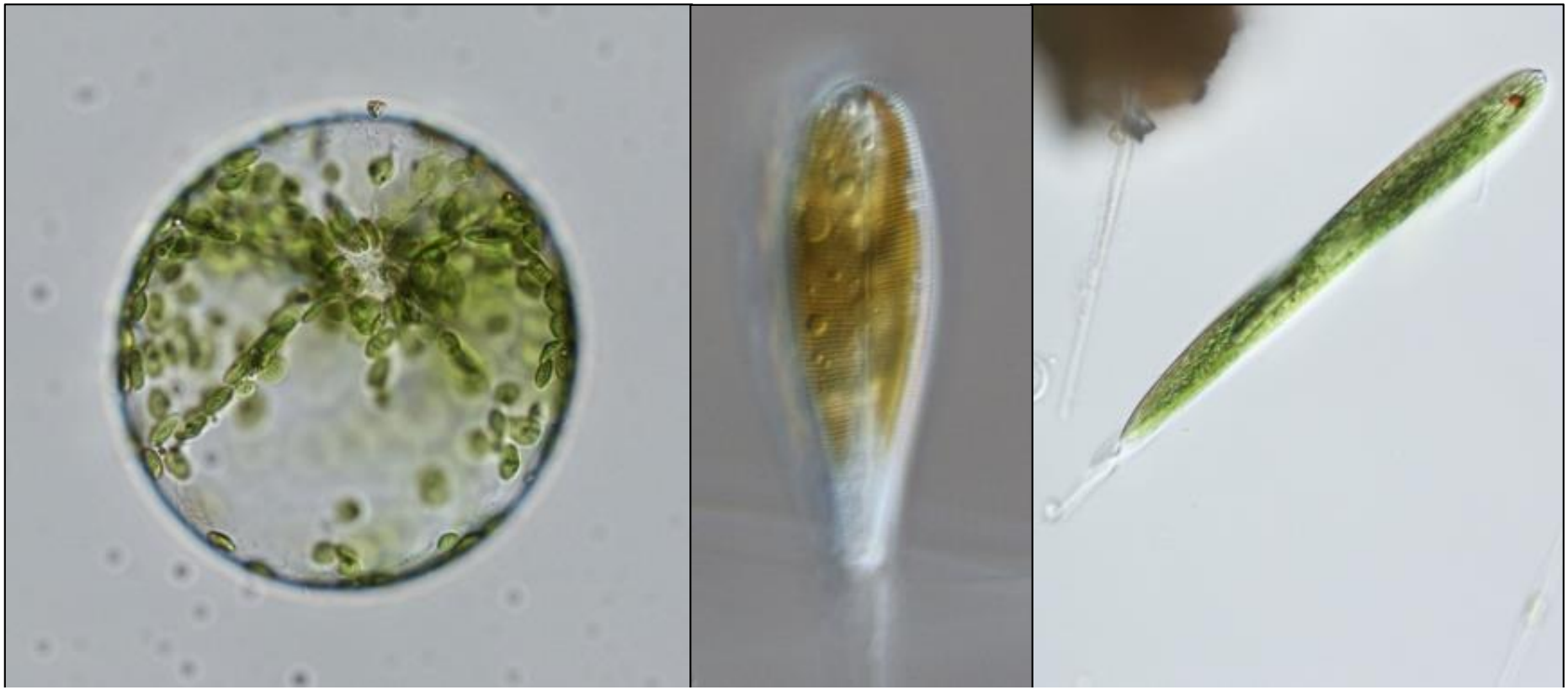
What are algae?

- Have chlorophyll, like plants
- Lack specialized tissues, unlike plants
- They grow everywhere, even in deserts
- From tiny unicells to giant kelp

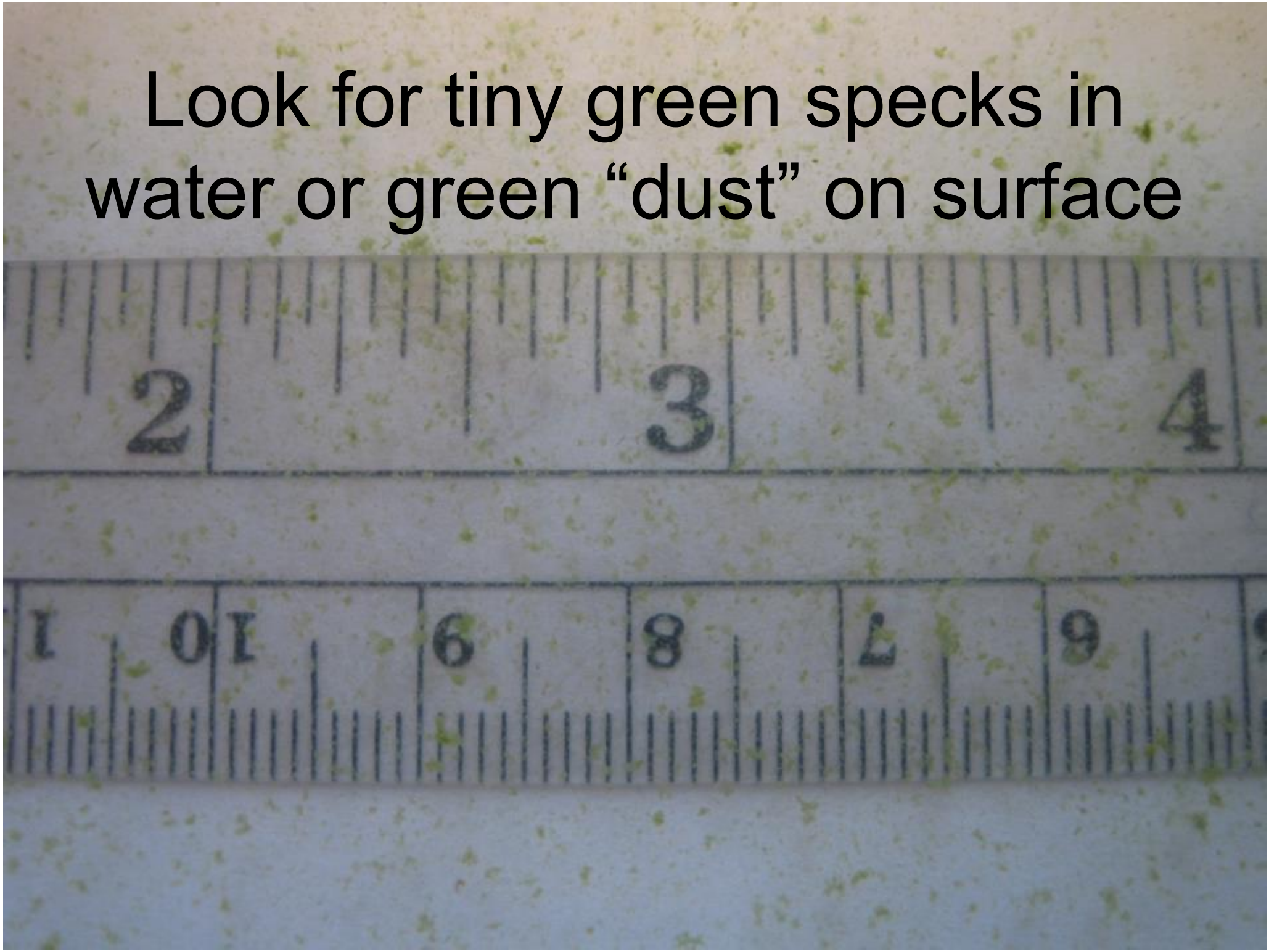


Cyanobacterial species vs. strains

- Cyanobacteria (blue-green algae) are true bacteria
- Bacteria only divide – no sexual reproduction
- Different genetic profiles can evolve within each cyanobacterial species – these are strains.

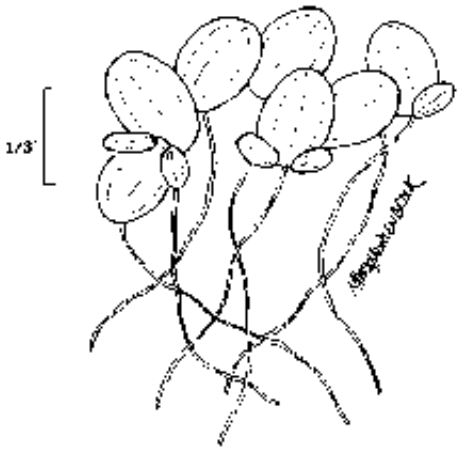
Key features for identification

- **Color.** All algae have chlorophyll-a. Many have additional pigments.
- **Texture:** stringy and hair-like? Tiny particles in water? Does it drape over your fingers or run right through them?
- **Shape** of colonies.
- In most cases, light microscopy is necessary.

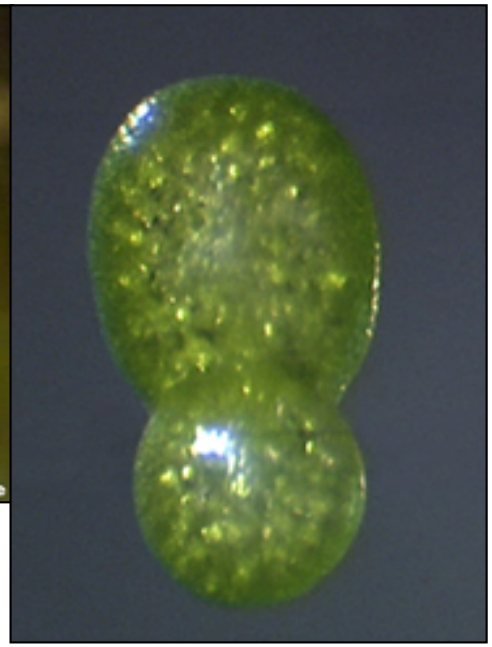

Look for tiny green specks in water or green “dust” on surface

Don’t mistake duckweeds or watermeal for blue-green algae

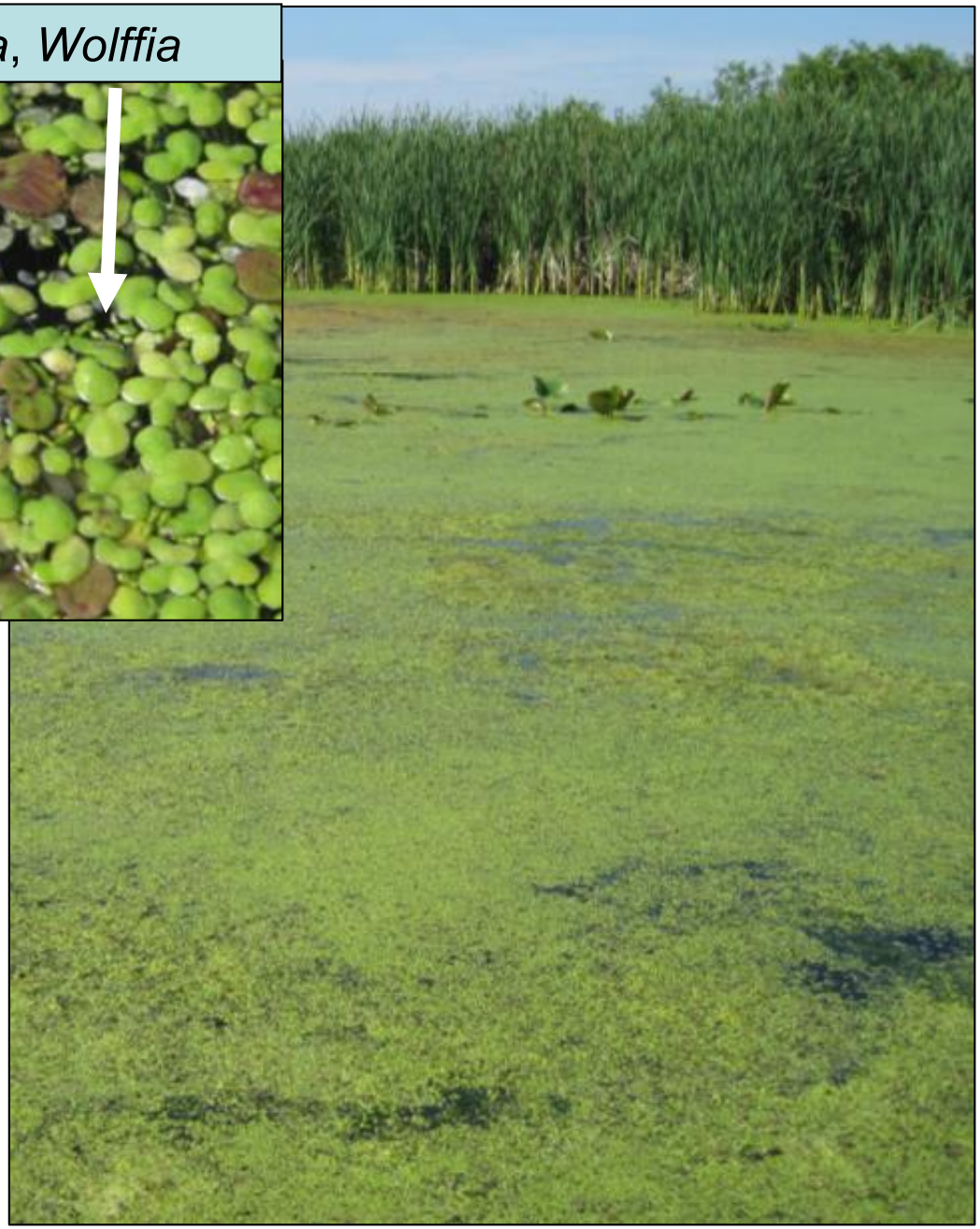
Duckweeds (*Lemna*, *Spirodela*) have roots



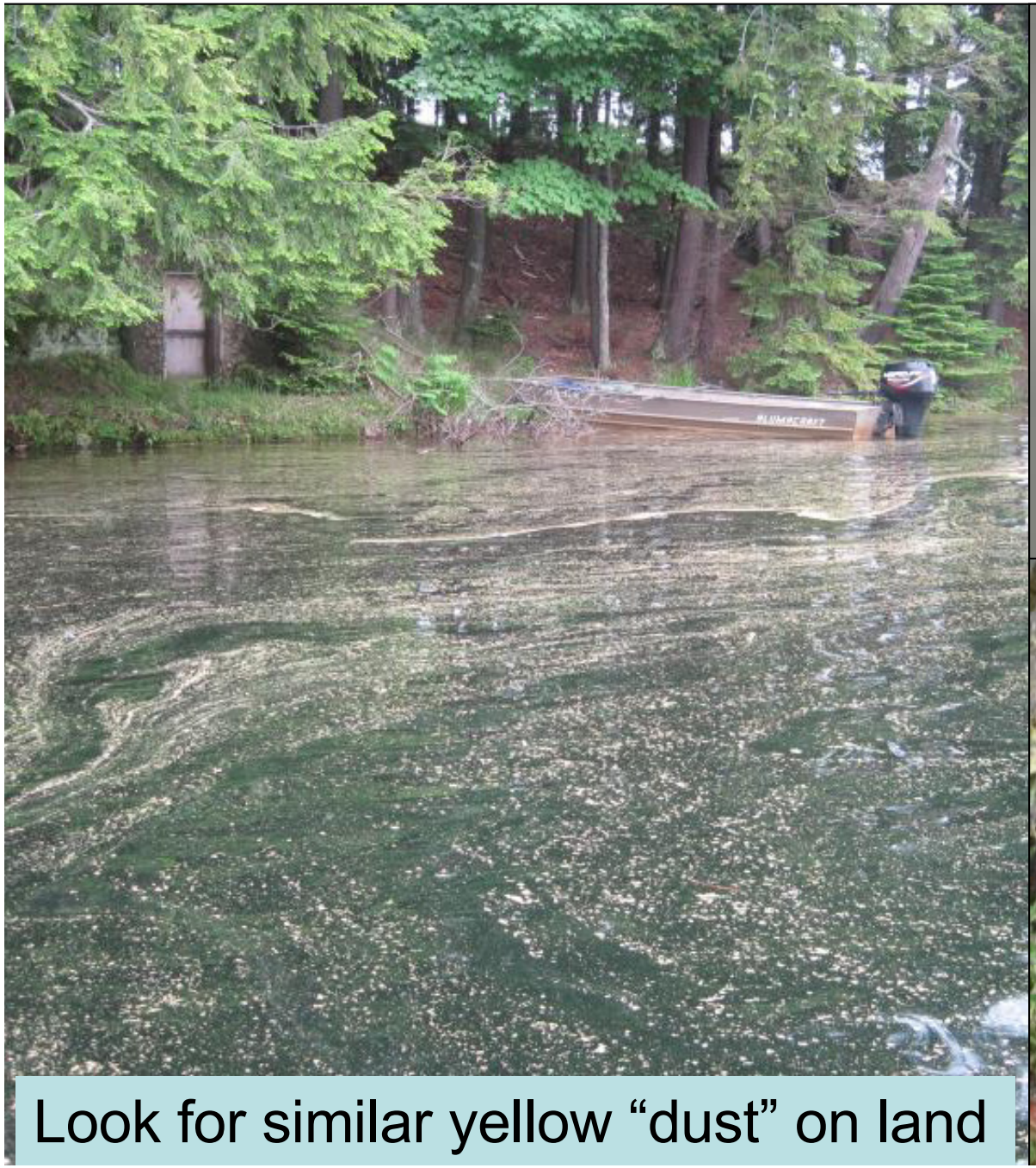
Lemna, *Spirodela*, *Wolffia*



Watermeal (*Wolffia*)
Tiny, firm, grainy

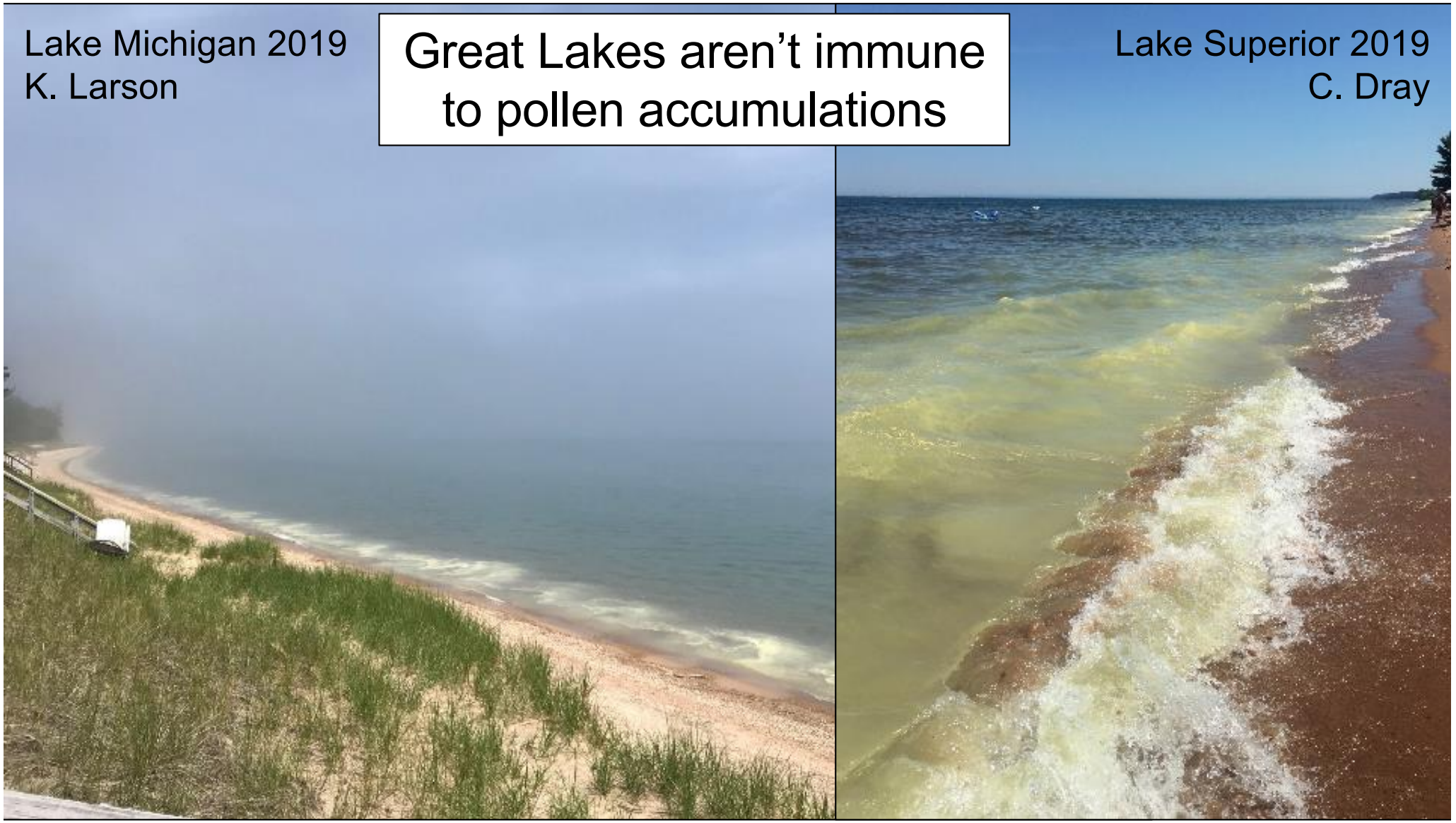


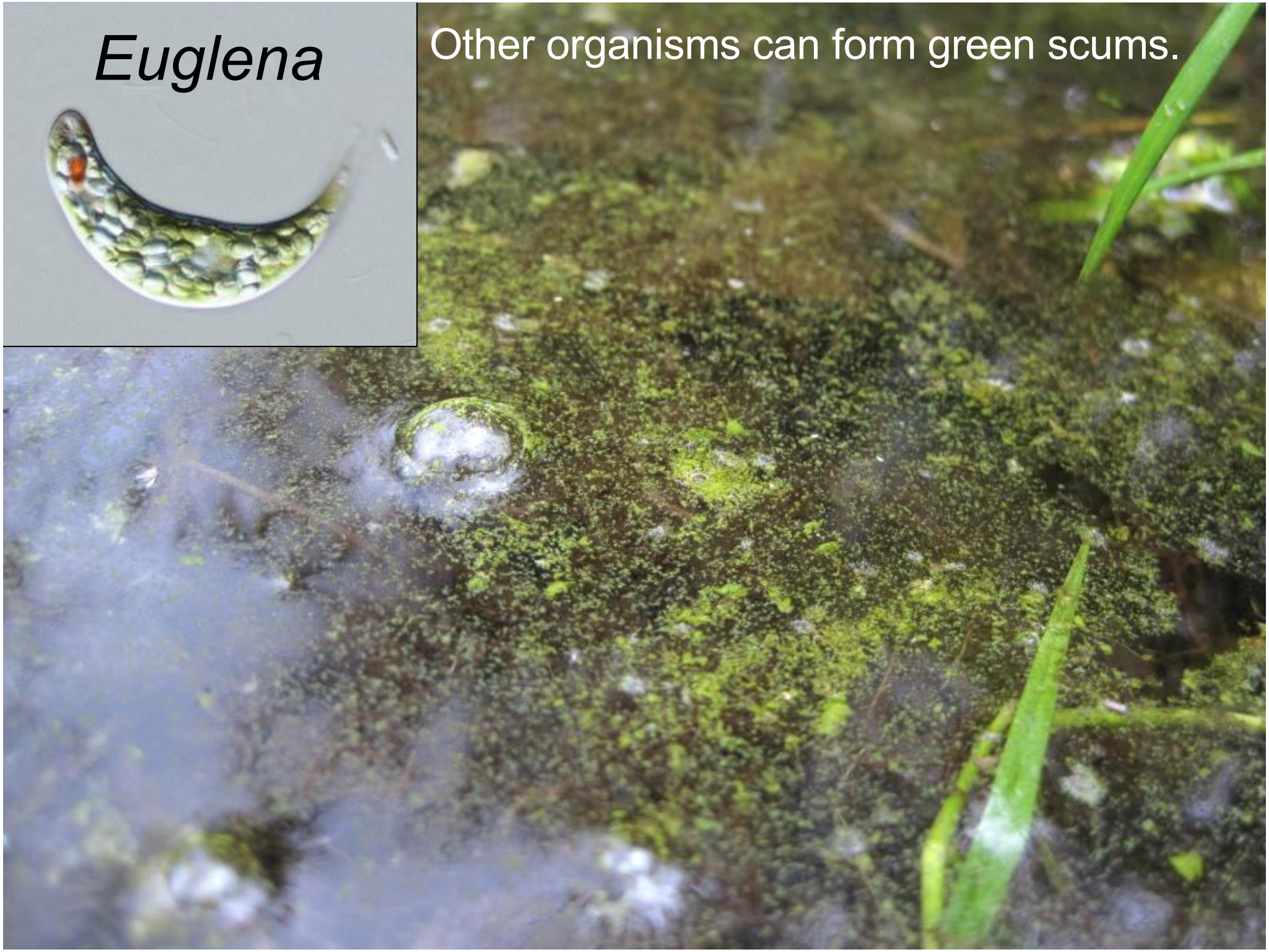
Don’t mistake yellow pollen for blue-green algae

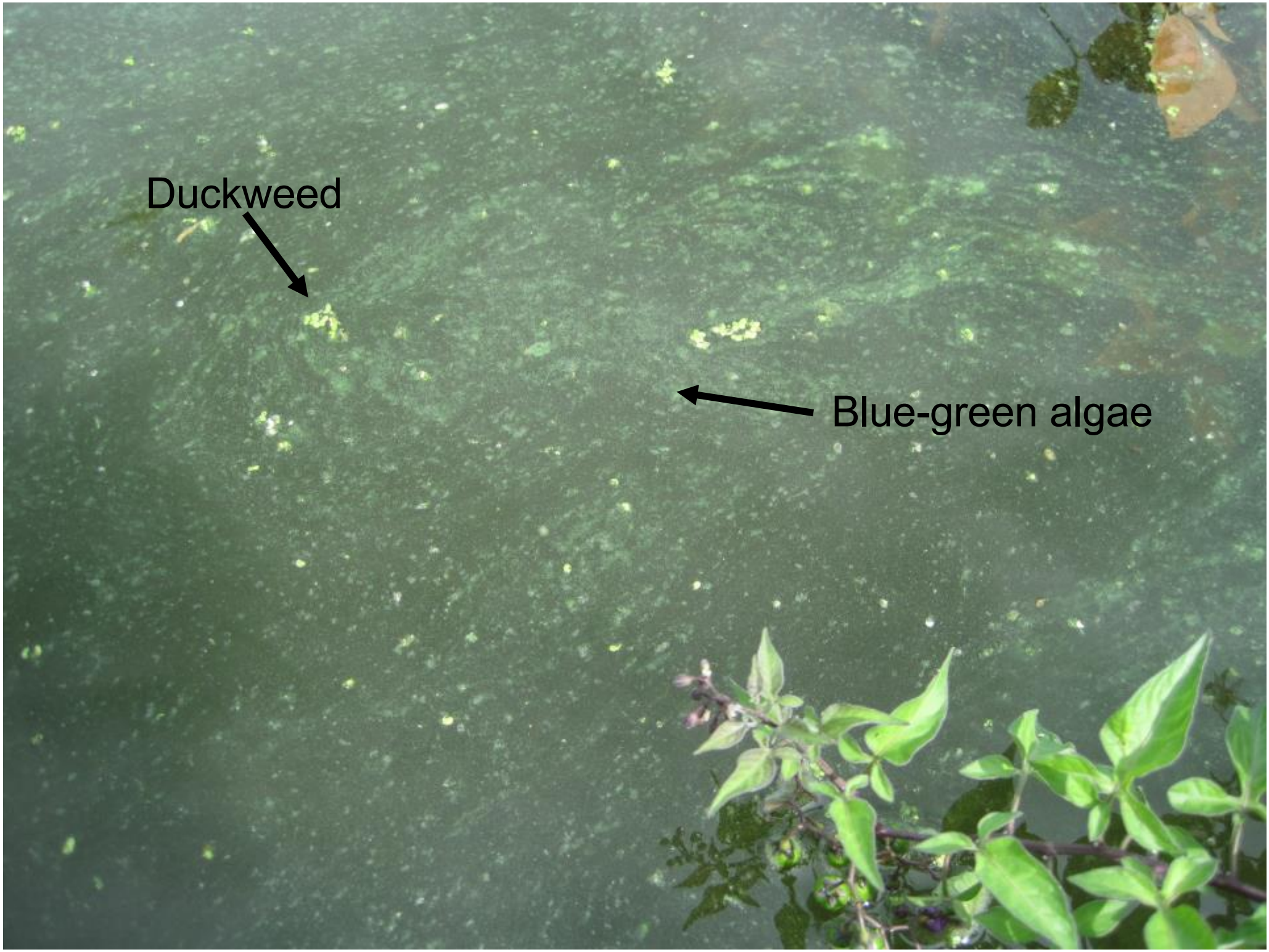


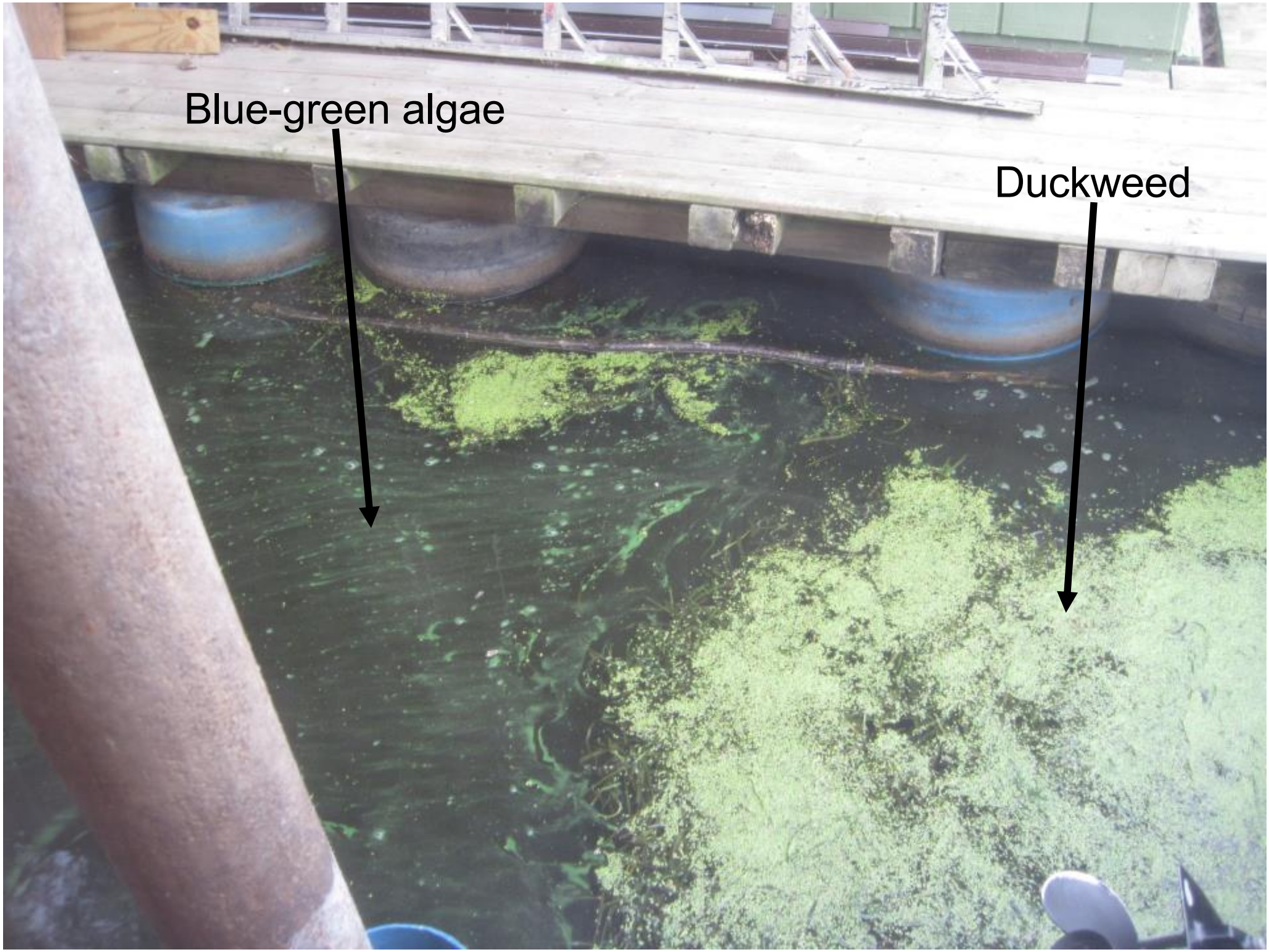
Look for similar yellow “dust” on land

Great Lakes aren't immune to pollen accumulations



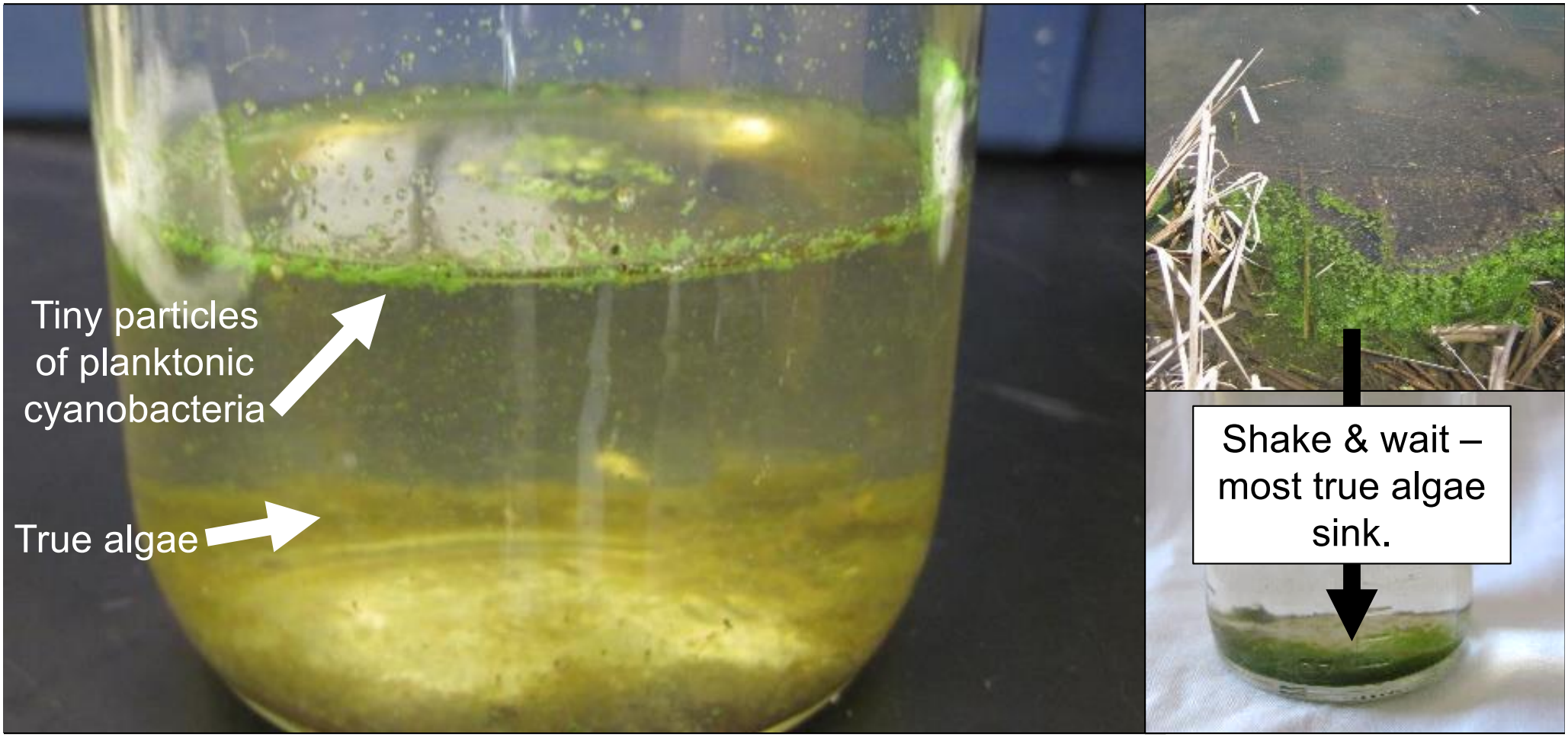

Euglena
Other organisms can form green scums.


Duckweed
Blue-green algae


Blue-green algae
Duckweed

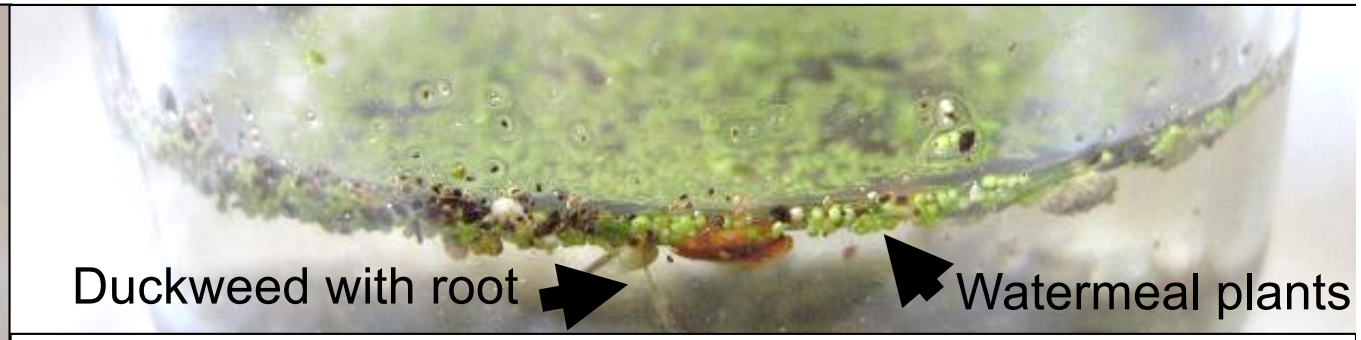
Don’t mistake filamentous green algae for blue-green algae

How do I tell if I am seeing cyanobacteria or something else? “Jar Test” – does it form a floating layer?



Minnesota Pollution Control Agency “Simple, no-cost tests for blue-green algae”
(Search for “Minnesota jar test”) tinyurl.com/y8jfxxpg

Take a close look at floating green layers

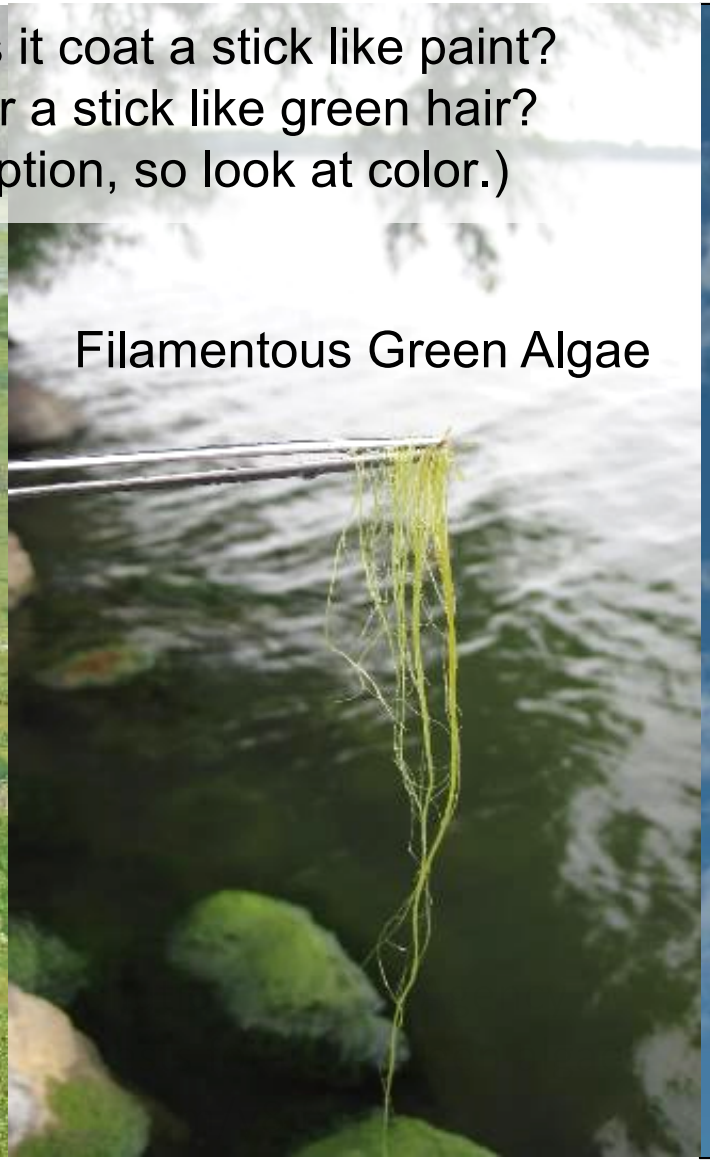


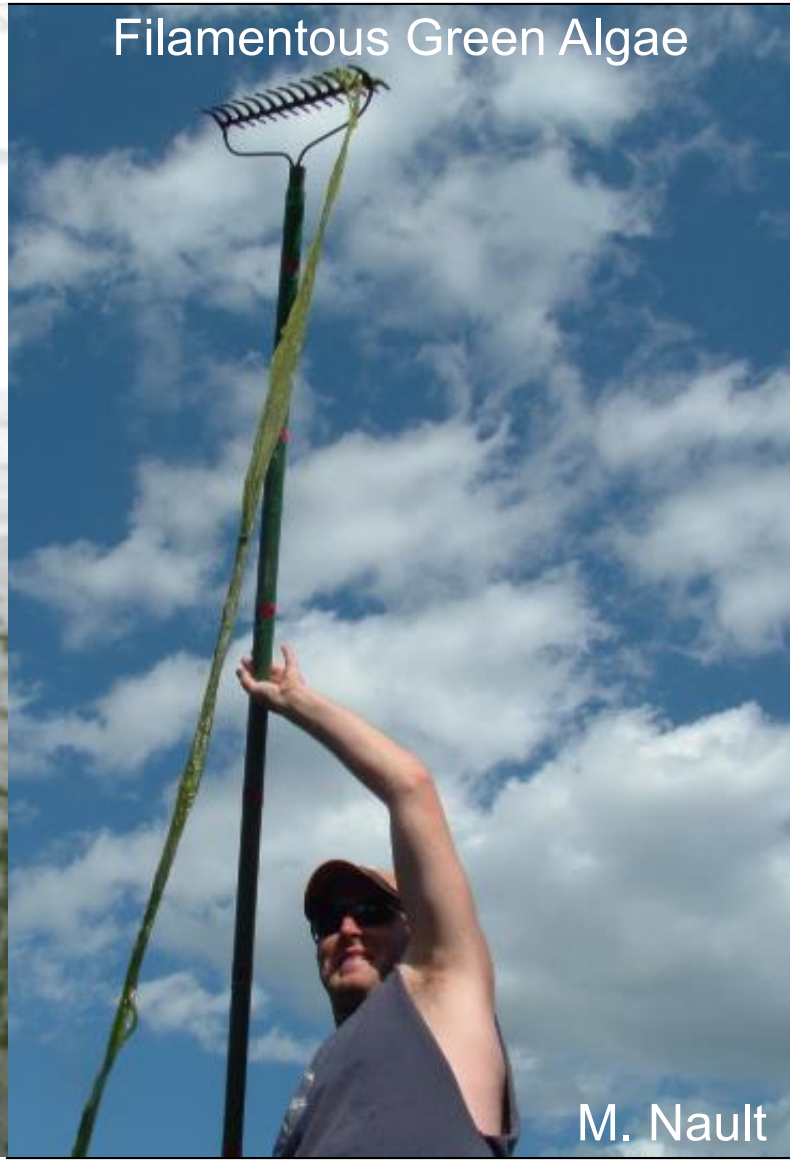
Green layer floats, but contains tiny leaf green plants with regular outlines.

Wolffia (watermeal) is a tiny floating plant. A few duckweeds are present too.

How do I tell if floating mats are cyanobacteria or something else?

"Stick Test" – does it coat a stick like paint?
Does it drape over a stick like green hair?
(There is 1 exception, so look at color.)





Minnesota Pollution Control Agency
"Simple, no-cost tests for blue-green algae" tinyurl.com/y8jfxxpg

“Blue-green” is misleading

J. Williamson

N. Trombly

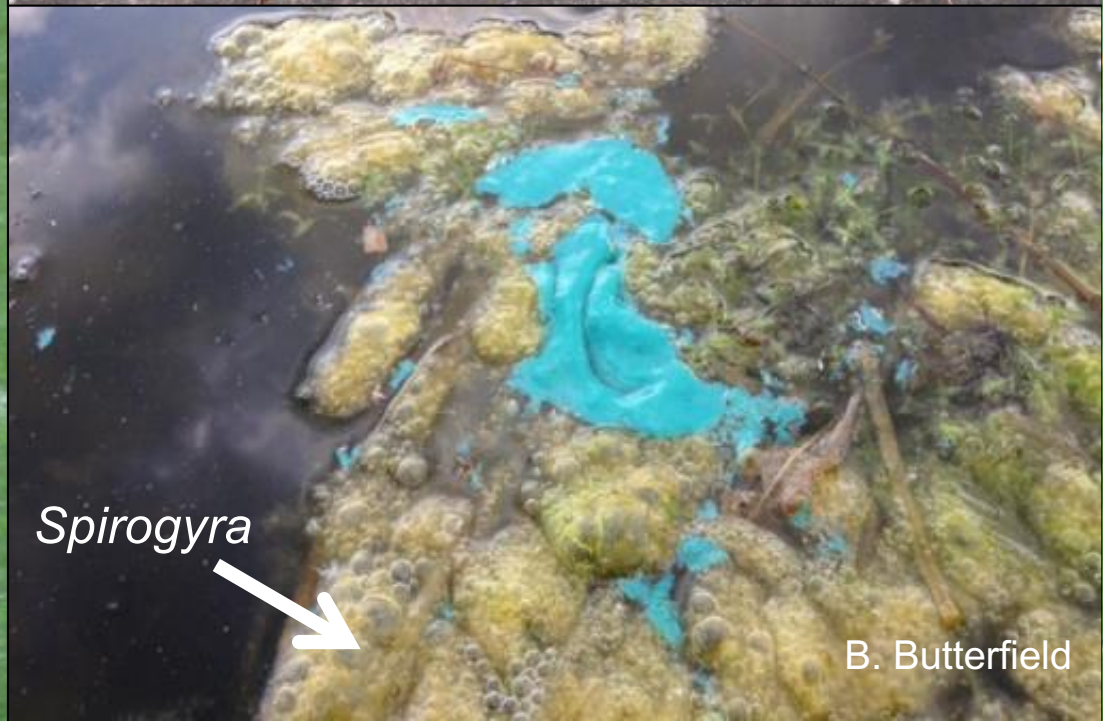
S. Greb

E. Heath

Growing blooms are most often green in color.


growing
J. Williamson

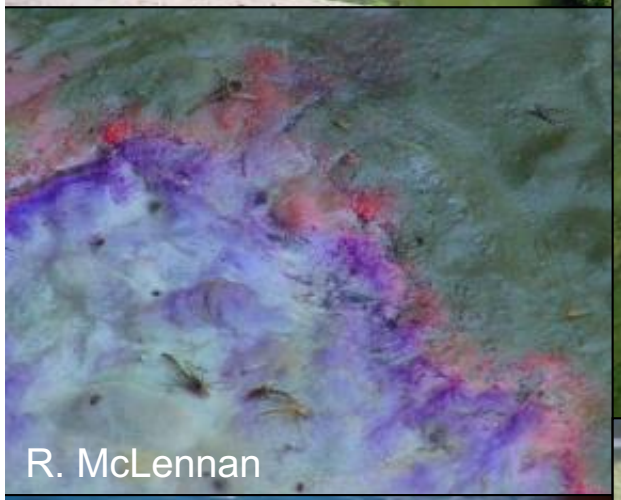

decomposing
pigments are released
M. Meade


Spirogyra
B. Butterfield


R. McLennan


N. Trombly


T. Moris


R. McLennan


J. Williamson

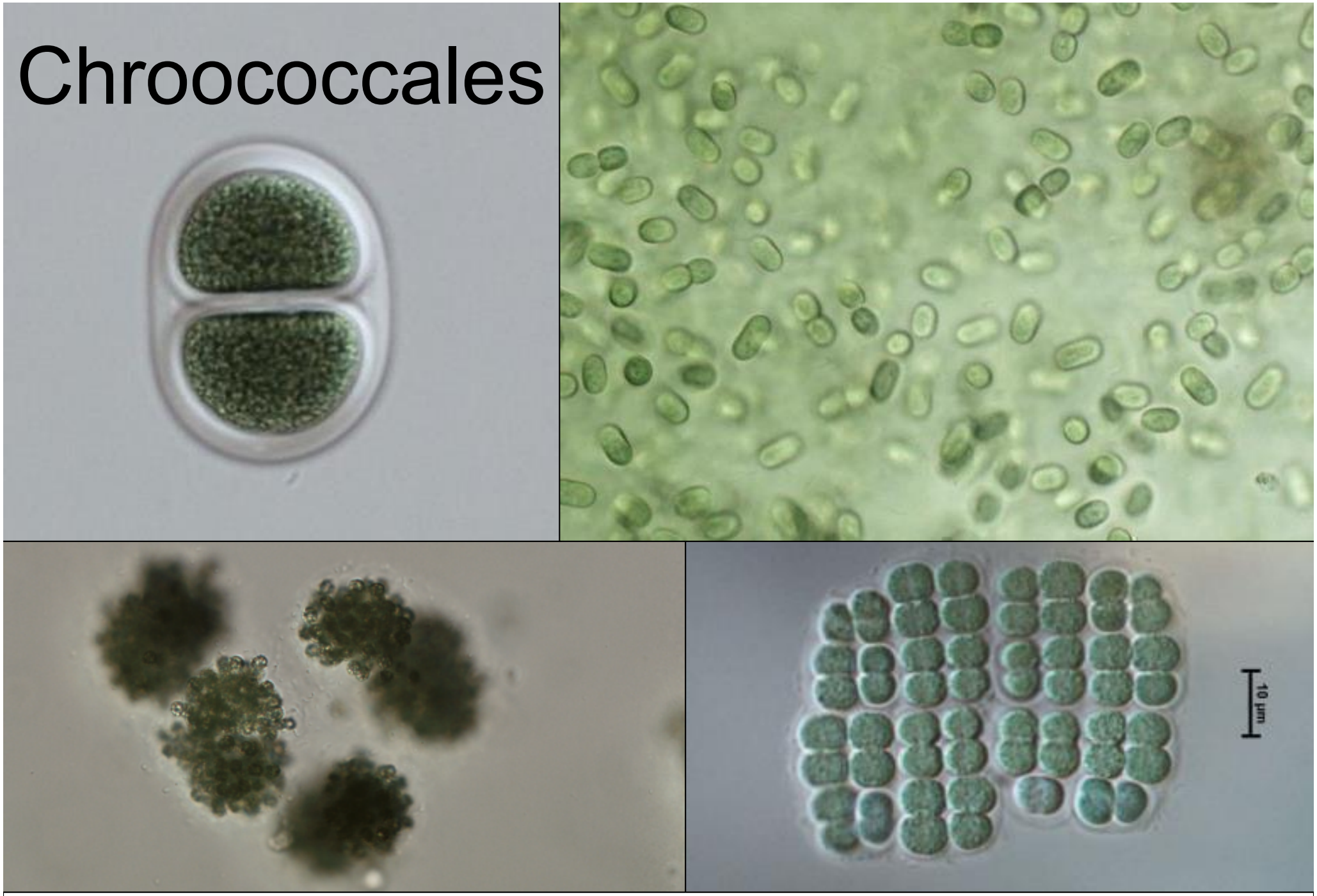

WDHS


J. Williamson

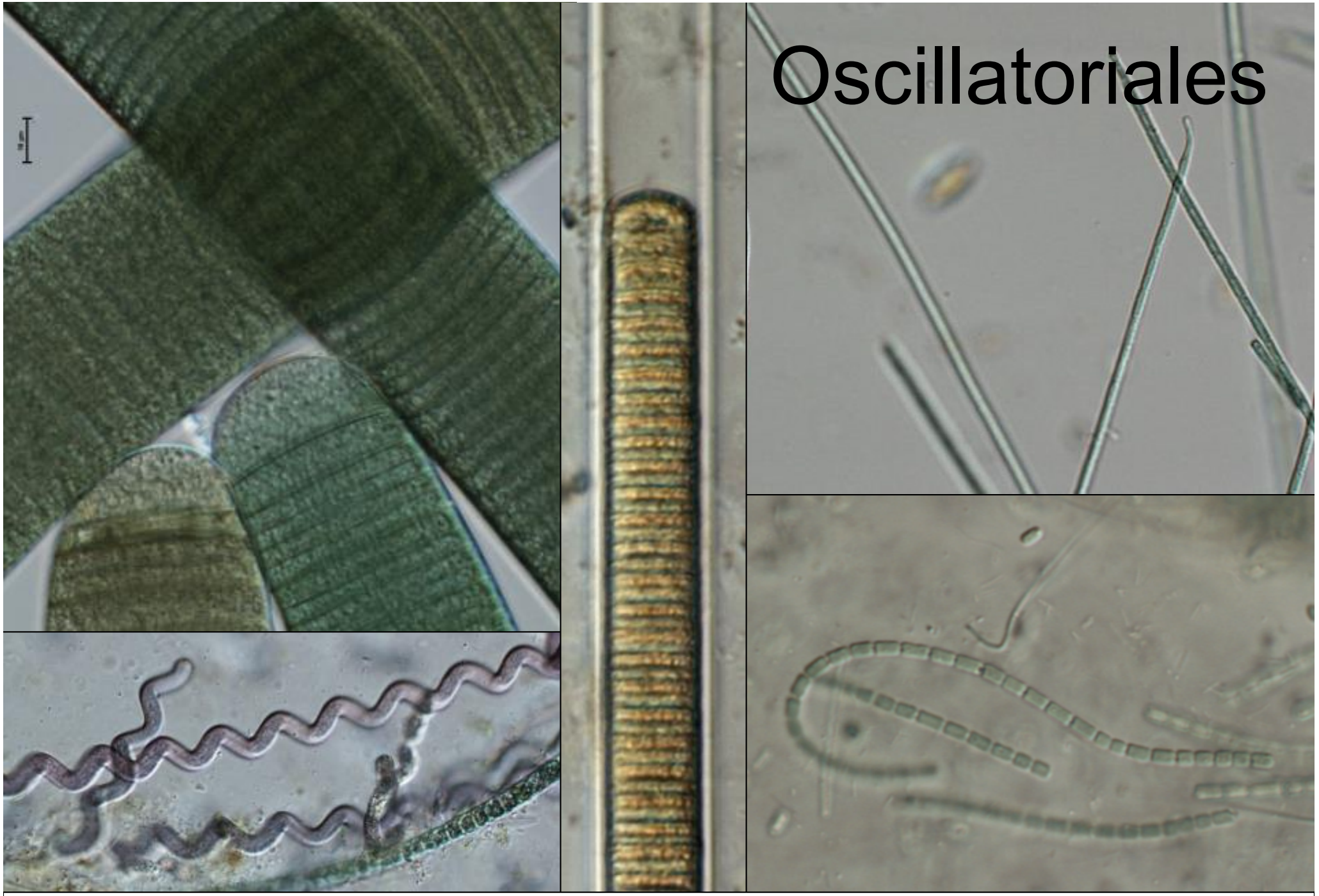

A. Dryja

Orders of Cyanobacteria

Chroococcales

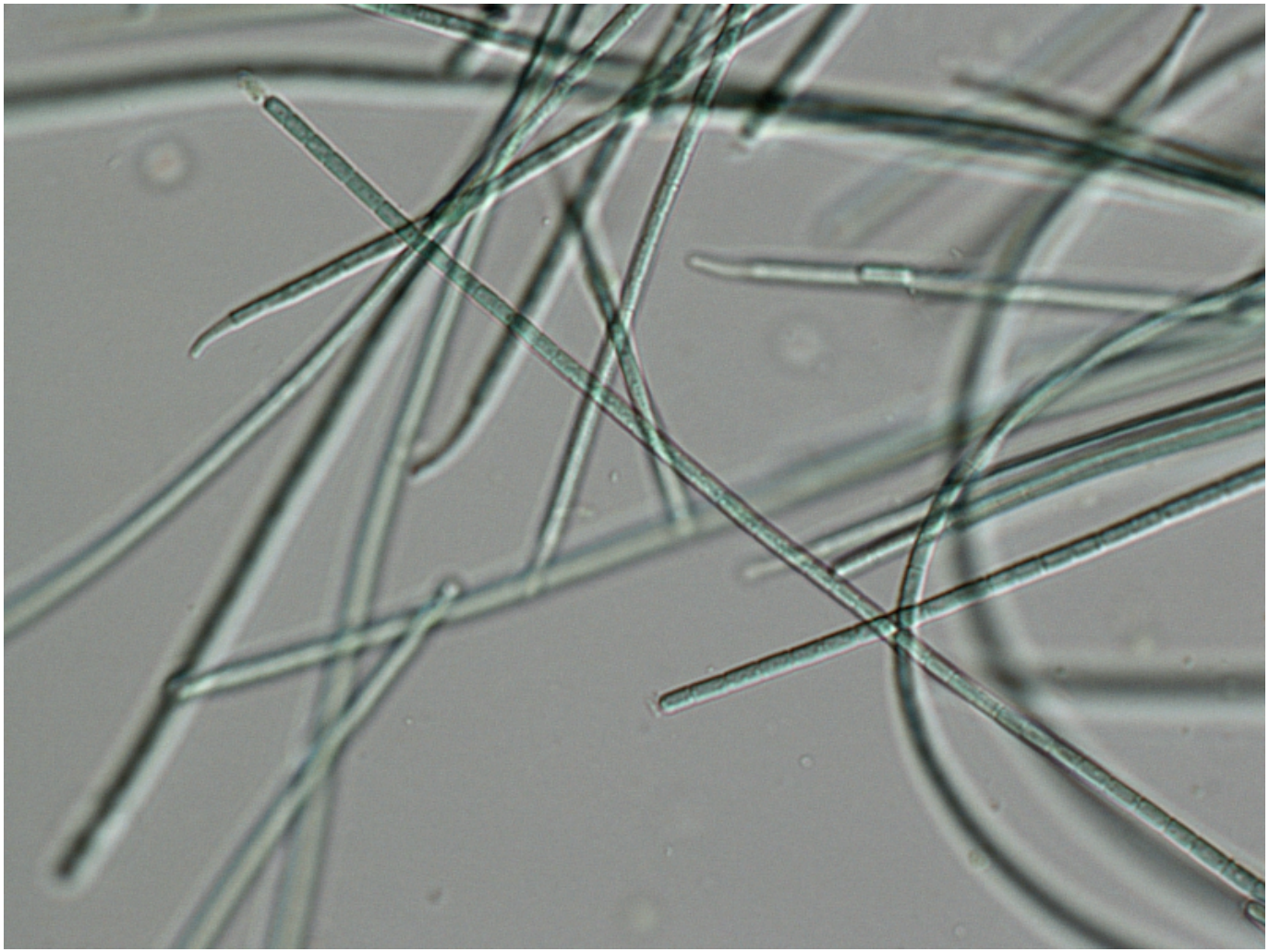


Single cells or colonies of (mostly) spherical or ovoid cells



Uniseriate, unbranched trichomes (filaments)

Some Oscillatoriales are motile



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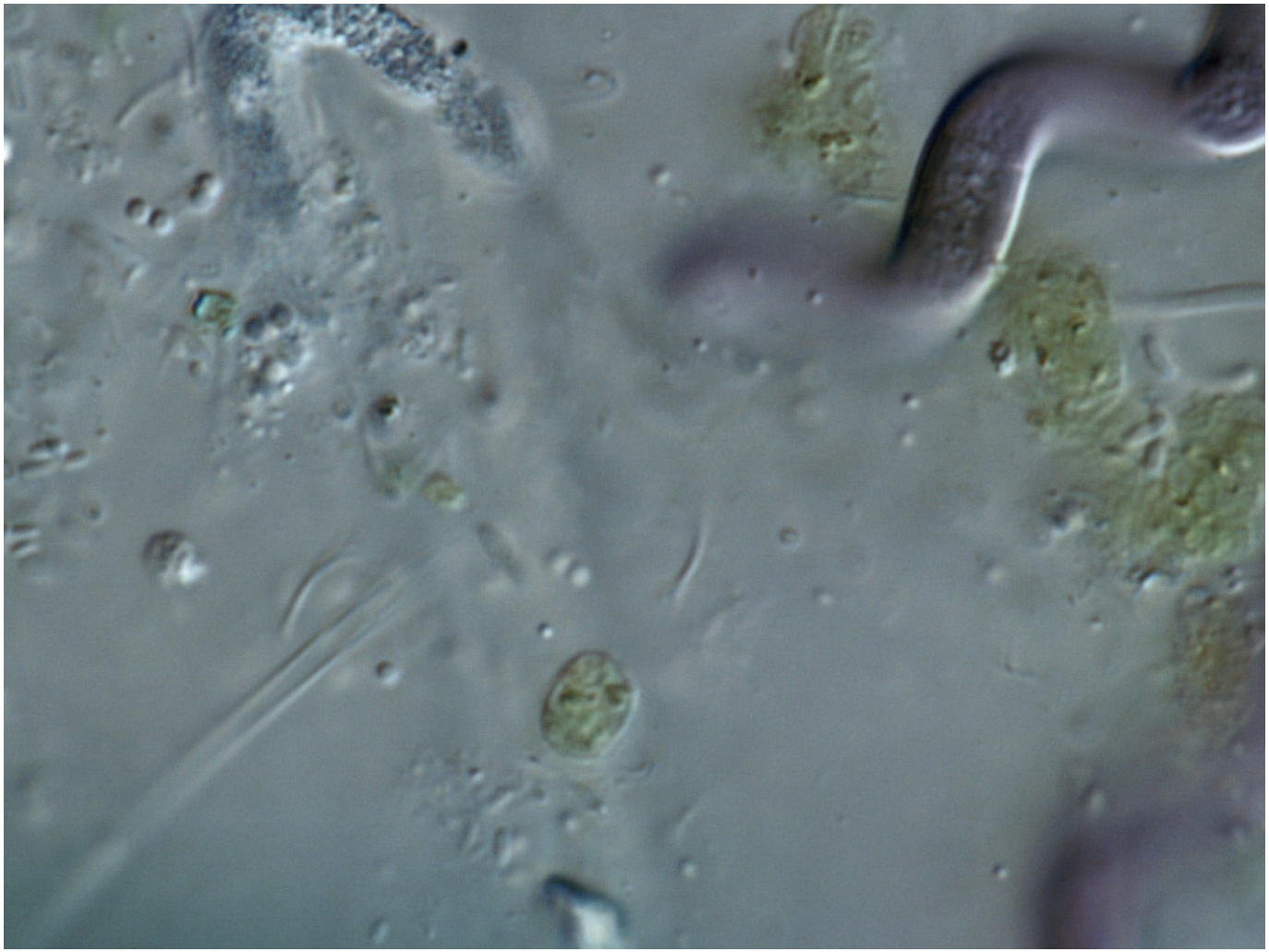

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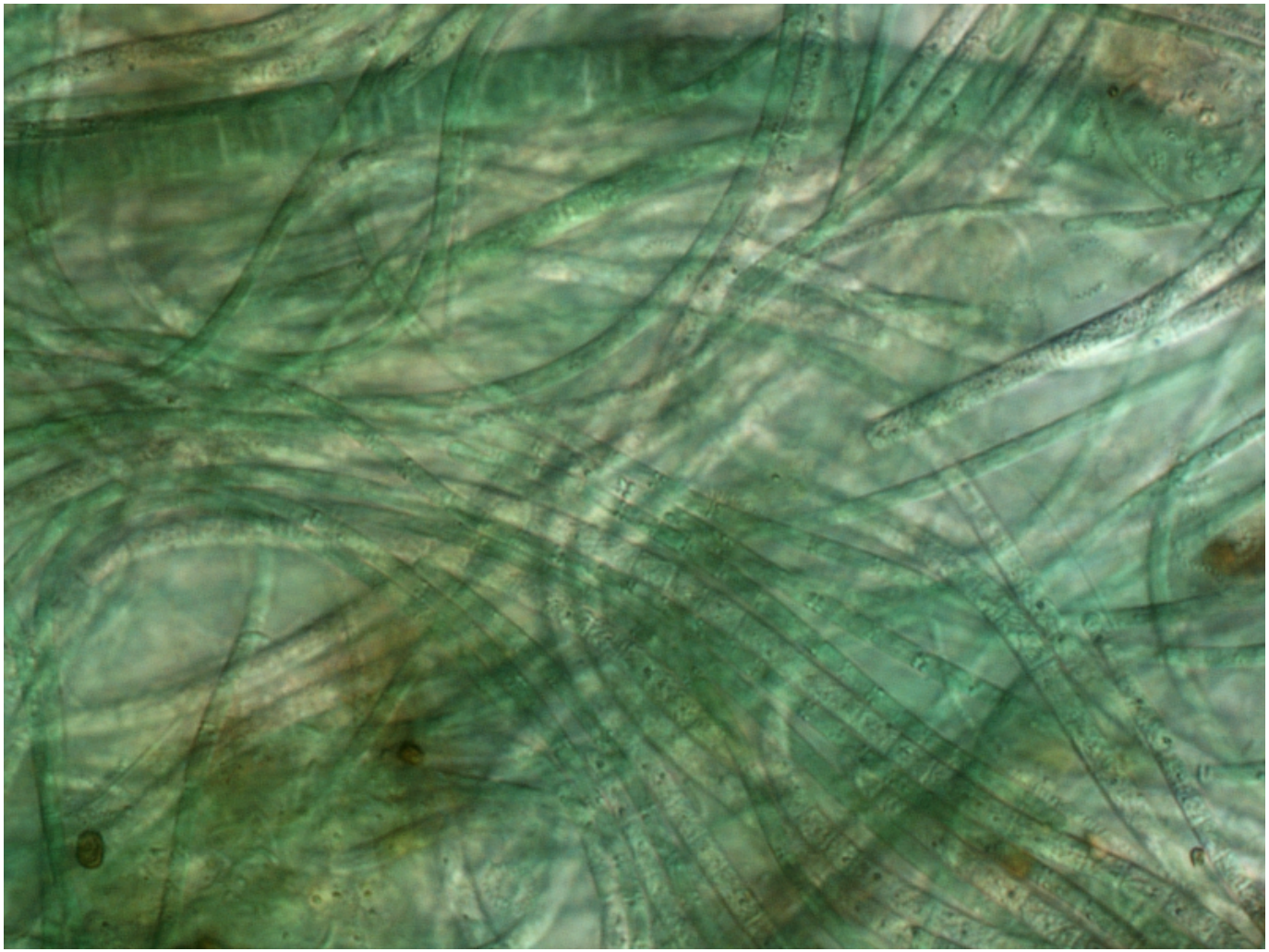
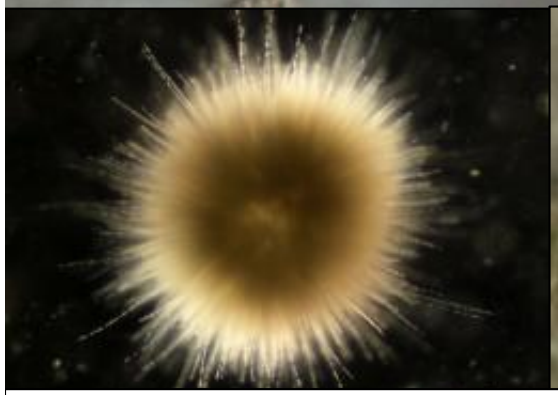


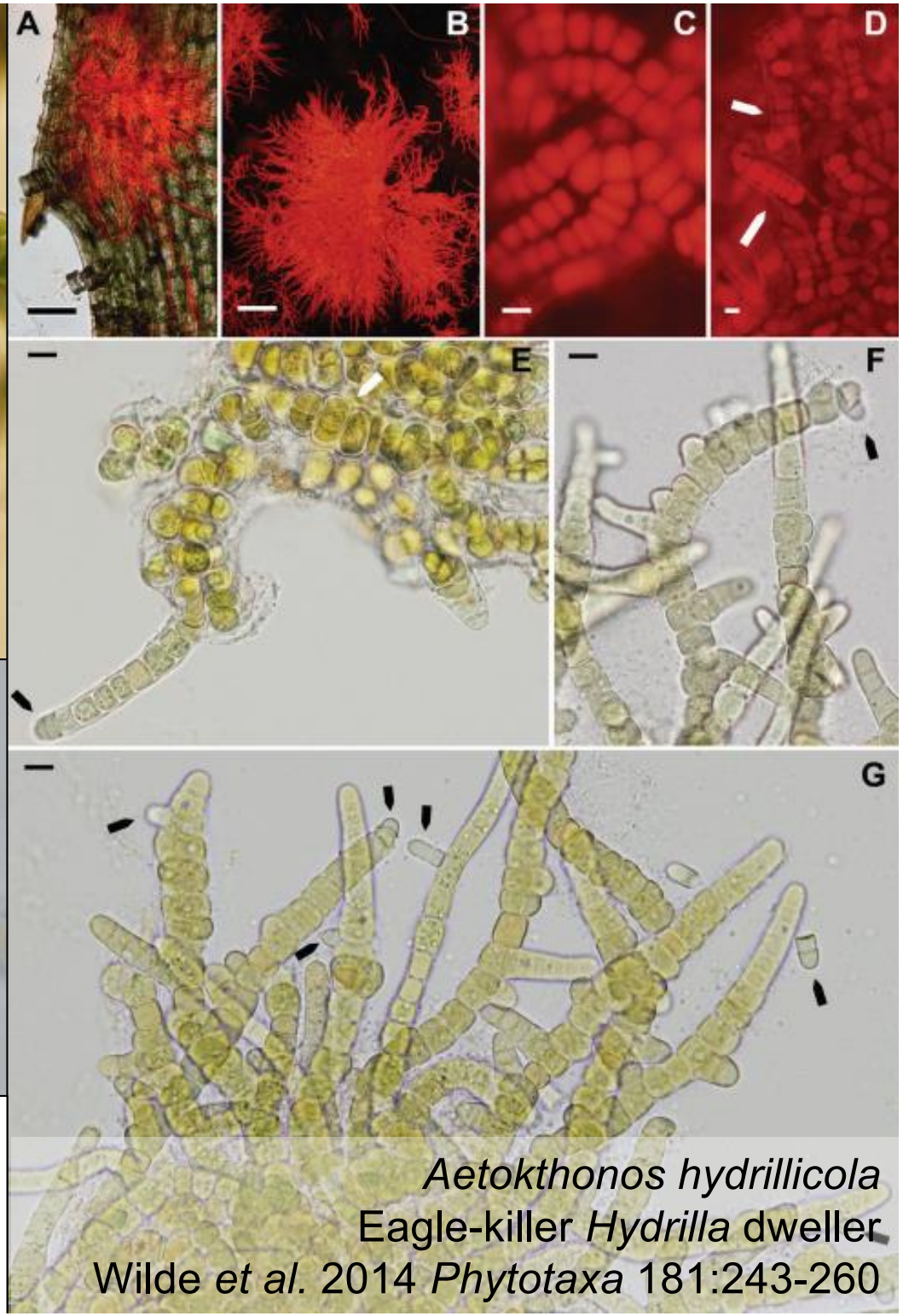
Nostocales



Heterocytes for N_2 fixation, false branching, uniseriate

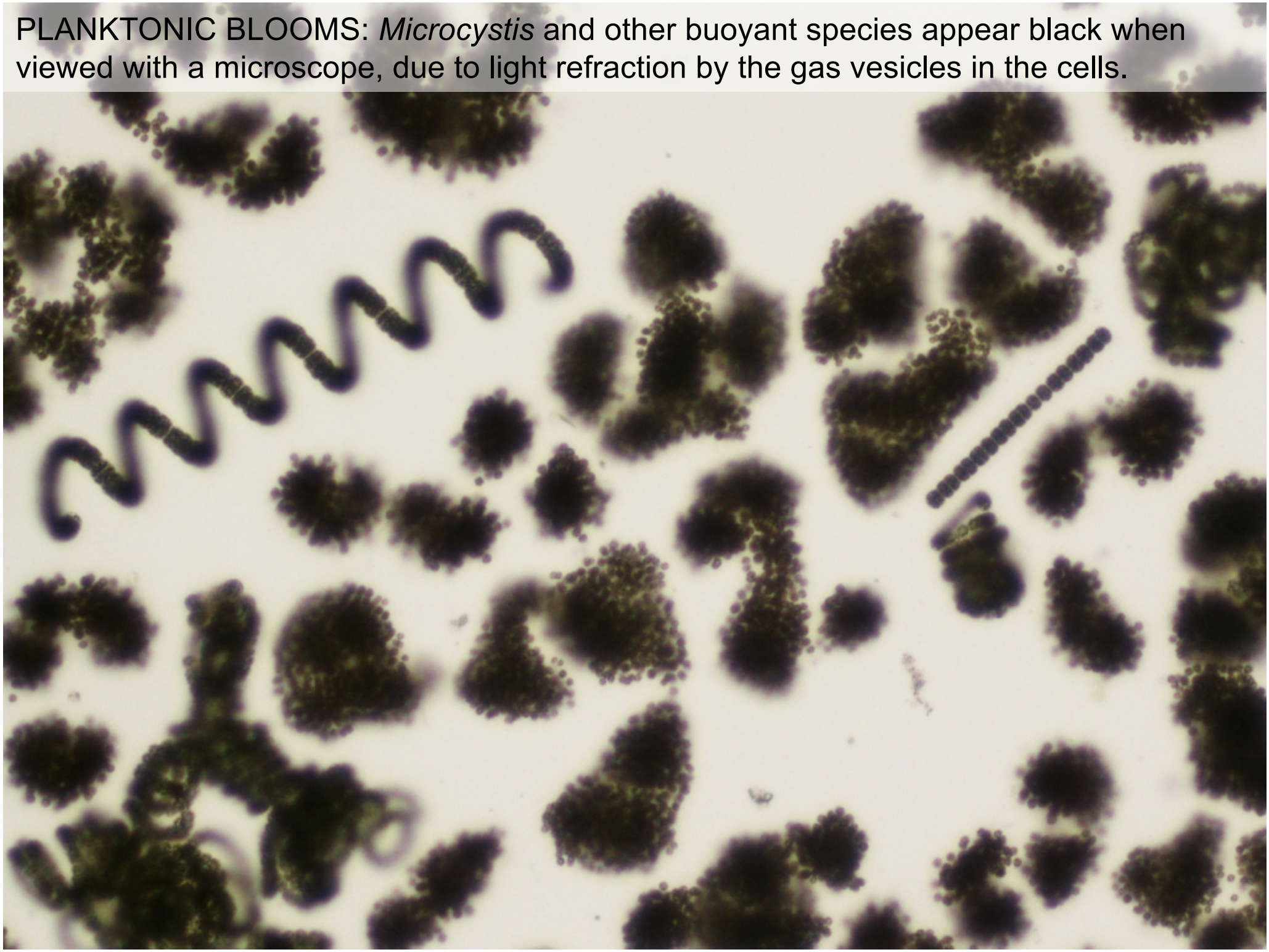
Stigonematales

Heterocytes for N_2 fixation, true branching, multiseriate



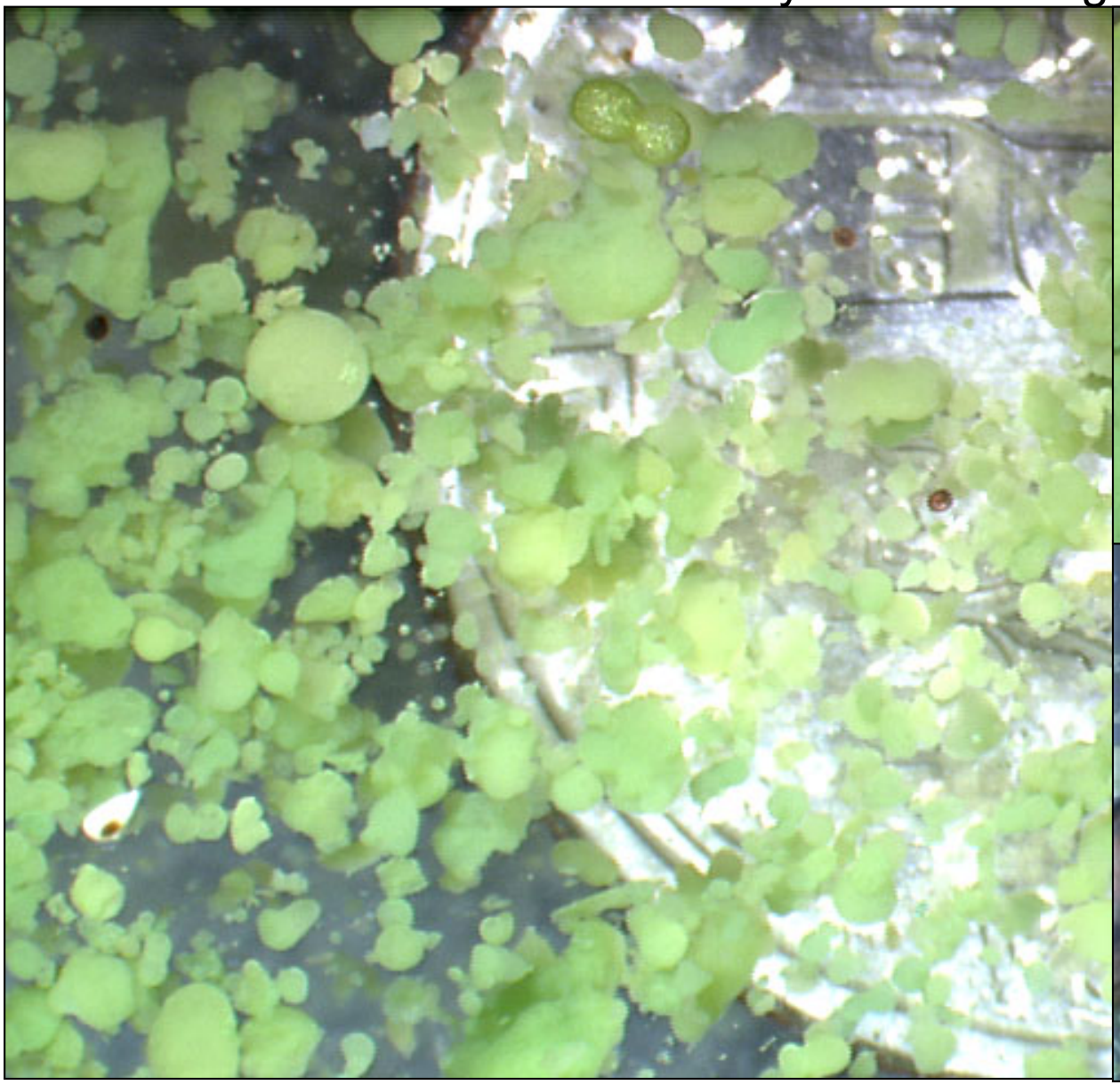
Aetokthonos hydrillicola
Eagle-killer *Hydrilla* dweller
Wilde *et al.* 2014 *Phytotaxa* 181:243-260

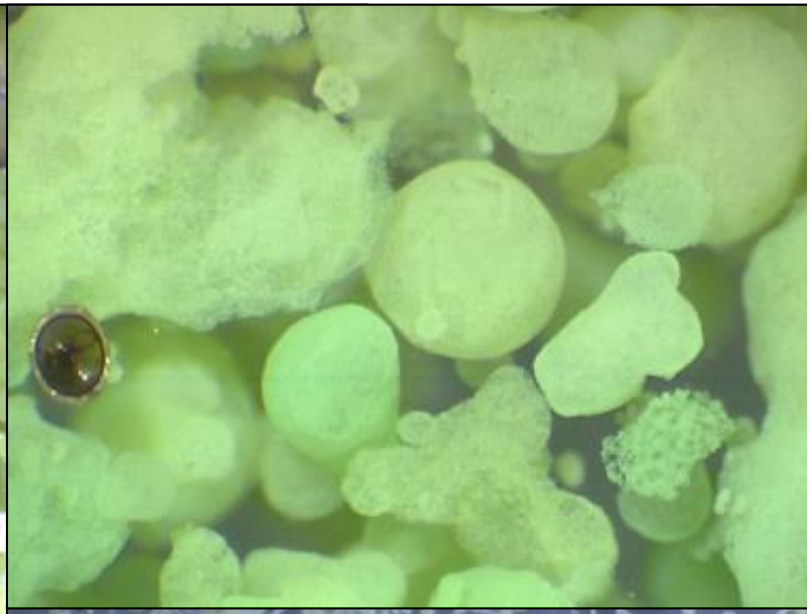
PLANKTONIC BLOOMS: *Microcystis* and other buoyant species appear black when viewed with a microscope, due to light refraction by the gas vesicles in the cells.

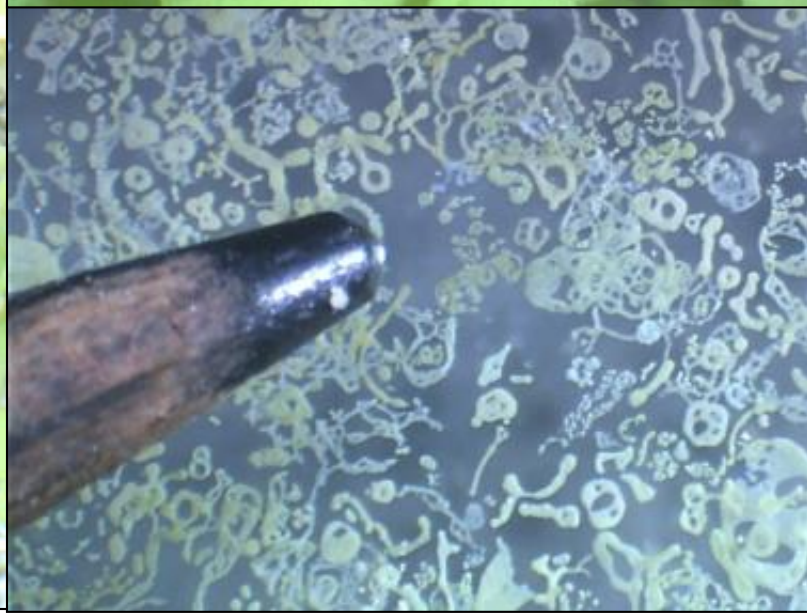


Microcystis

The most common bloom-forming cyanobacteria genus in Wisconsin lakes

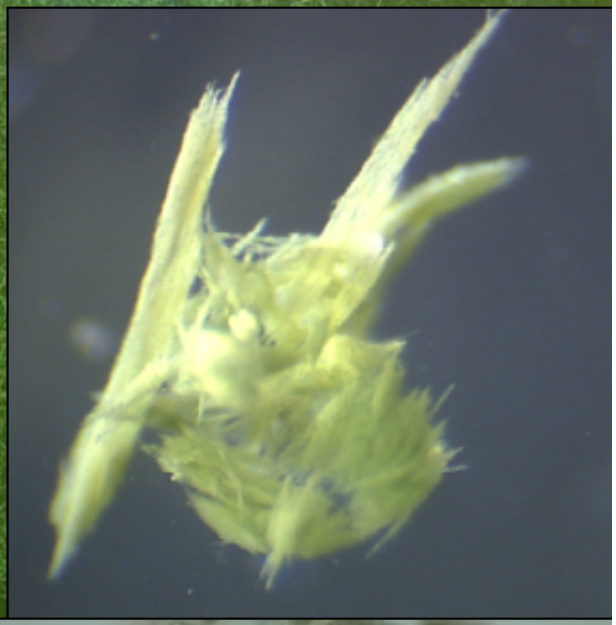




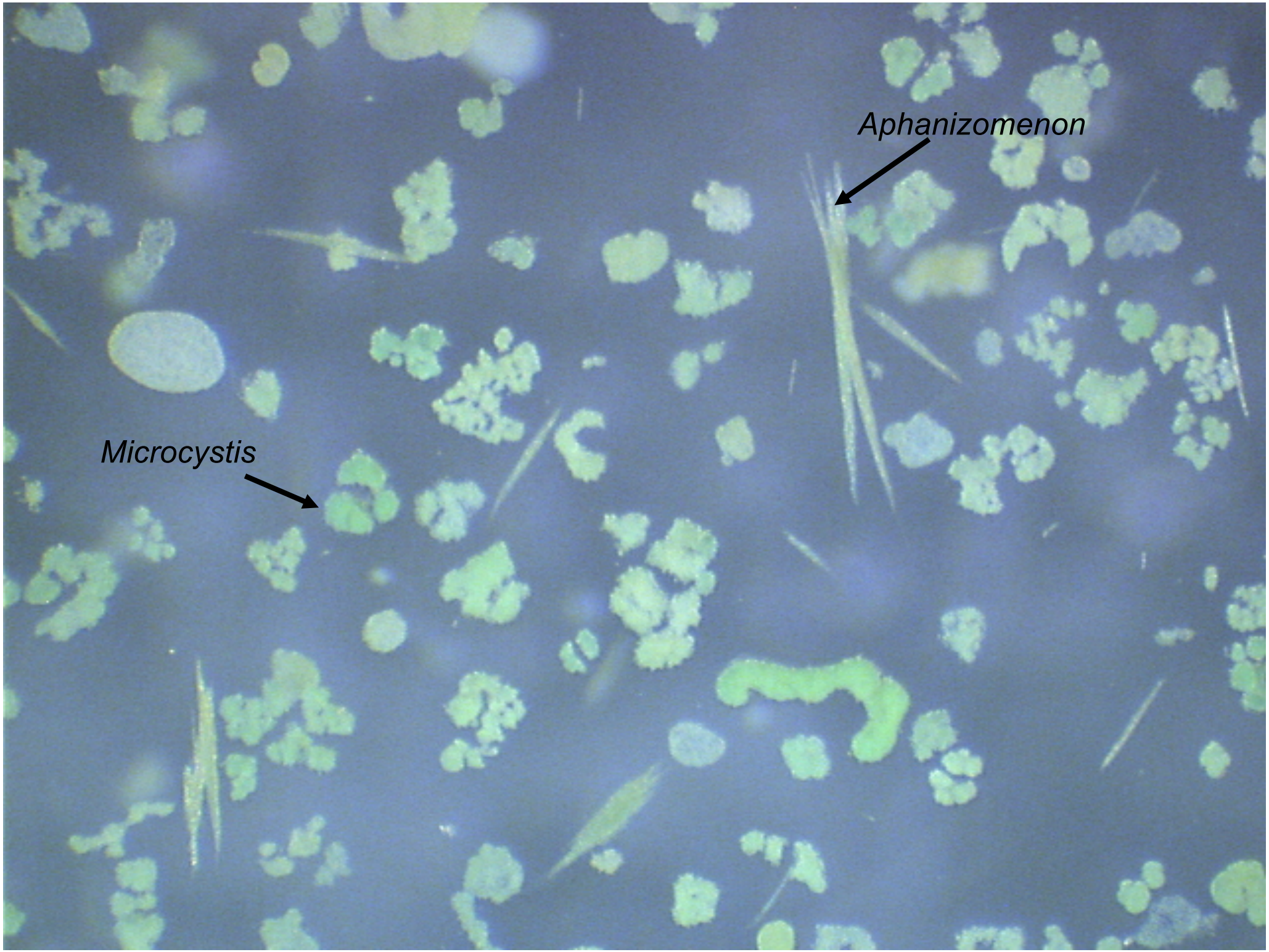


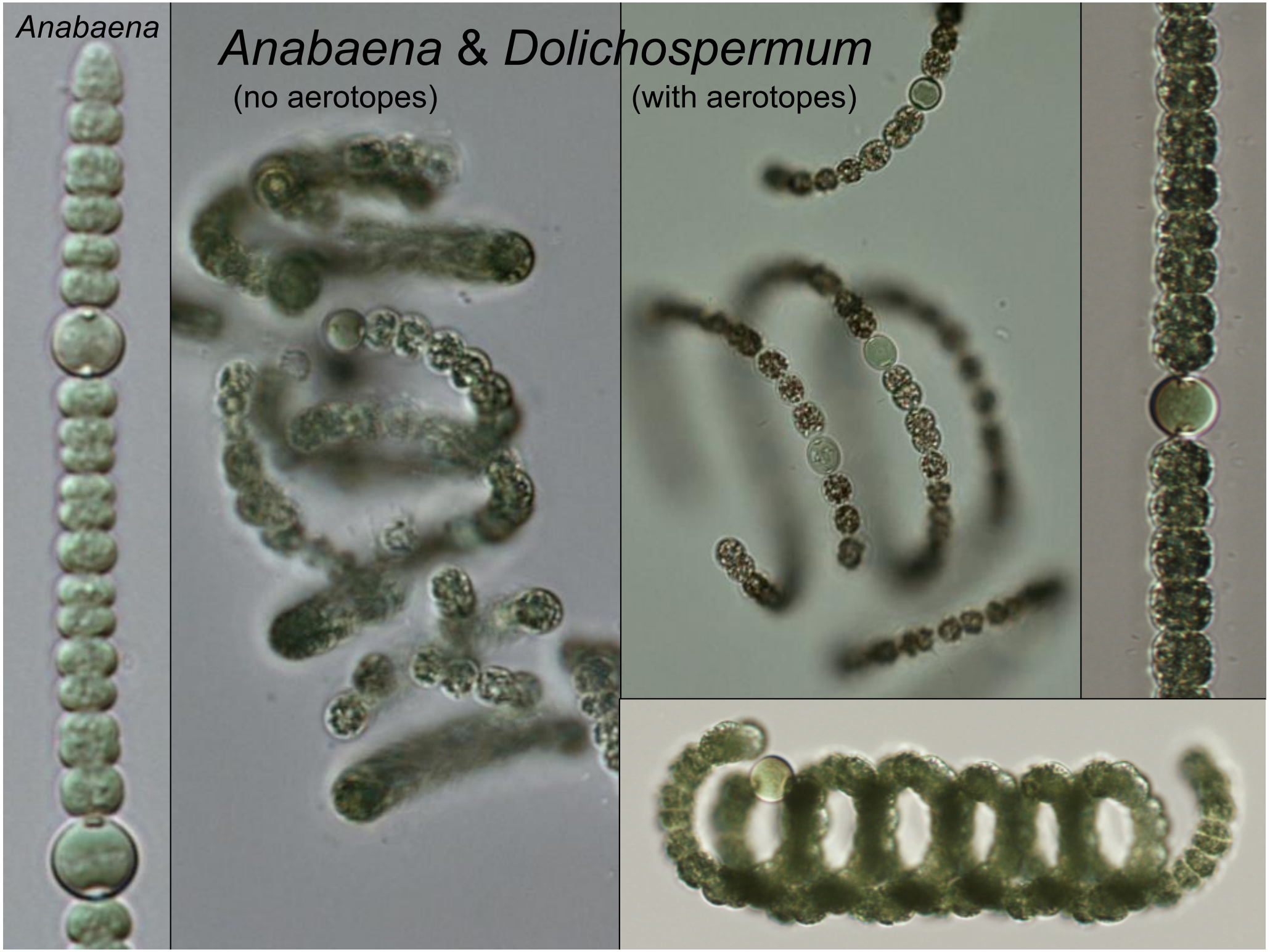
Aphanizomenon

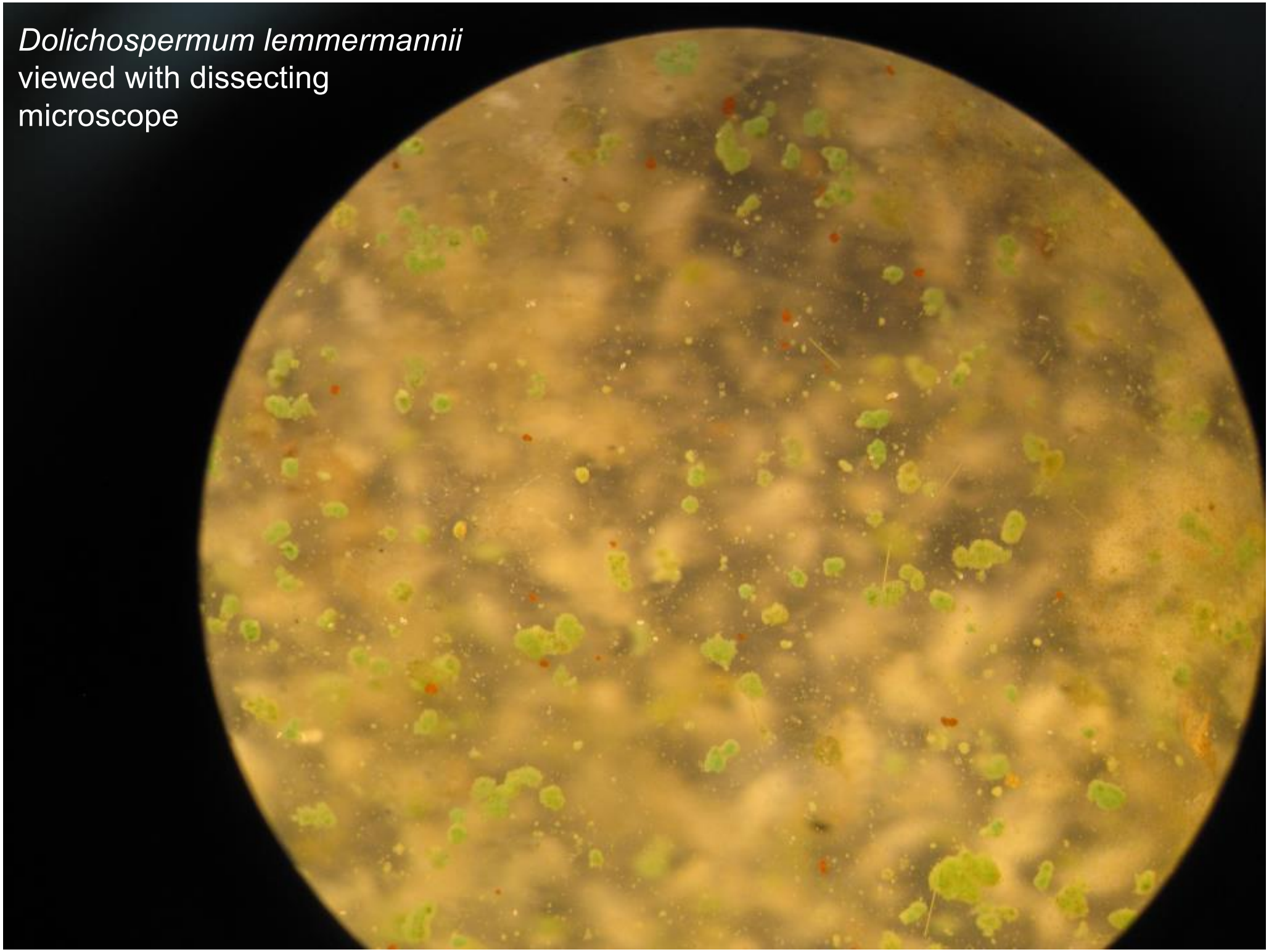
Tiny grass clippings



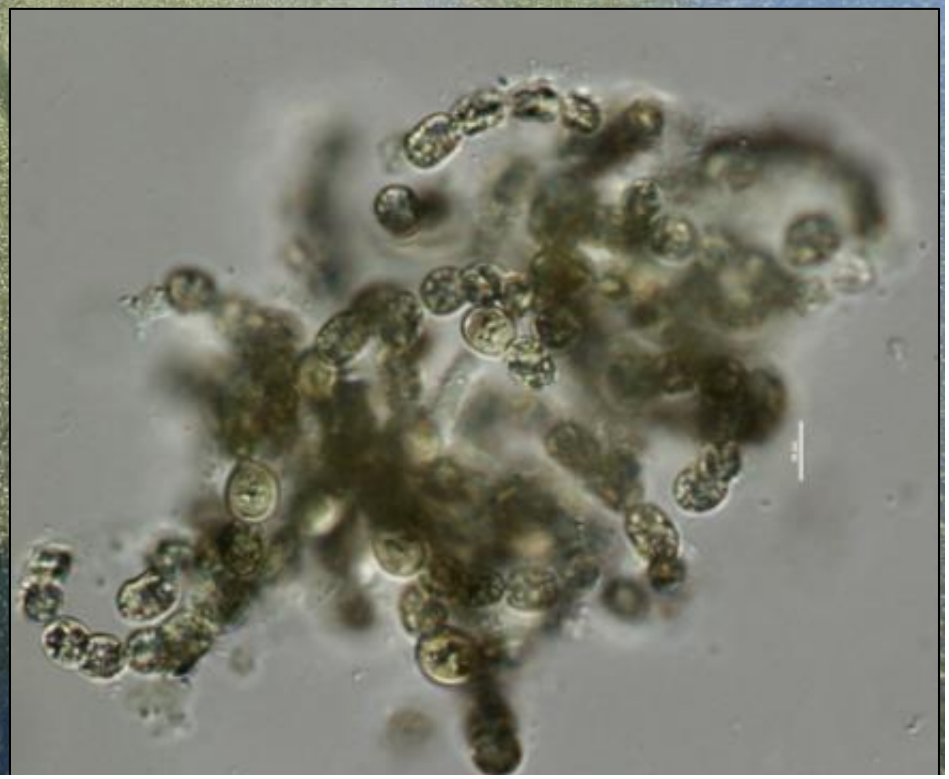
C. Carlson


Aphanizomenon
Microcystis


Anabaena
Anabaena & Dolichospermum
(no aerotopes)
(with aerotopes)

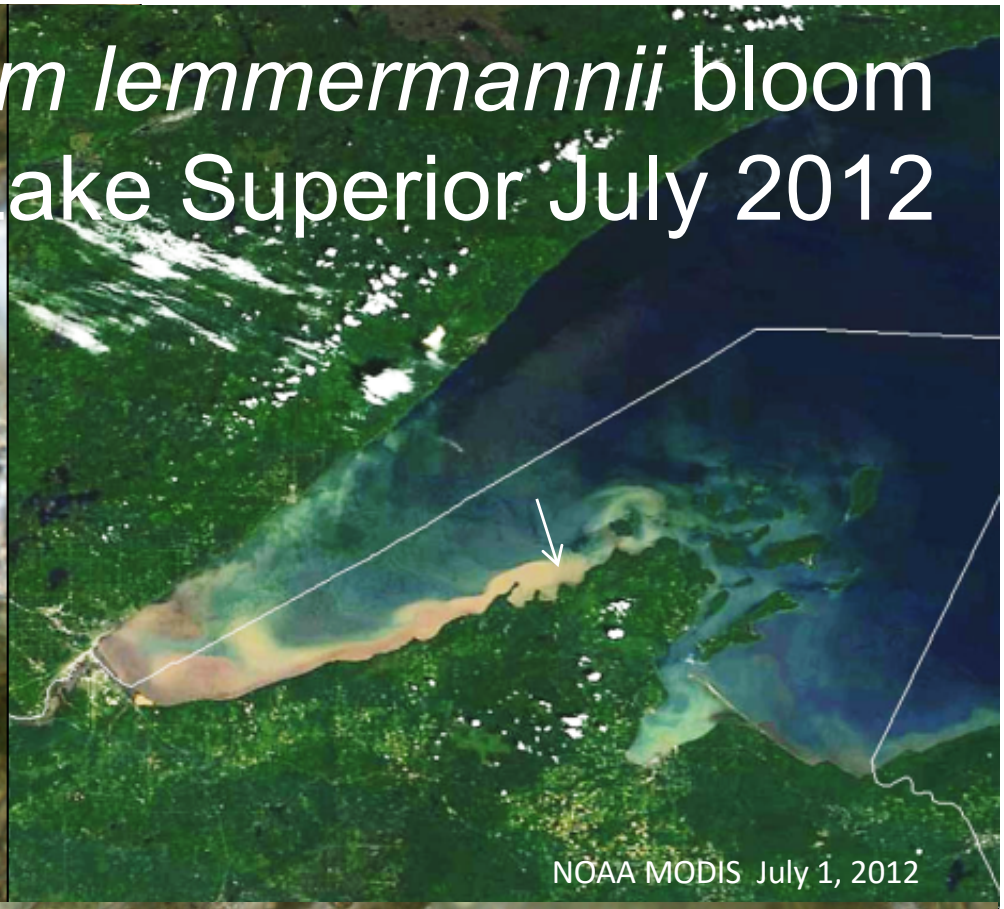

Dolichospermum lemmermannii
viewed with dissecting
microscope

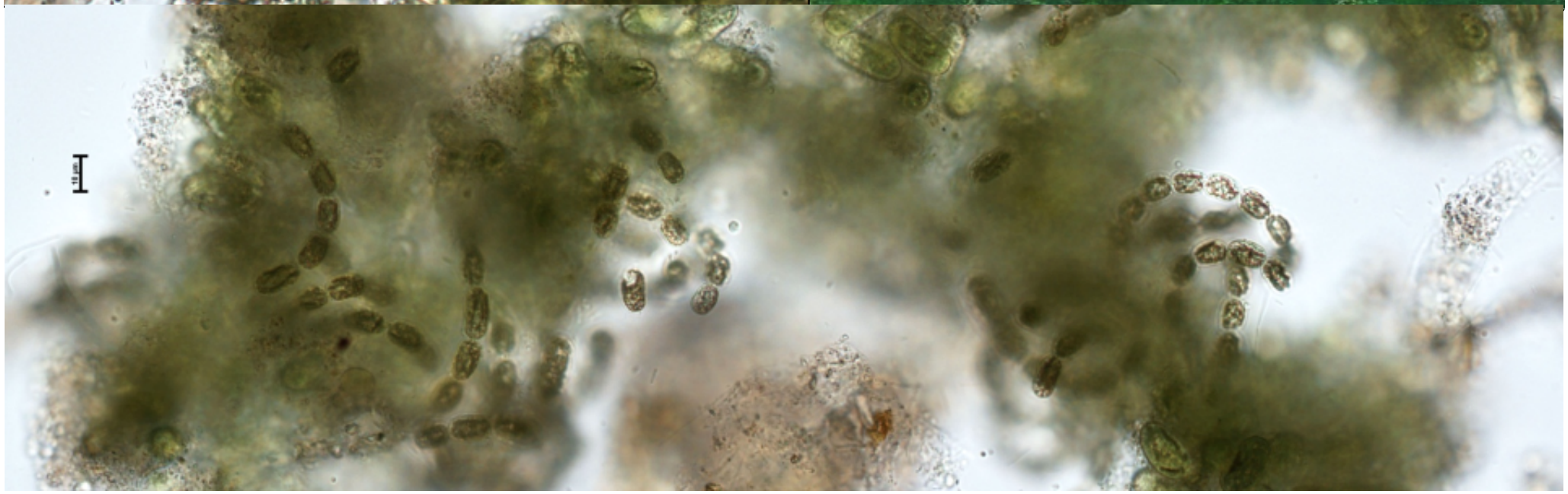
Dolichospermum lemmermannii
(previously *Anabaena*)



J. Lamers, Pickerel Chain Lake Association

Dolichospermum lemmermannii bloom Lake Superior July 2012

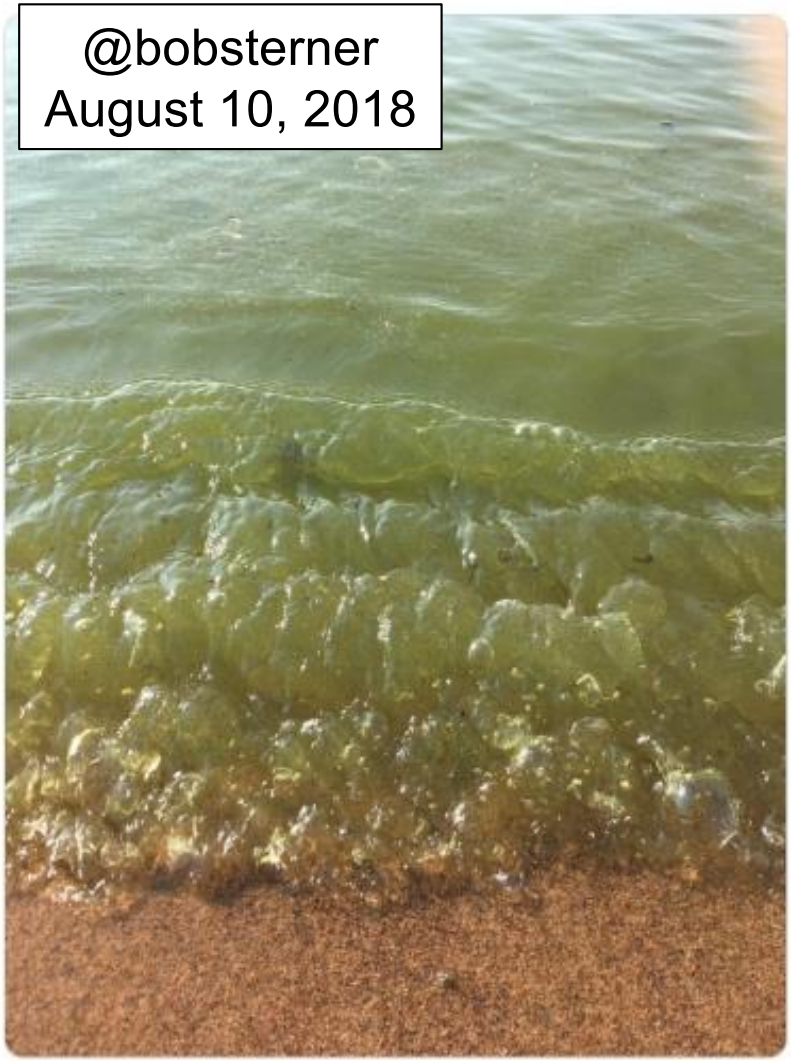




Bob Sterner
@bobsterner

Perhaps unprecedented surface algal bloom at @LakeSuperior shore at Cornucopia, WI yesterday. We are coordinating with Apostle Islands NPS to sample today. Photo by Brenda Lafrancois. Nutrients, warming, wind, what have you done?

@bobsterner
August 10, 2018



8:11 AM · Aug 10, 2018 · Twitter for iPhone

84 Retweets **102** Likes

Algae Bloom in Lake Superior Raises Worries on Climate Change and Tourism

New York Times
August 29, 2018

Scientists collecting samples of the algae. Lake Superior is one of several major bodies of water where algae blooms have drawn scientific scrutiny. Brenda Moraska Lafrancois

By Christine Hauser

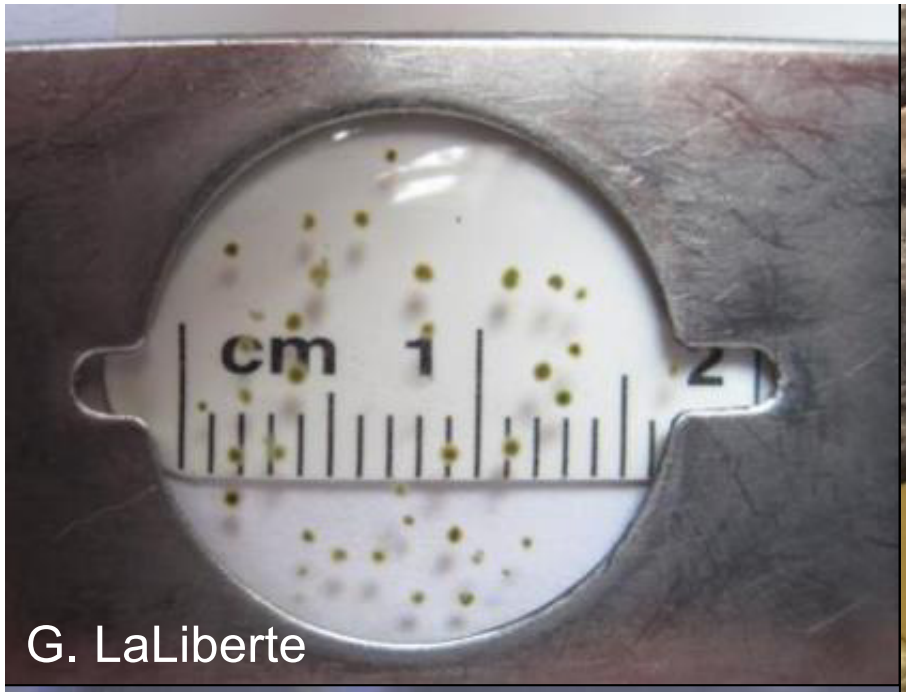
Aug. 29, 2018

In 19 years of piloting his boat around Lake Superior, Jody Estain had never observed the water change as it has this summer. The lake has been unusually balmy and cloudy, with thick mats of algae blanketing the shoreline.

Gloeotrichia echinulata

Not usually associated with toxic bloom events, although some populations have been shown to produce microcystin at low levels.
Blooms may be increasing, even in low-nutrient lakes.
Resting cells overwinter in lake sediments.

Dense *Gloeotrichia* colonies
J. Williamson, Polk County Land & Water Resources Department



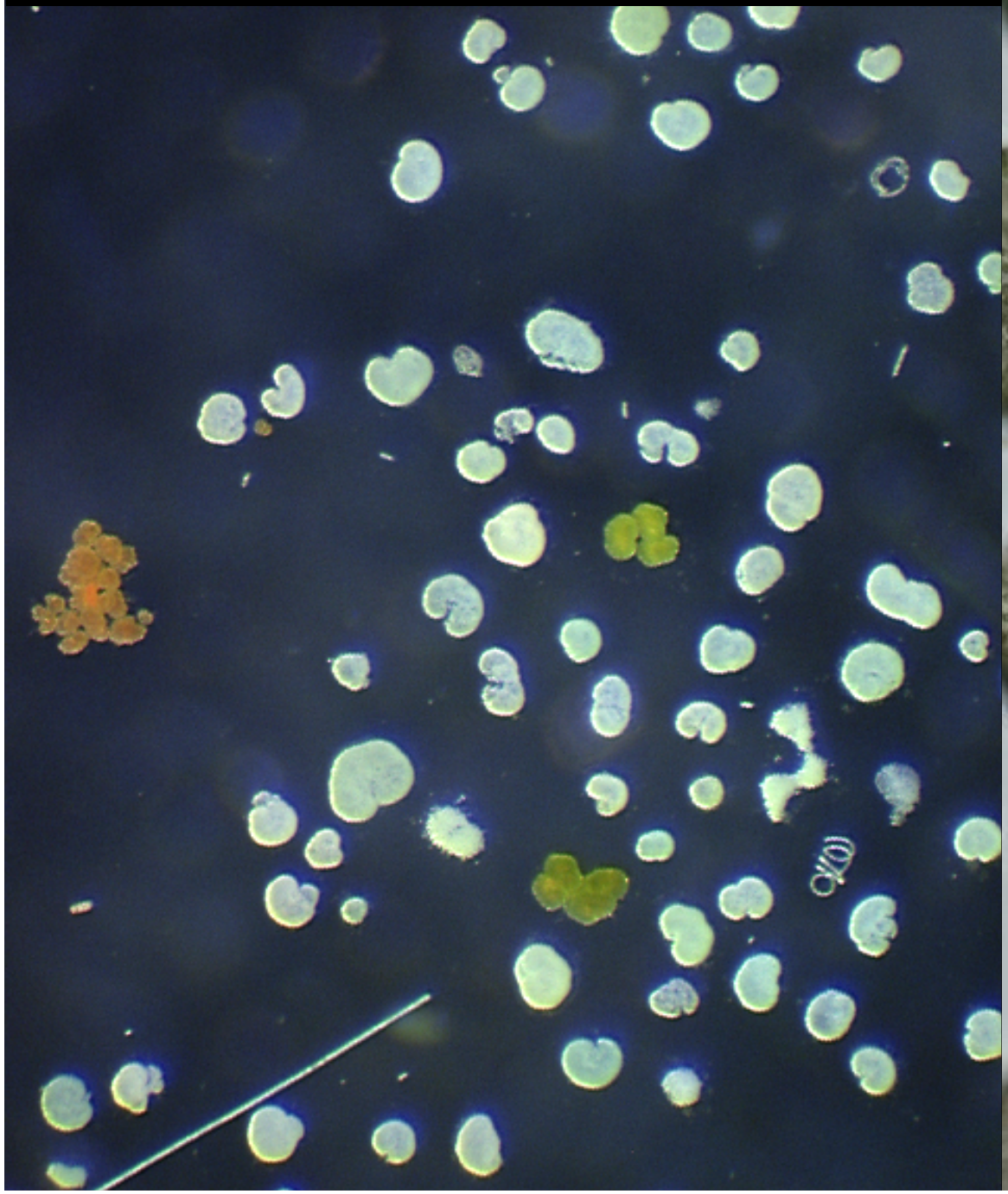
G. LaLiberte

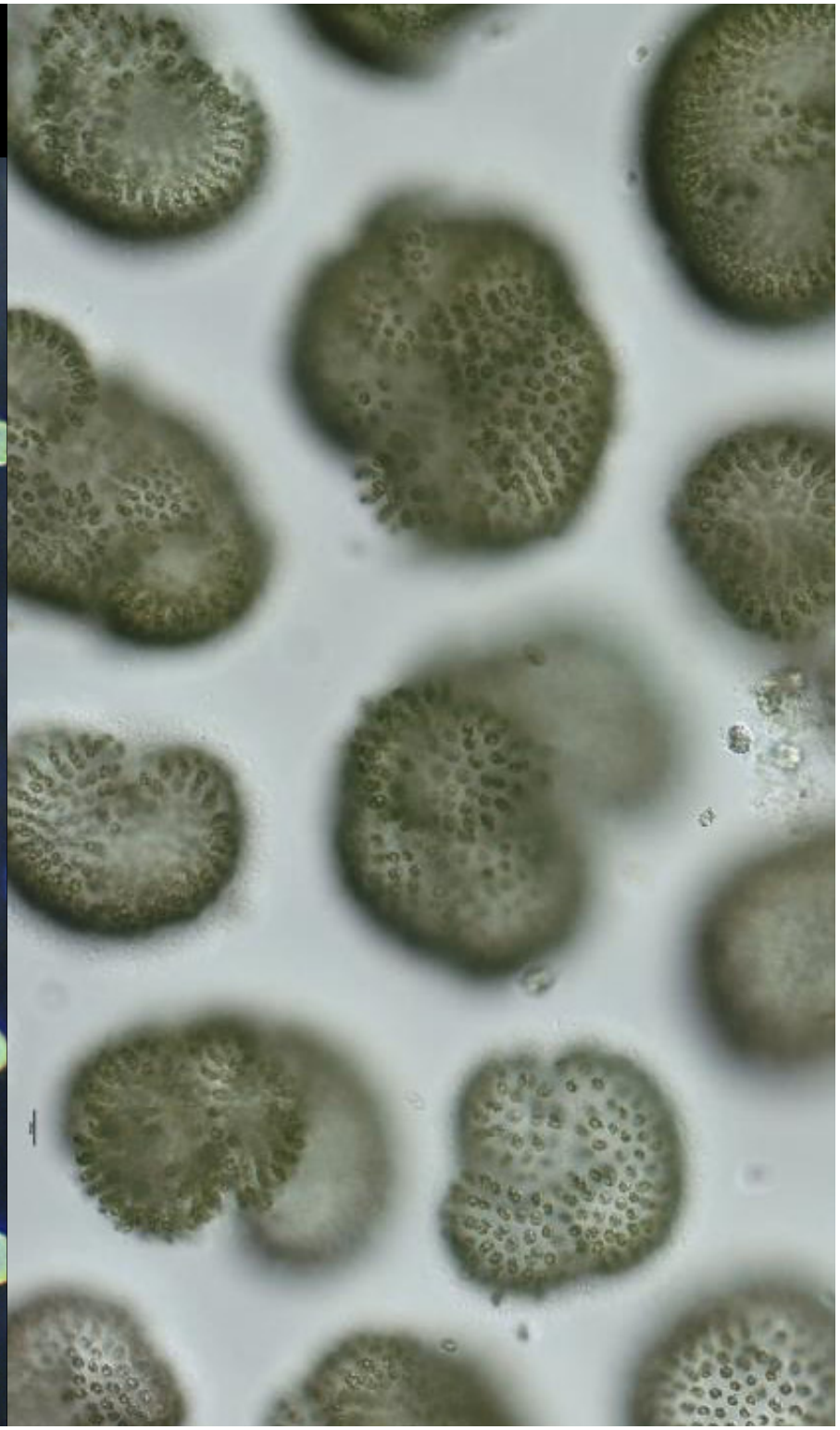

G. LaLiberte


Gloeotrichia echinulata
Clean Lakes Alliance Monitoring Volunteer

Woronichinia

(formerly *Coelosphaerium*)



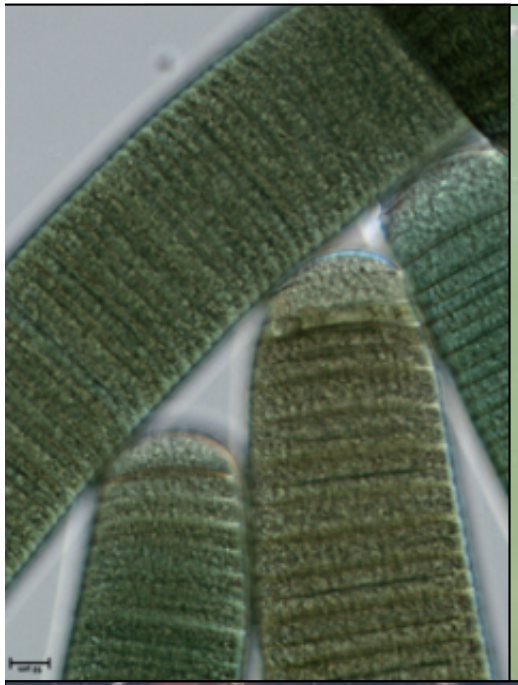


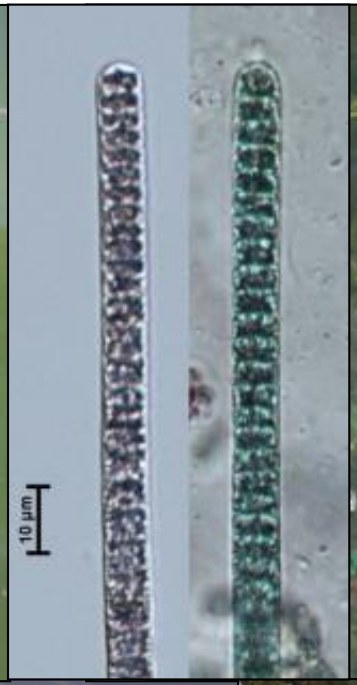
Cylindrospermopsis raciborskii

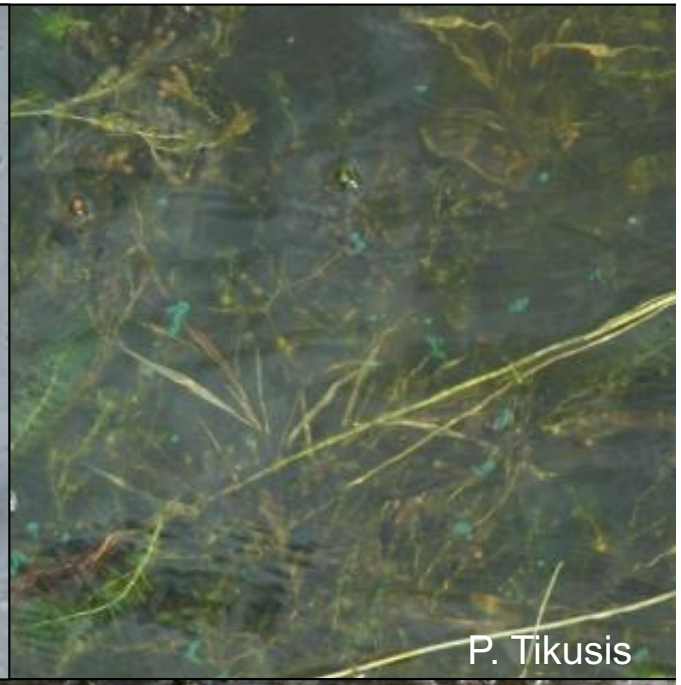
Blooms may occur at depth

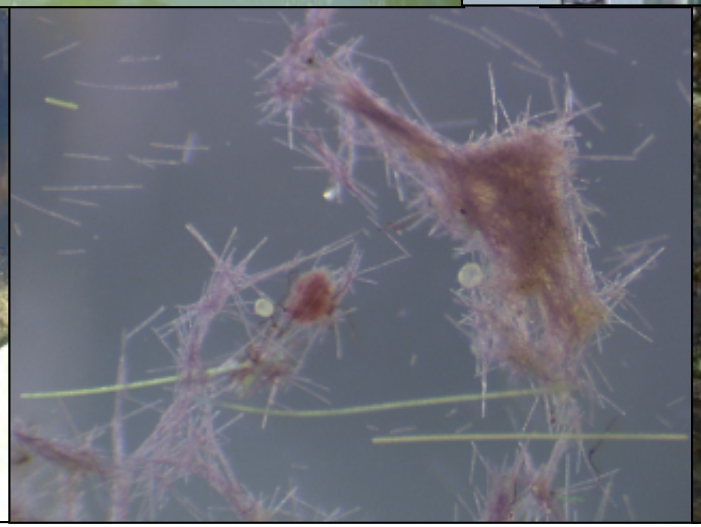
NR40 Prohibited species; subtropical but expanding its range in temperate regions

Floating Benthic Algal Mats:
Oscillatoria, Lyngbya, Plectonema, Planktothrix



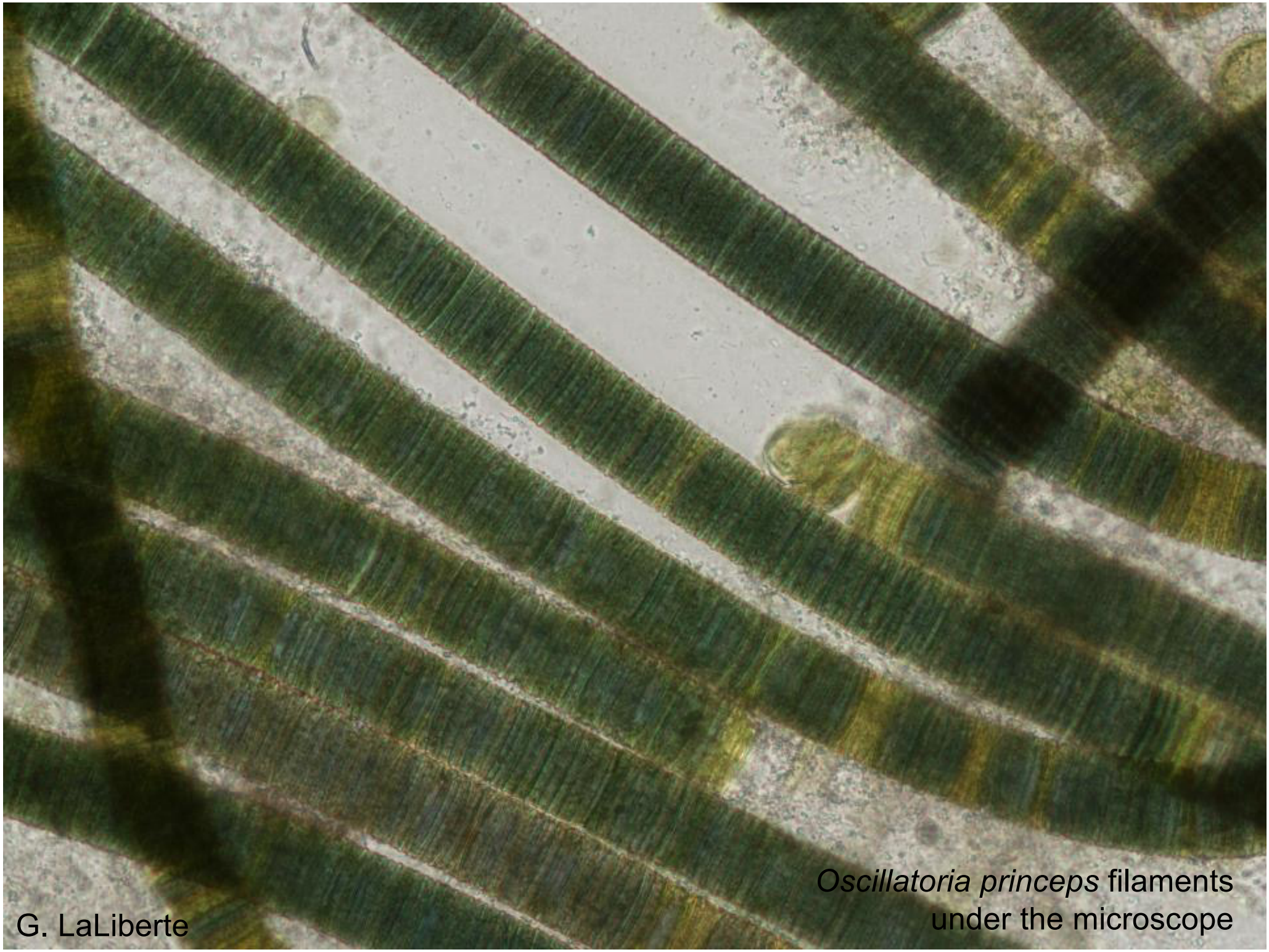






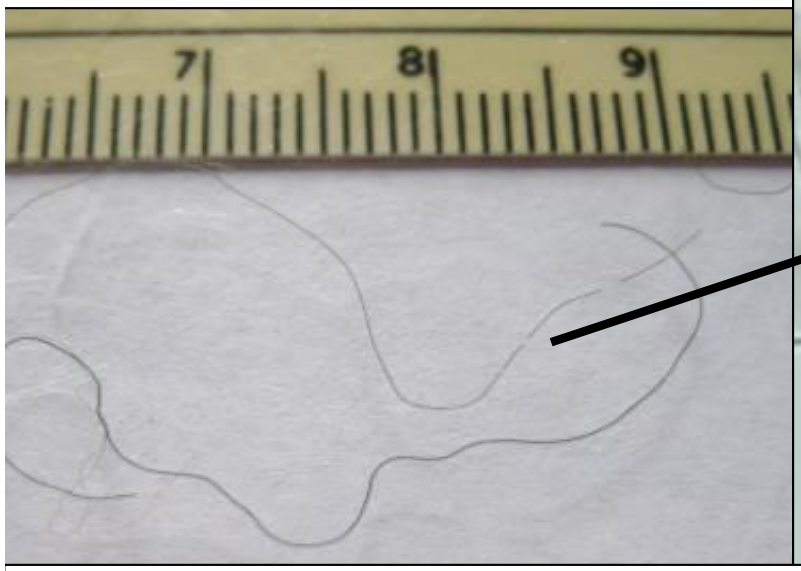

Oscillatoria princeps mats
E. Evensen

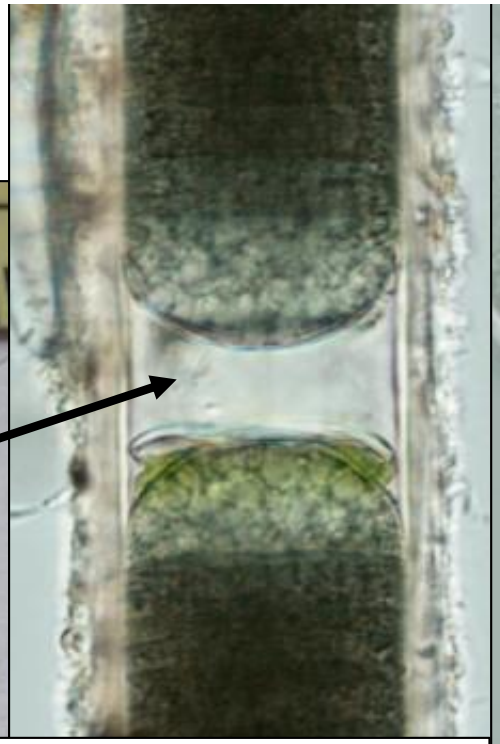

Filaments are more evident in water.
These filaments are very long for cyanobacteria – up to 10 mm.
G. LaLiberte


Oscillatoria princeps filaments
under the microscope
G. LaLiberte

Microseira wollei

(formerly *Lyngbya*, *Plectonema*)



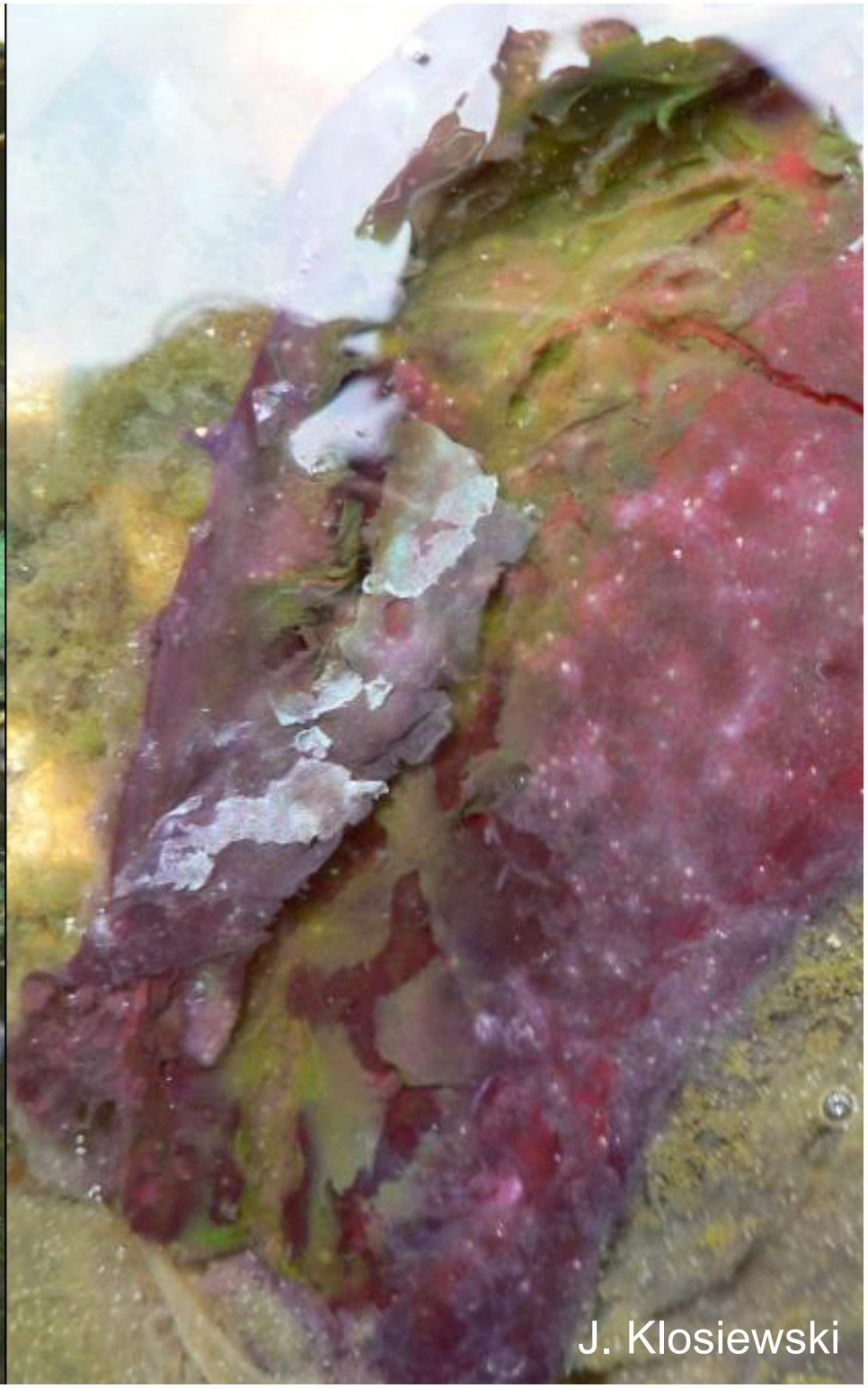


Up to several cm long - huge for a cyanobacterium.
"Breaks" are gaps between trichomes inside sheath.

False branching may occur


Microseira wollei
forming balls in Lake Erie


D. Daulton


J. Klosiewski

Possible look-alike: purple sulfur bacteria. If material is very finely granular, use a microscope to confirm identity.

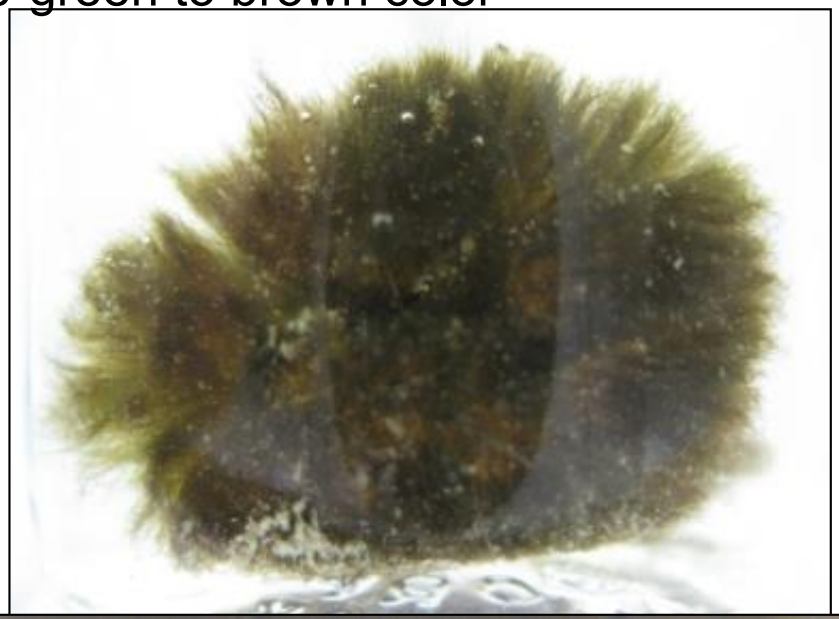
Tolypothrix

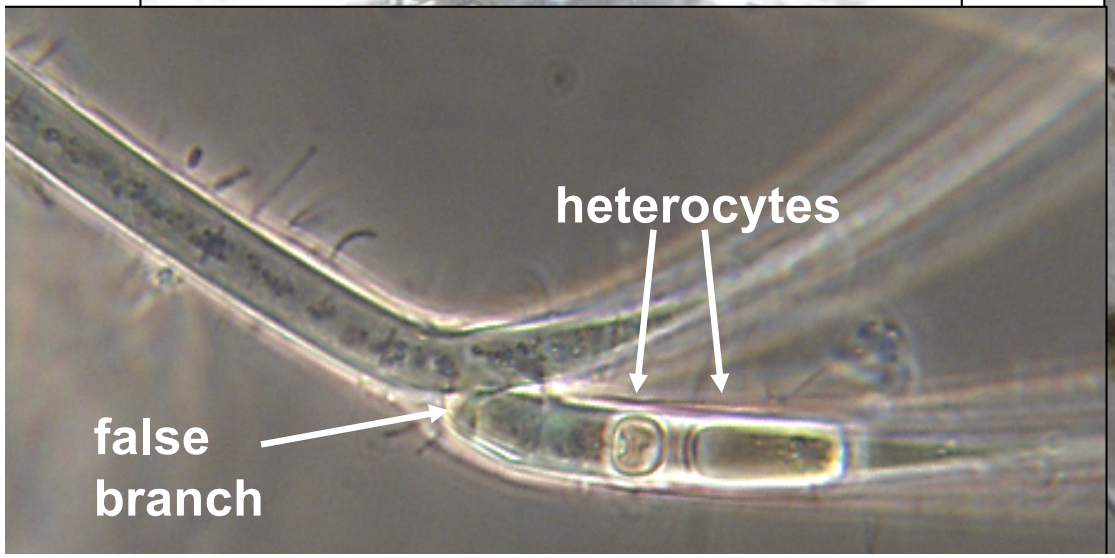
Can form balls on lake bottoms that later float to surface

Microscope needed for identification

False branching; heterocyte at branch

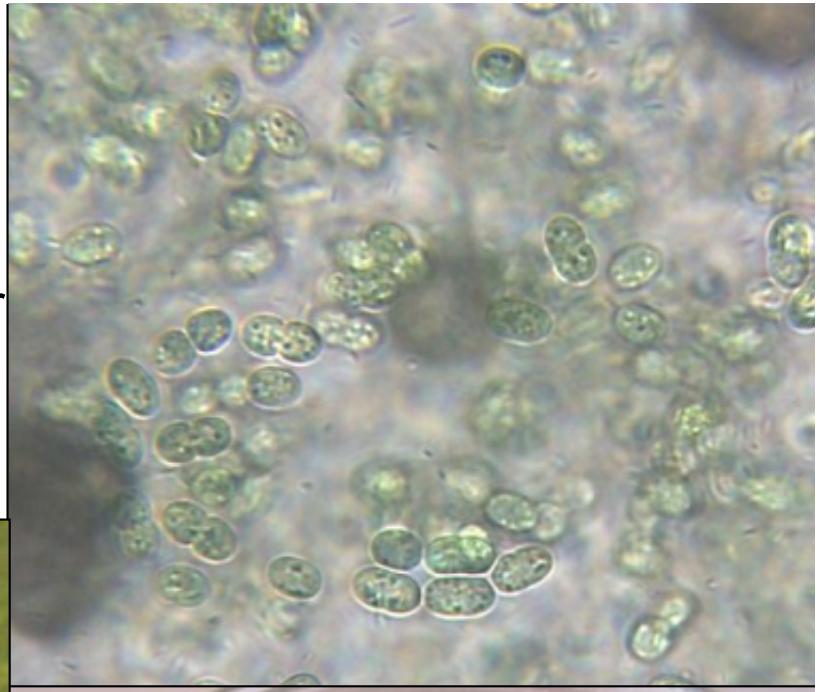
Olive-green to brown color



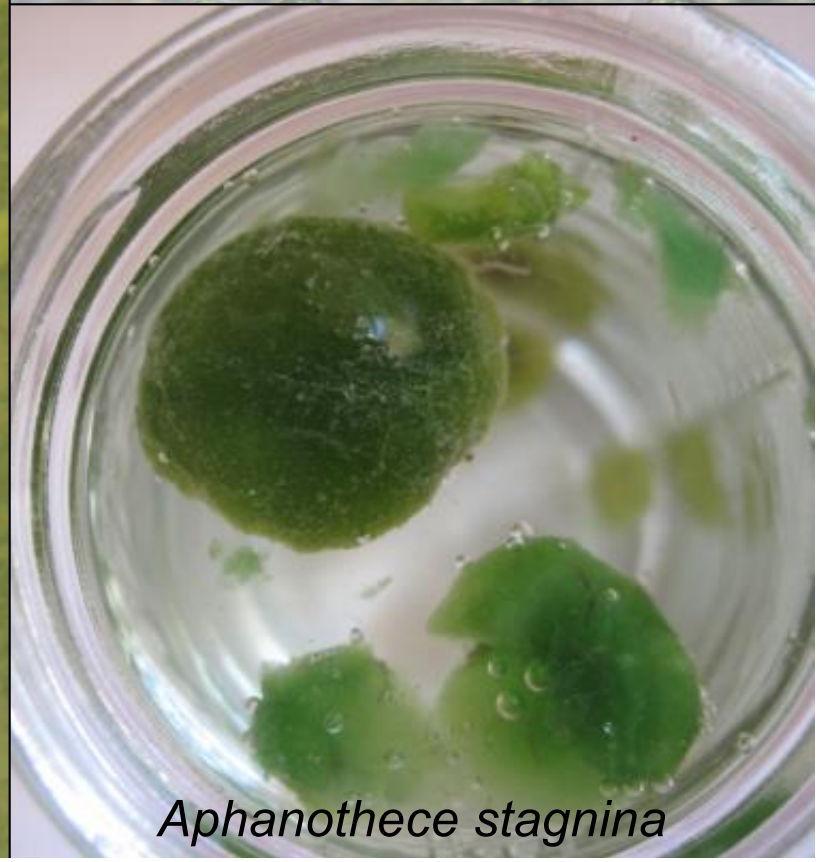



D. Blumer

Aphanothece & *Aphanocapsa*
Colonies consist of small spherical or ovoid cells
Difficult to identify to species – microscope necessary
Aphanothece stagnina:
Globular or irregular colonies up to a few cm diameter
May form large masses on lake beds, or float
May contain calcite crystals



P. Skawinski



Aphanothece stagnina


www.bio.no

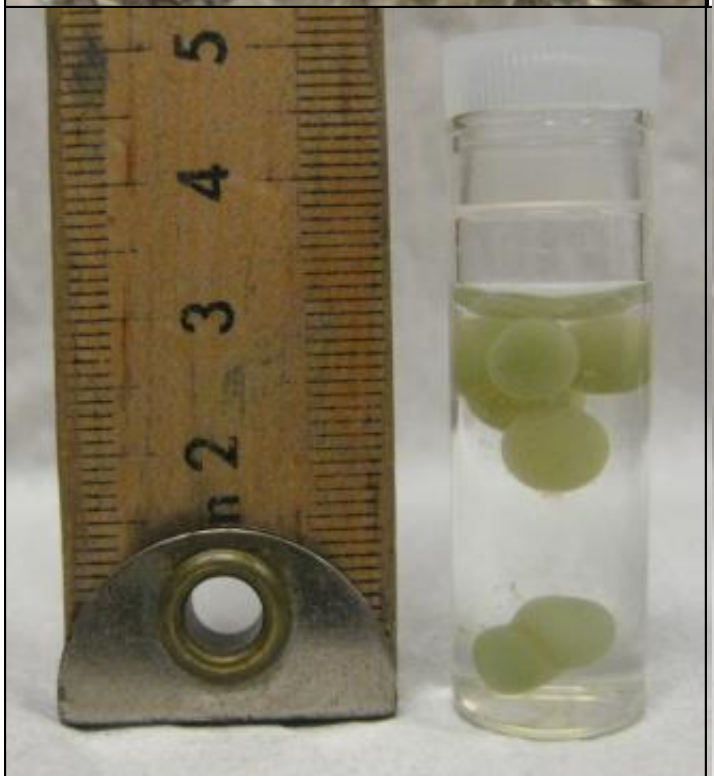
Nostoc

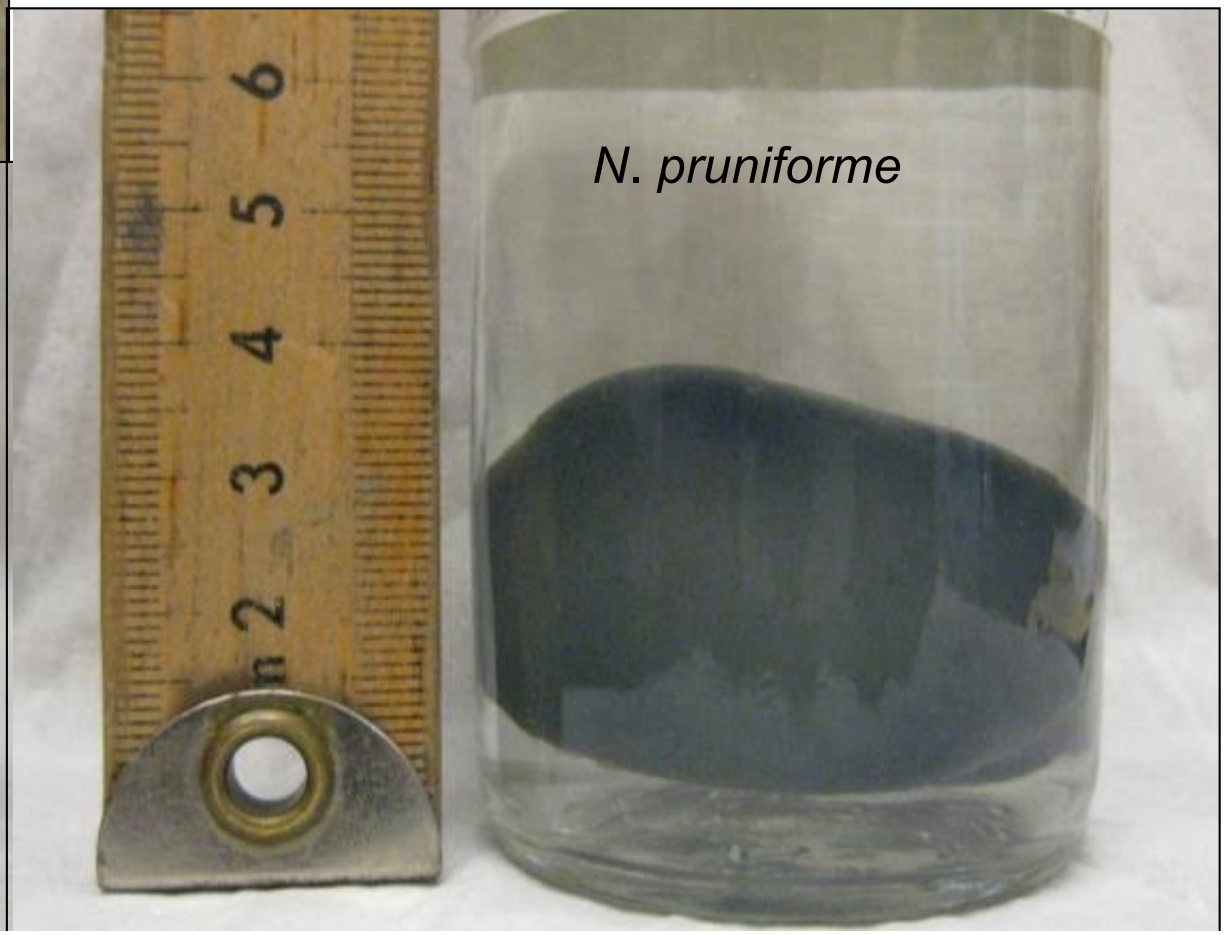
Aquatic species: pinhead to egg-size, on lake bottom or floating

N. pruniforme: “lake plums,” “mare’s eggs”

Colonies consist of unbranched filaments in a firm gelatinous matrix

Filaments have heterocytes – *Nostoc* uses them to fix atmospheric nitrogen





Nostoc zetterstedtii: “lake blackberries”
Rare! Red-list species in Europe
Prefers *Lobelia* & *Isoetes* lakes (oligotrophic, clear water)
Replaced by *N. pruniforme* as lake water becomes more eutrophic

Please let me know if you find *N. zetterstedtii* or *N. pruniforme*! Gina.LaLiberte@wisconsin.gov

Nostoc commune

Terrestrial!

Star jelly, witches' butter
French: Crachat de lune
(moon spit)

Outer mucilage layer
often dark yellow

Black and crispy when
dehydrated
Rehydrates & is more
noticeable after rain

COULD BE MISTAKEN FOR NOSTOC: *Ophrydium versatile*

Colonial protozoan

Internal symbiotic algae (*Zoochlorella*) give colonies their green color

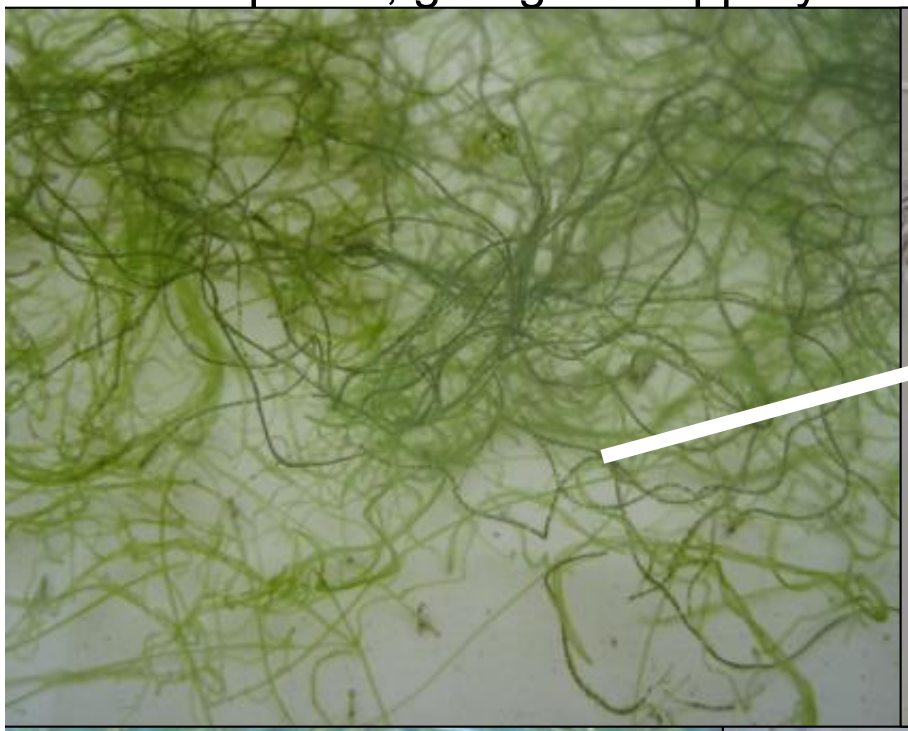
Soft, gelatinous texture

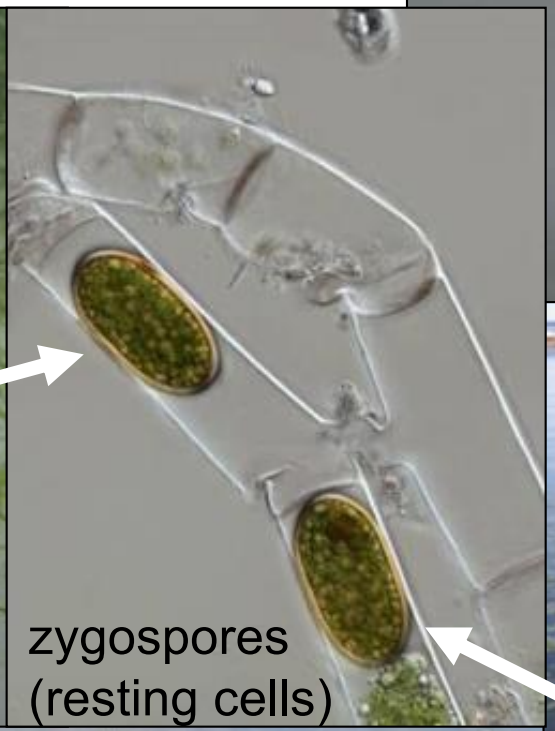
Colony may be attached to plants, on the lake bottom, or broken free and floating


Beyond the Look-Alikes:
Algae Common in Wisconsin

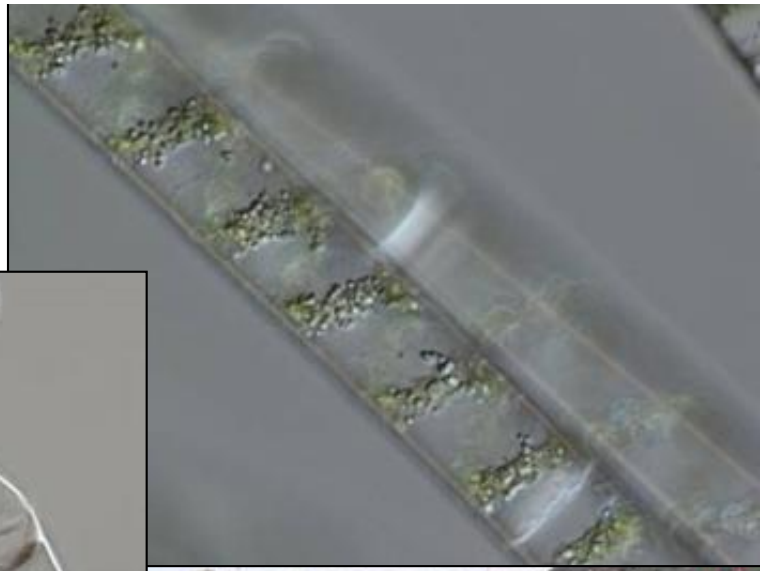

Unbranched Green Filamentous Algae
(Chlorophyta)

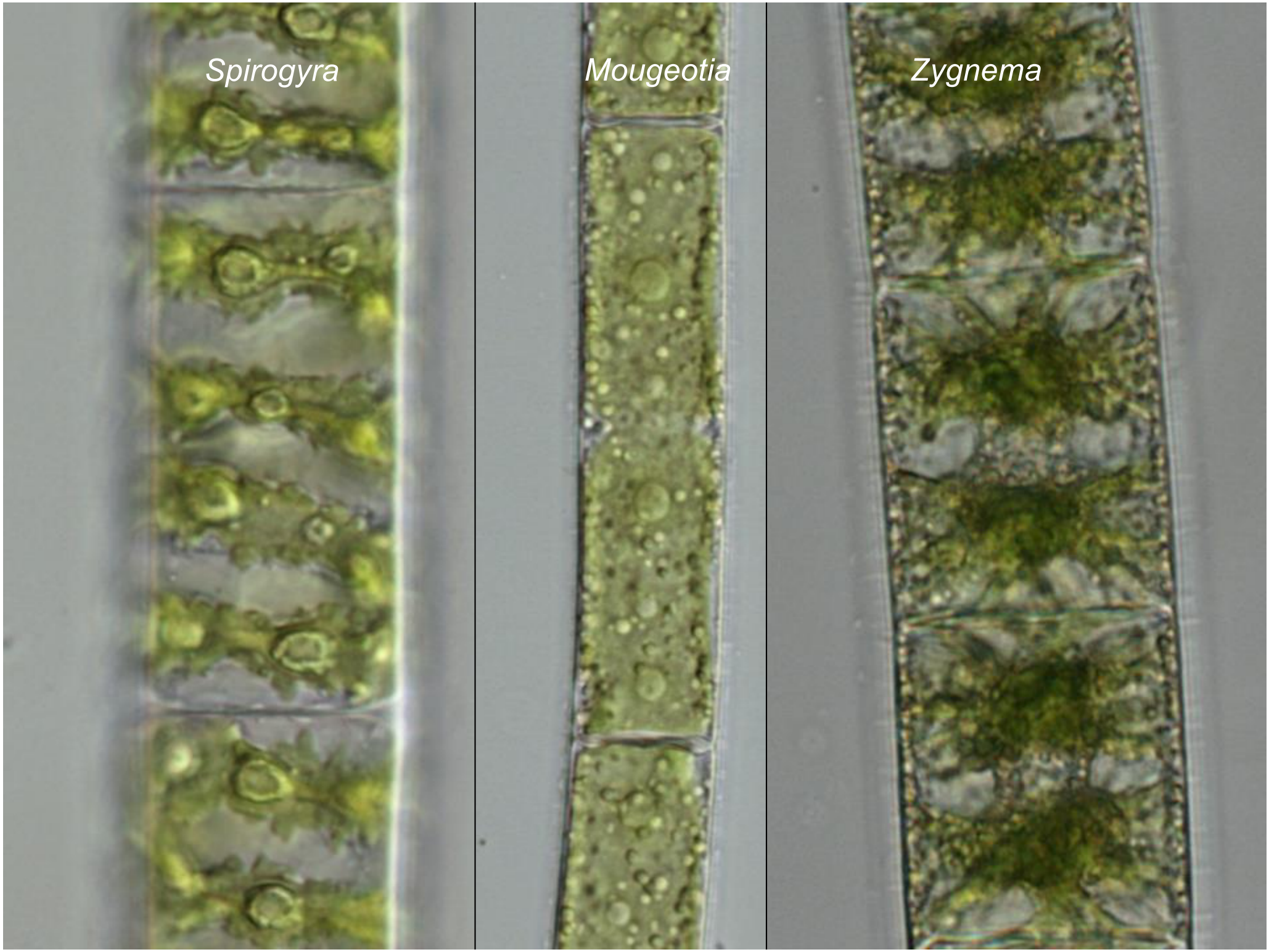
Unbranched filamentous green algae:
Spirogyra and relatives *Mougeotia & Zygnema*
"water silk," "frog spit"
Secretes pectin, giving it a slippery texture





zygospores
(resting cells)



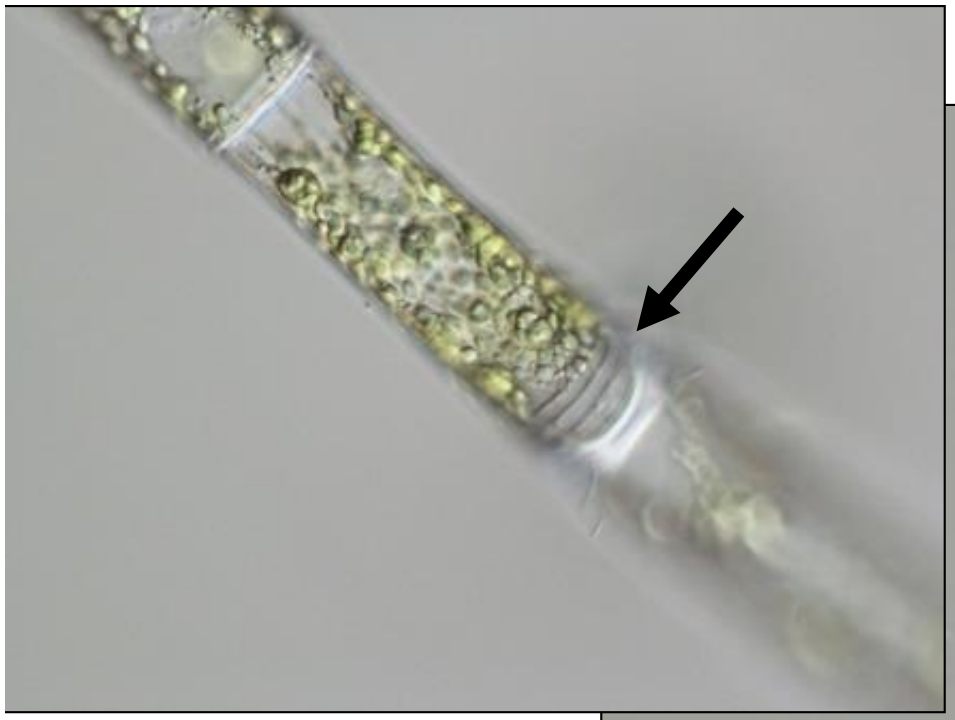

Spirogyra
Mougeotia
Zygnema

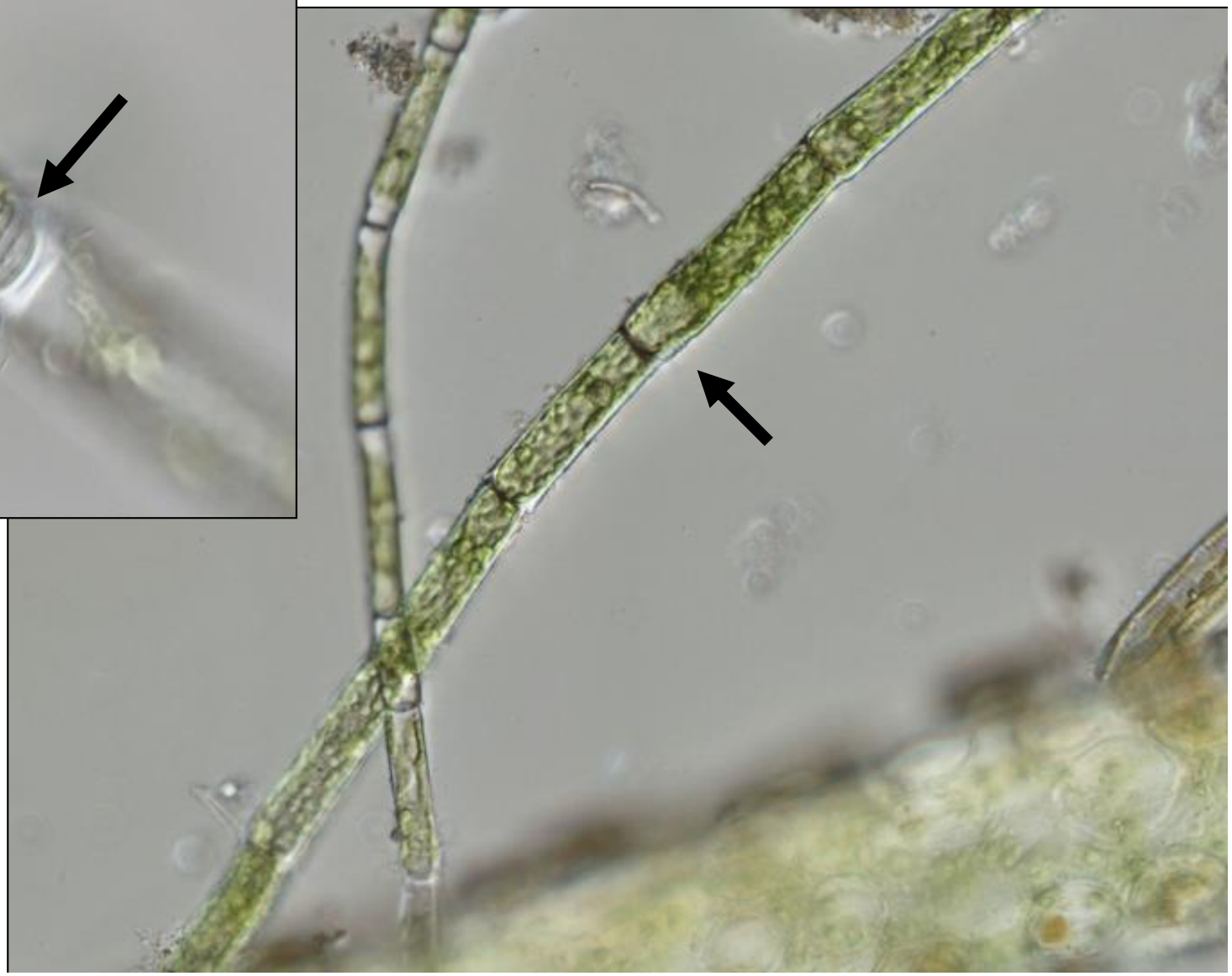
Unbranched filamentous green algae: *Oedogonium*

Often covered with epiphytic algae and mixed in with other filamentous greens

Microscope needed for identification

Rings of apical caps from cell division are a key diagnostic feature

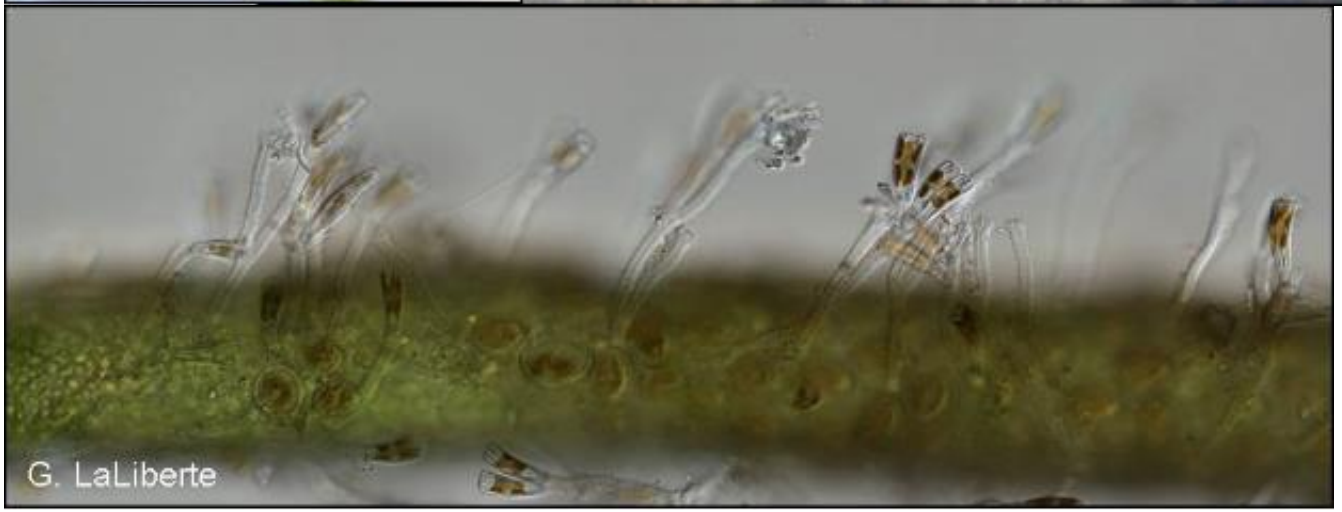





Branched Green Filamentous Algae
(Chlorophyta)

CHLOROPHYTA: *Cladophora*

Microscope needed for identification, but cottony, highly branched greens on hard substrates are usually *Cladophora*. Some large, coarse species have few branches.



Older portions are often covered with algal epiphytes. Diatoms make it appear to be a golden-brown color.

CHLOROPHYTA: *Cladophora* & *Rhizoclonium*

Microscope needed for identification

Phenotypically plastic so they are difficult to identify to species

Cladophora species with minimal branching are confused with related *Rhizoclonium*

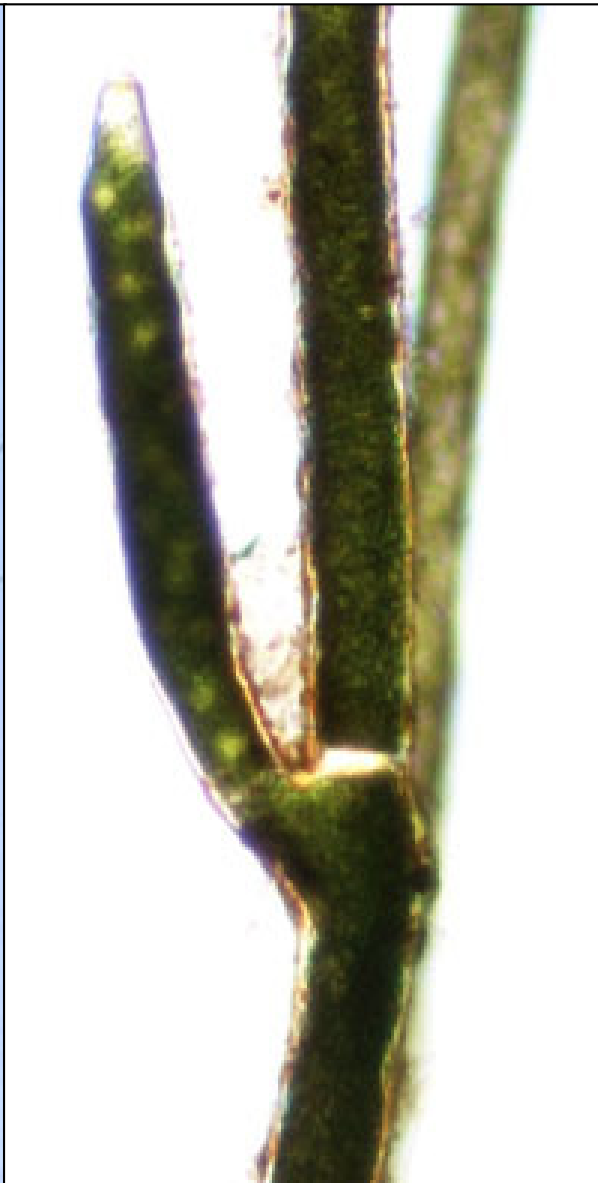
Often entangled with macrophytes or forming nuisance growths

Large, coarse filaments (>40 μm diameter) are most likely *Cladophora*

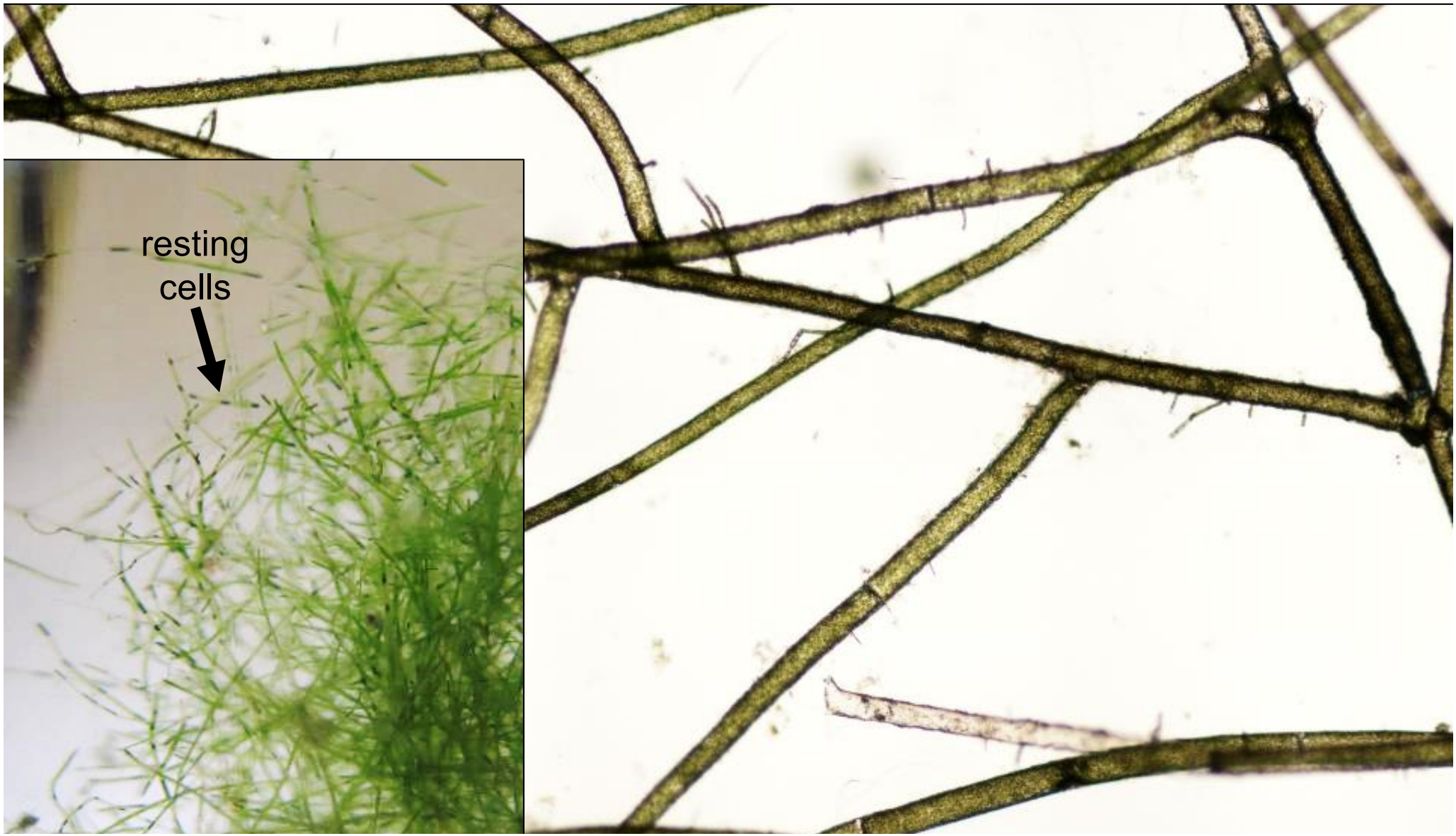
CHLOROPHYTA: *Aegagropila linnaei*

(formerly *Cladophora profunda* var. *Nordstedtiana*, *Cladophora aegagropila*)

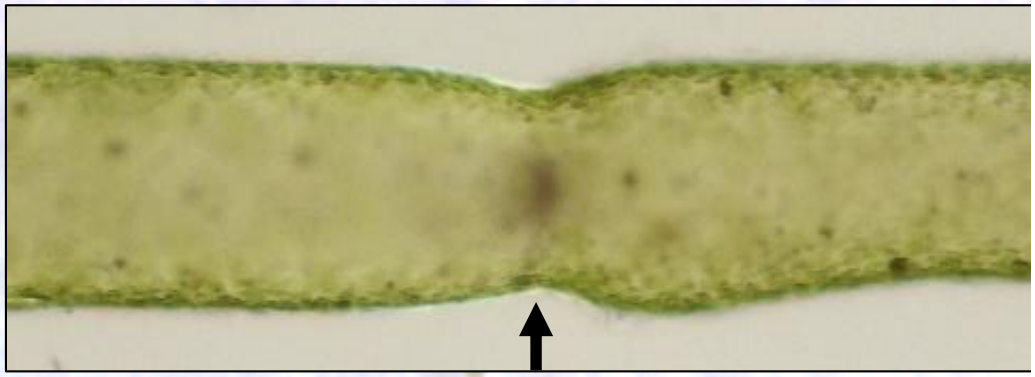
Coarse, branched, somewhat crispy texture. Side branches are lateral and subterminal. May form round “lake balls” (*marimo* in Japanese) from rolling around on lake bottoms.



CHLOROPHYTA: *Pithophora* Also known as “horsehair algae.”
Microscope needed for identification. Branching and coarse, rough texture.
Branches are at right angles and cells are long. Resting cells appear as dark ovals.
Notorious for forming nuisance growths floating or entangled in macrophytes.



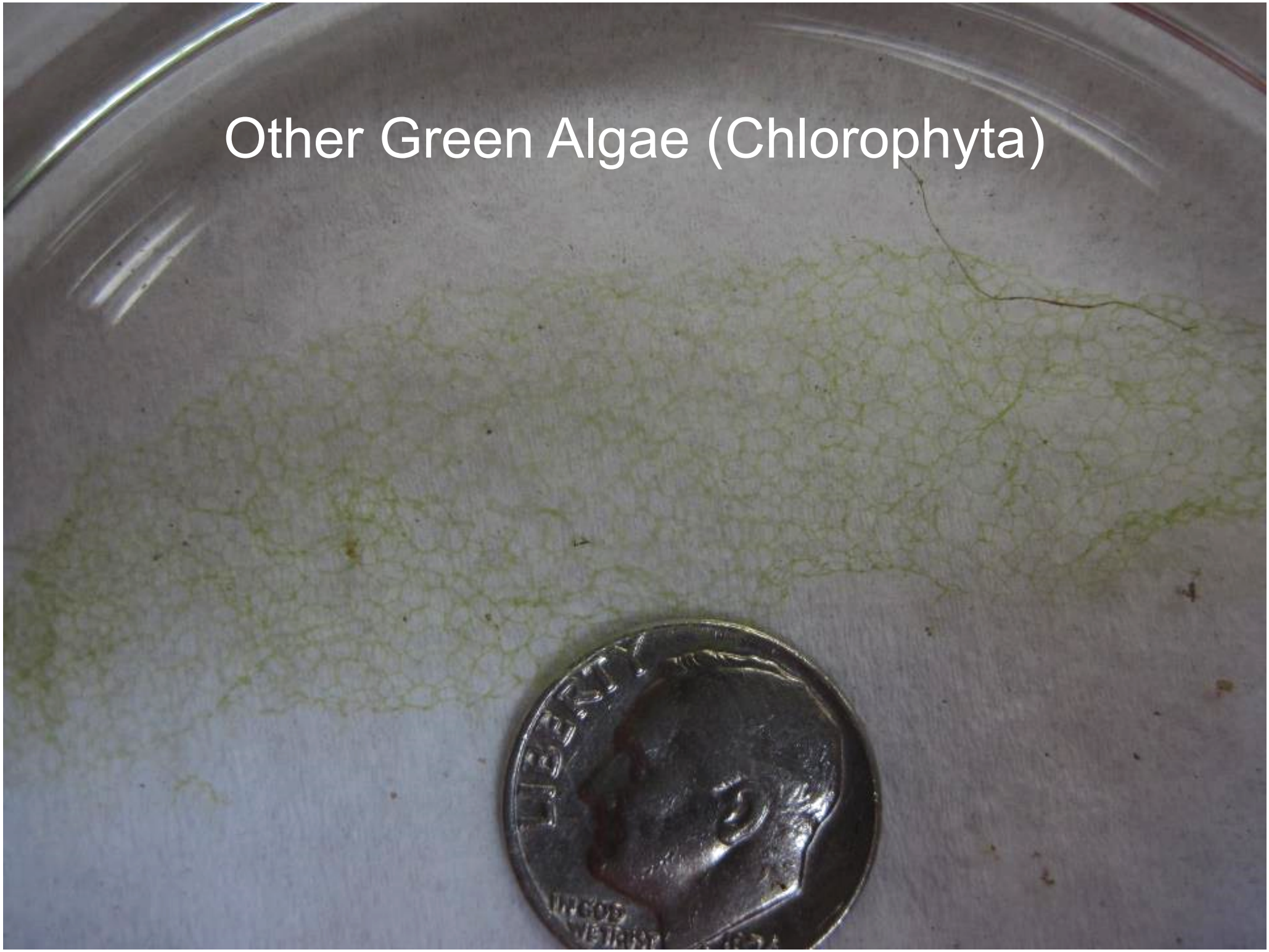
CHLOROPHYTA: *Dichotomosiphon tuberosus*



Filaments lack true crosswalls and have only constrictions with “pinched” appearance.

Branches are in pairs at constrictions in filaments.

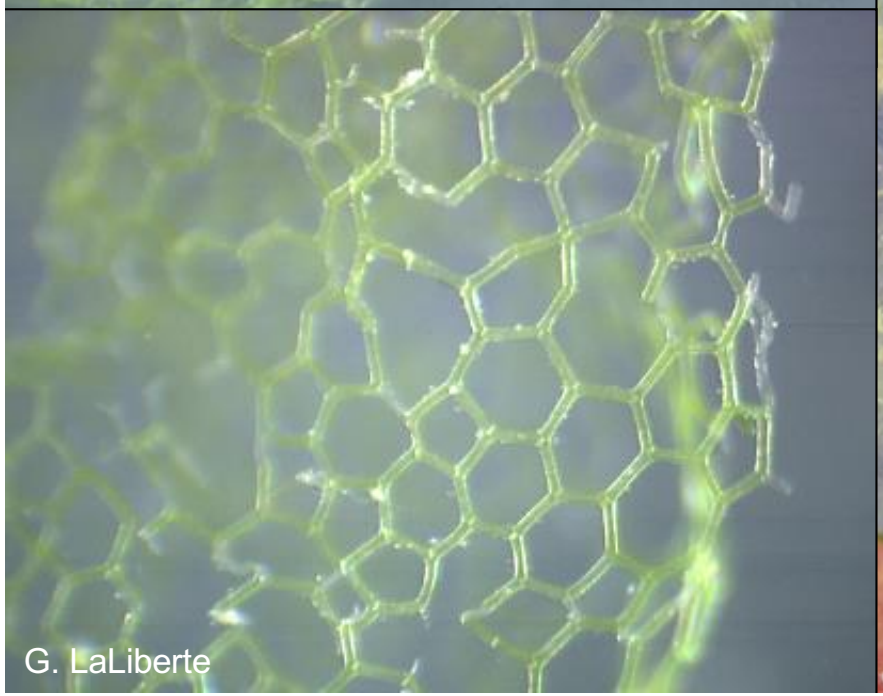
Other Green Algae (Chlorophyta)



CHLOROPHYTA: *Hydrodictyon reticulatum* "Water net"

Each cell can grow into another colony.

Prefers high pH.



CHLOROPHYTA: *Chaetophora*

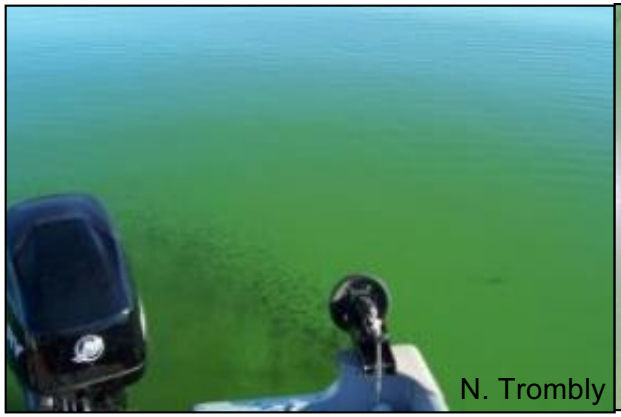
Small, firm, gelatinous lumps which are difficult to compress; can take a branched form

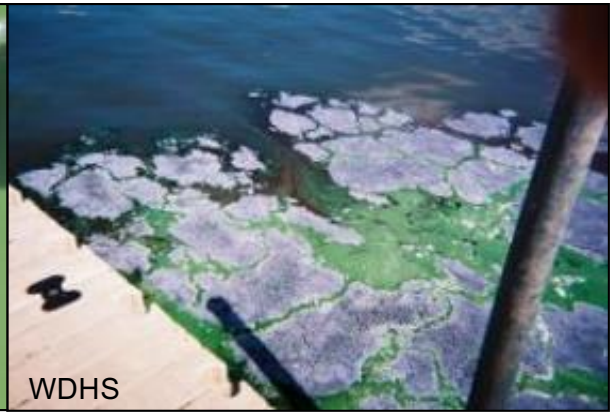
Commonly attached to plants in lakes, especially rushes

Branching can be seen with a microscope

What We Know: Exposure Routes & Toxins

- Ingestion, inhalation, skin exposure
- Liver & kidney toxins: microcystin & cylindrospermopsin
- Neurotoxins: anatoxins and saxitoxin
- Dermatotoxins: lipopolysaccharides
- **Not all cyanobacteria make toxins, and toxins are not made all the time.**
- **You can't tell if toxins are present by looking at a bloom.**

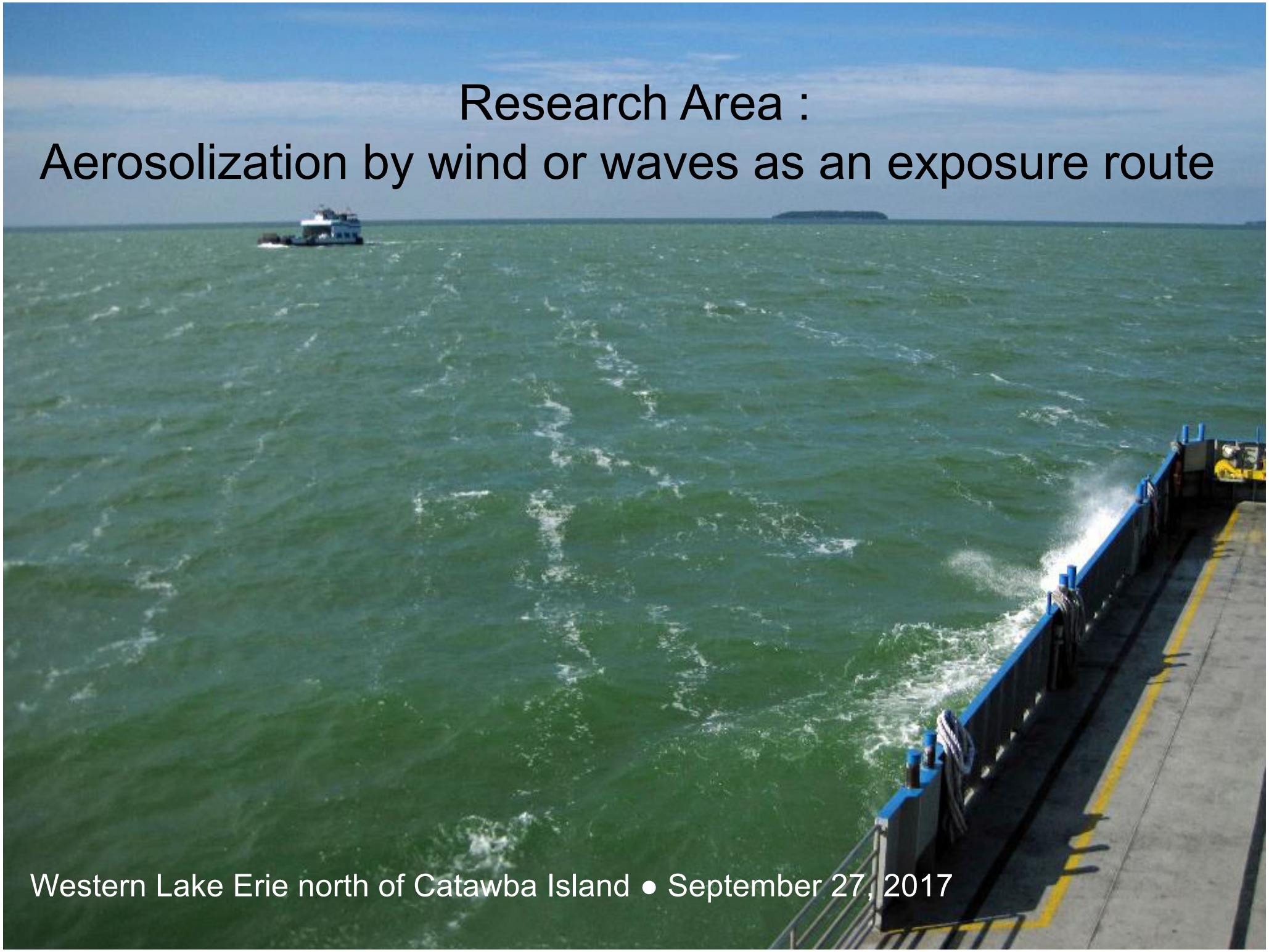




Research Area: Fish Consumption

- Not all of the health risks from cyanotoxins in fish are currently known.
- Toxins may accumulate in organs, so only eat fillets.
- Rinse fillets well with clean water before cooking or freezing.
- Fish from waters with recurring blooms may have off-flavors from taste & odor compounds.
- Oregon Heath Authority fact sheet: https://tinyurl.com/yywwbvdp (search for “Oregon Health fishing algae”)

Research Area :
Aerosolization by wind or waves as an exposure route



Western Lake Erie north of Catawba Island ● September 27, 2017

Research Area : β-*N*-methylamino-L-alanine (BMAA)

Non-protein amino acid

Hypothesized link to neurodegenerative diseases via chronic exposure.

Other environmental exposures may play a role.

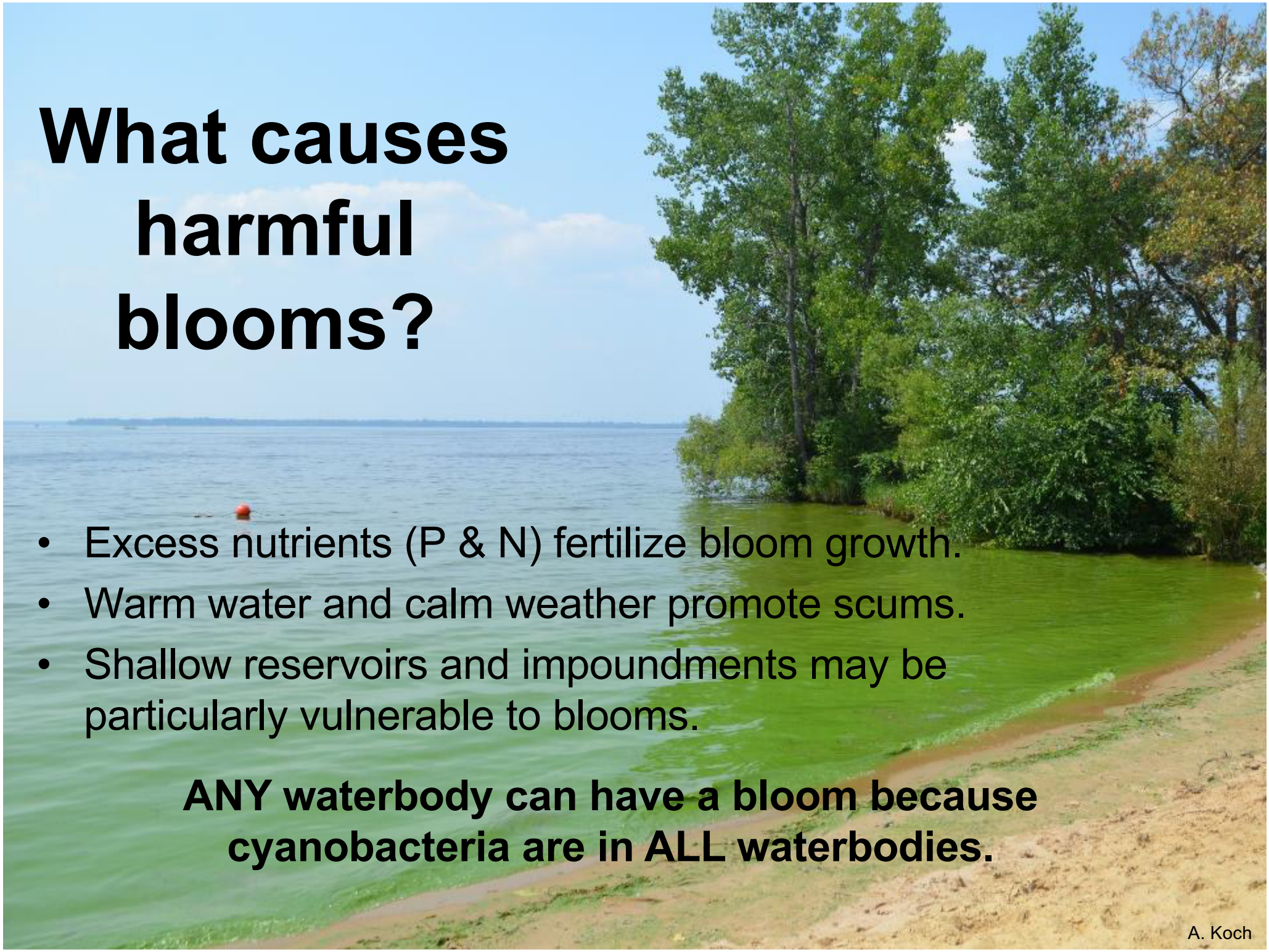
There may be a genetic component to vulnerability - Cox 2009

Not all evidence supports link to neurodegenerative diseases.

Some exposure studies use levels beyond what is environmentally relevant.

Reviewed in Chernoff *et al*. 2017 tinyurl.com/y5sx3u2l

What causes harmful blooms?



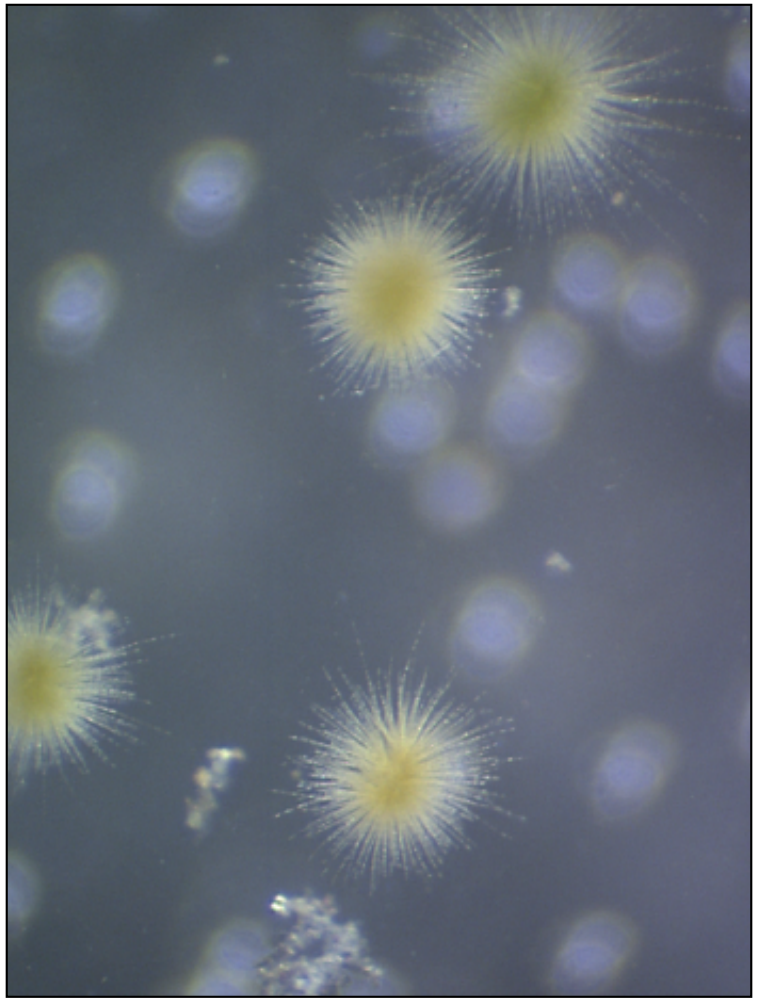
- Excess nutrients (P & N) fertilize bloom growth.
- Warm water and calm weather promote scums.
- Shallow reservoirs and impoundments may be particularly vulnerable to blooms.

ANY waterbody can have a bloom because cyanobacteria are in ALL waterbodies.

A. Koch

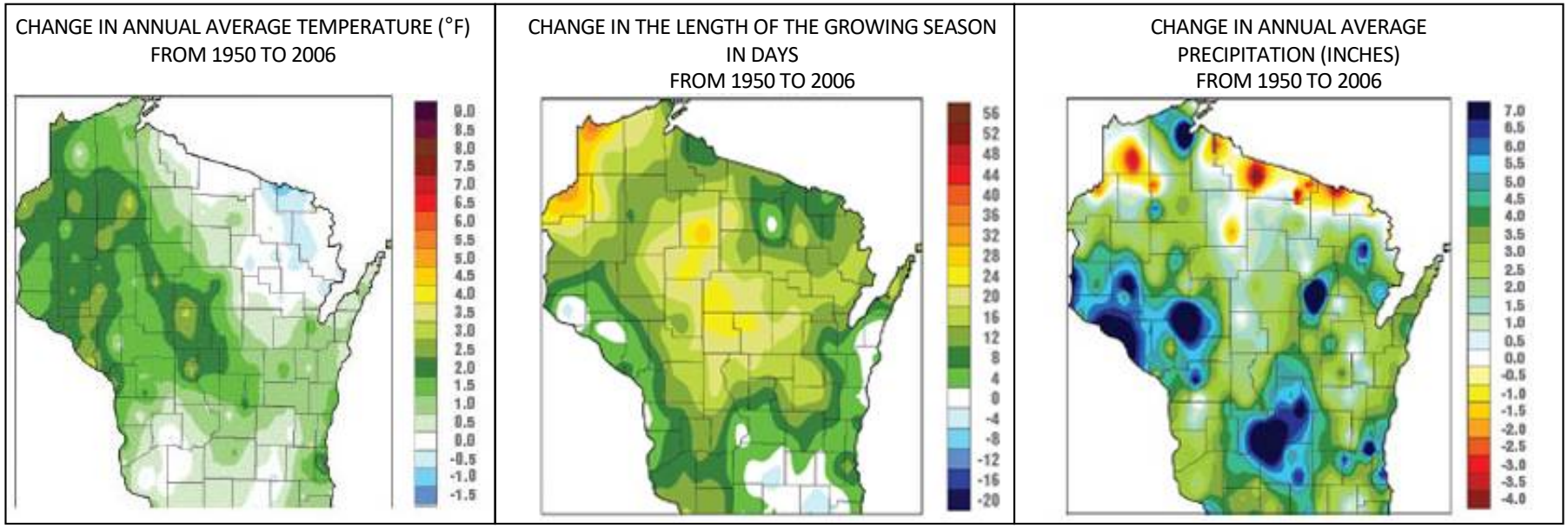
The details are more complicated…

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



"Favorable environmental conditions"
– Mark Vander Borgh, NCDENR

Are blooms more frequent?



- Yes – worldwide evidence
- Heavy rains & snowmelt: extra nutrients
- Drought –lower, warmer water
- Earlier warming & extended warming may lead to blooms

Figures from Wisconsin Initiative on Climate Change Impacts 2011: *Wisconsin's Changing Climate: Impacts and Adaptations*

How do I get rid of it?

Chemical treatment usually not permitted – killed cells can release toxins in 1 big dose.

Other “solutions” are often ineffective or treat the symptom, not the cause.

Reduce nutrient input, but internal loading can continue to fuel blooms.

Methods should be supported by peer-reviewed science and address effects on non-target organisms.

T. Johnson

Toxins

- We have a good idea of what common planktonic species contain strains that can make toxins.
- We know much less about uncommon or infrequently occurring species.
- About 2700 described species worldwide.
- Research carefully – unless you know the full story, inadequate information may cause you undue concern.

How to tell if it's safe?

- What does the water look like?
- Can you see your feet?
- How does it smell?
- For pets, does the water look like something YOU would want in your mouth?

- Has there been a recent heavy rain? (higher bacteria levels)

Who is at risk

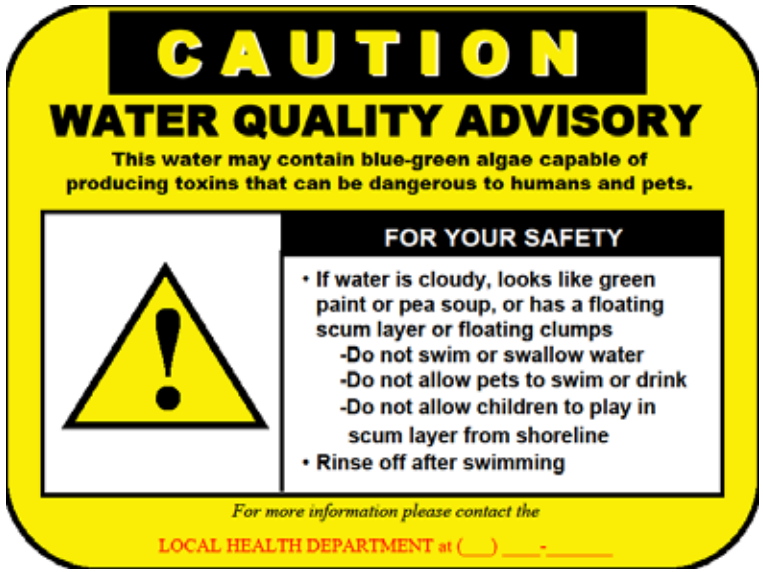
- Children, especially small children.
- People with compromised immune systems.
- People with allergies may have greater sensitivity.
- Animals.

Can I do my own testing?

- Yes – Wisconsin State Laboratory of Hygiene
- Keep in mind blooms may change significantly between time of collection and when results are available – concentration, toxin production
- Posting advisories should be left to public health officials

Who issues advisories?

Chapter 254.46 Beaches. The department or a **local health department** shall close or restrict swimming, diving and recreational bathing if a human health hazard exists in any area used for those purposes on a body of water and on associated land and shall require the posting of the area.



DNR has the responsibility for advisories at State Park and State Forest properties.

US EPA Recreational Guidelines

Recreational Advisory Levels for Cyanotoxins	
Microcystins (MC)	**Cylindrospermopsin (CYN)**
8 µg/L	15 µg/L

Swimming Advisory: not to be exceeded on any day
(also dually proposed as Ambient Water Quality Criteria)

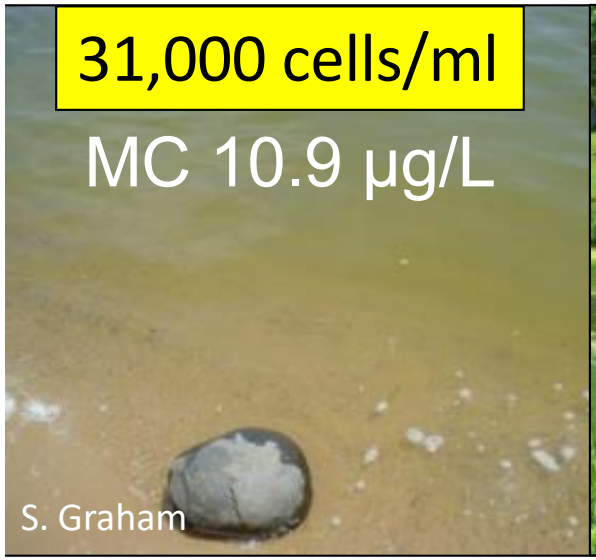
- Based on toxins' effects on target organs (liver, kidney), not on acute effects (e.g., allergic reactions, vomiting, diarrhea).
- Take children's smaller size into account.
- Not enough data to determine cell densities or pigment levels (chlorophyll or phycocyanin) correlated with these toxin concentrations.

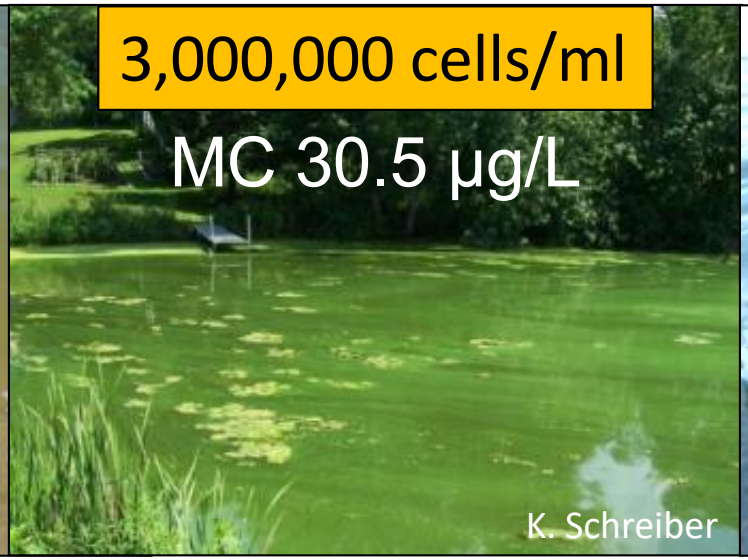
https://www.epa.gov/wqc/recreational-water-quality-criteria-and-methods

WHO Recreational Guidelines

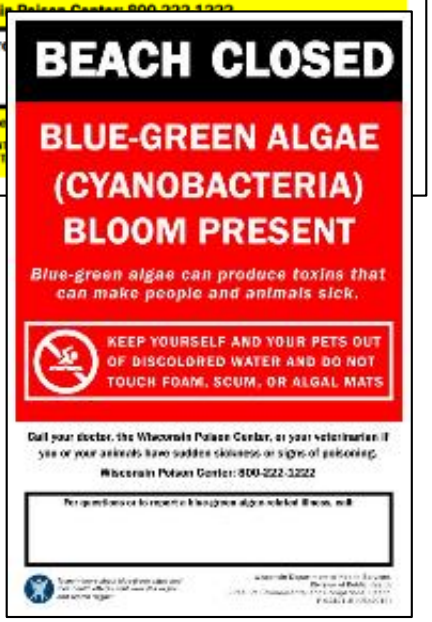
Probability of Adverse Health Effects	Cell Density (cells/ml)	Microcystin-LR (µg/L)	Chlorophyll (µg/L)
Low	< 20,000	< 10	< 10
Moderate	20,000-100,000	10 – 20	10 – 50
High	100,000-10,000,000	20 – 2,000	50 – 5,000
Very High	> 10,000,000	> 2,000	> 5,000

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





Signs for tribal & local public health and other agencies

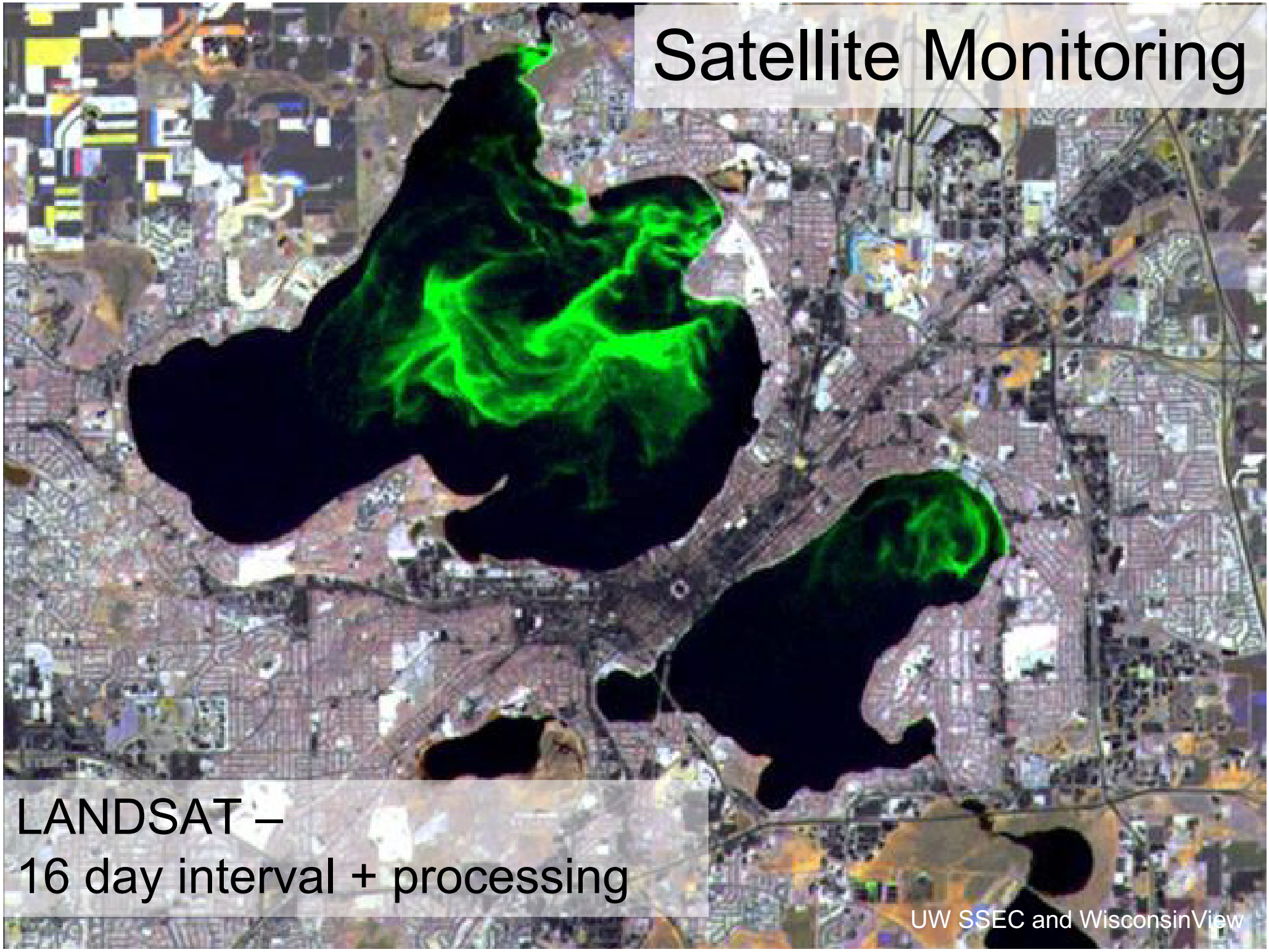


Also available as bookmarkers

https://www.dhs.wisconsin.gov/water/bg-algae/health-pros.htm

Communication Caveats

- DON'T terrify your audience.
- Know who has the responsibility for issuing advisories. ALWAYS work with local public health officials (tribal, county, municipal) if there is a need to communicate risk to the public for a given water body.
- Be absolutely certain that a "bloom" is actually cyanobacteria!
- Recognize that conditions can change rapidly, so results may not reflect current conditions.
- Learn to identify impaired conditions, but recognize that toxins may persist after blooms abate, or may be produced by less noticeable benthic cyanobacteria.


Satellite Monitoring
LANDSAT –
16 day interval + processing
UW SSEC and WisconsinView

Lake Erie Harmful Algal Bloom Forecast

Lake Erie Harmful Algal Bloom Bulletin

25 September, 2017, Bulletin 22

The *Microcystis* cyanobacteria bloom continues in the western basin along- and offshore the Michigan and Ohio coasts from Maumee Bay east into the central basin, and northeast to the Ontario coast. Observed winds since Thursday (9/21-9/25) caused an increase in surface concentrations. Scums were visible within Maumee Bay extending northeast to the Ontario coast. Measured toxin concentrations are below recreational thresholds throughout most of the bloom extent, but concentrations can exceed the threshold within Maumee Bay and in the western basin extending towards the Ontario coast where the bloom is most dense (appearing green from a boat).

Forecast winds (2-5kn) today through Wednesday (9/25-9/27) may increase the potential for scum formation. Forecast winds today through Thursday (9/25-9/28) may limit the transport of remaining *Microcystis* concentrations.

Please check Ohio EPA's site on harmful algal blooms for safety information: http://epa.ohio.gov/habalgae.aspx. Keep your pets and yourself out of the water in areas where scum is forming. NOAA's GLERL provides additional HAB data: https://www.glerl.noaa.gov/res/HABs_and_Hypoxia. The persistent cyanobacteria bloom in Sandusky Bay continues.
-Davis, Lalime

The images below are "GeoPDF". To see the longitude and latitude under your cursor, select "Tools > Analyze > Geospatial Location Tool".

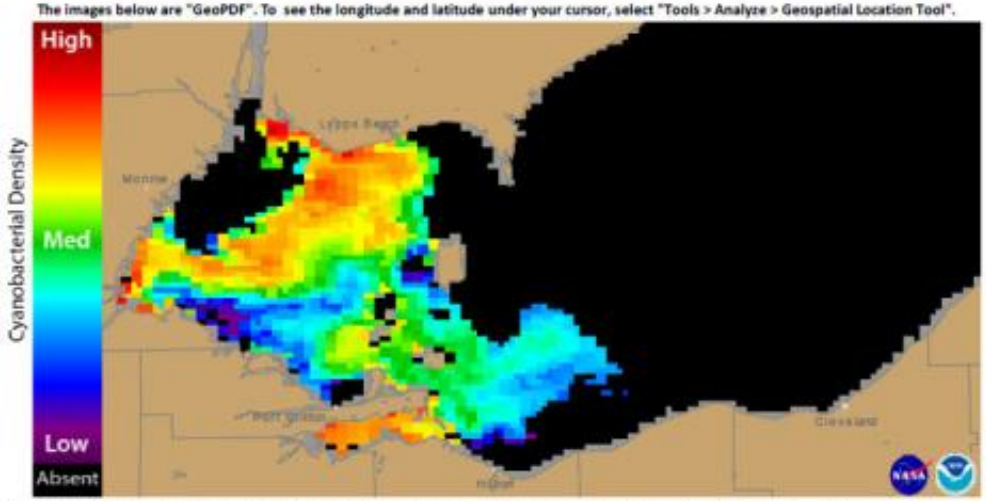


Figure 1. Cyanobacterial Index from NASA MODIS-Terra data collected 24 September, 2017 at 11:55 EST. Grey indicates clouds or missing data. The estimated threshold for cyanobacteria detection is 20,000 cells/mL.

Figure 2. Cyanobacterial Index from NASA MODIS-Terra data collected 24 September, 2017 at 11:55.

Wind speed and direction from Marblehead, OH. Blooms mix through the water column at wind speeds greater than 15 knots (or 7.7 m/s).

For more information and to subscribe to this bulletin, go to: https://tidesandcurrents.noaa.gov/hab/lakeerie.html

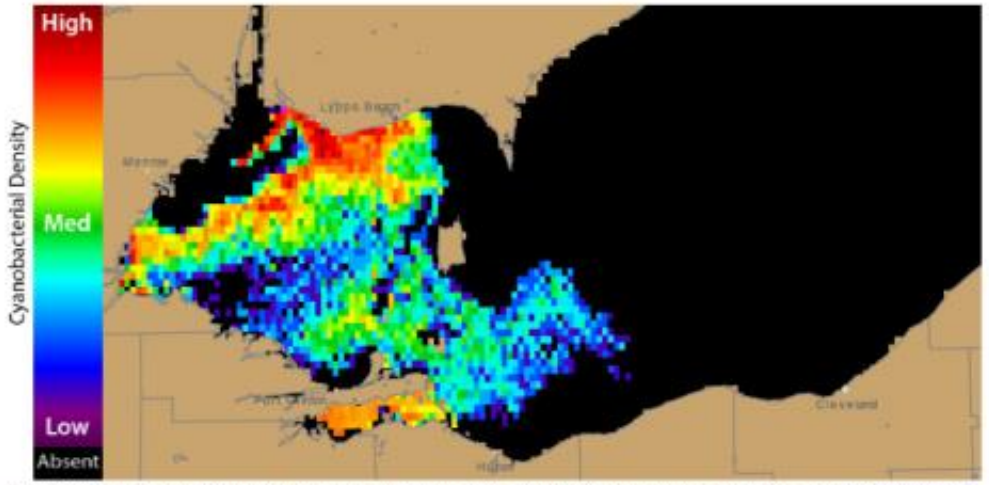


Figure 3. Nowcast position of bloom for 25 September, 2017 using GLFS modelled currents to move the bloom from the 24 September, 2017

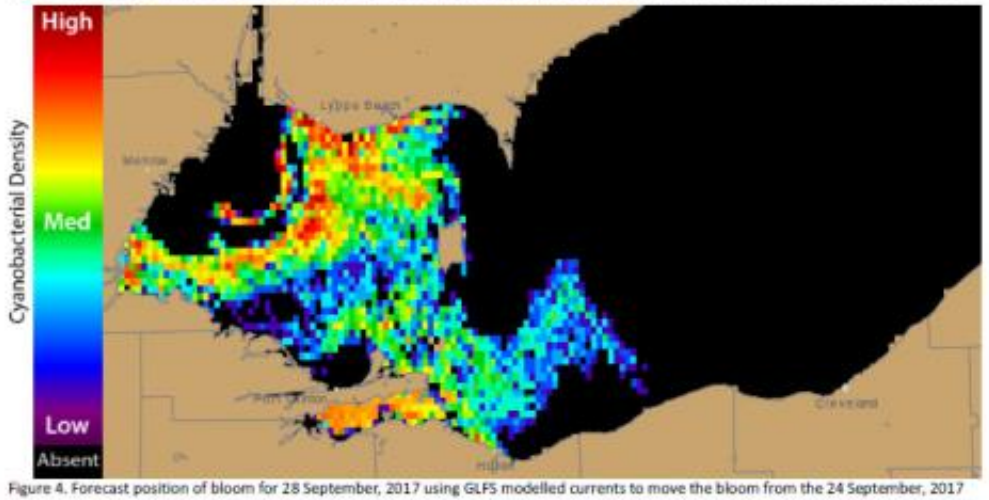
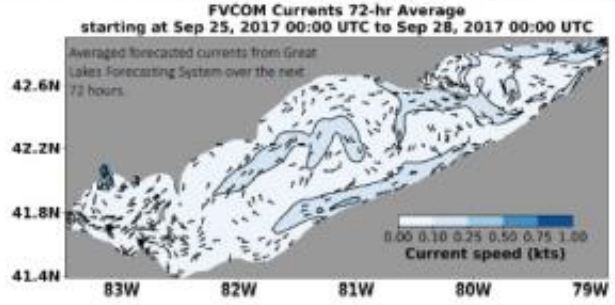


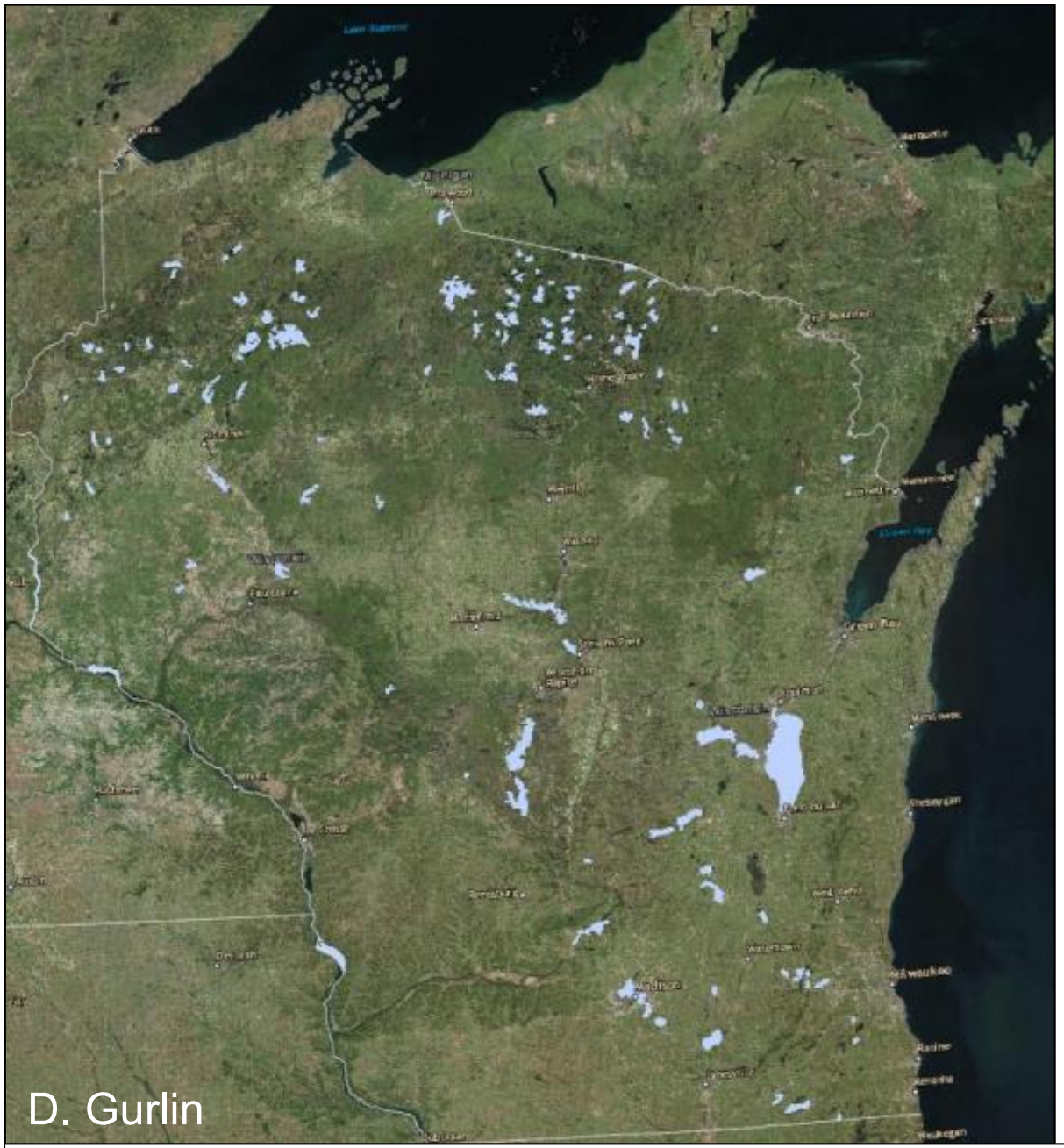
Figure 4. Forecast position of bloom for 28 September, 2017 using GLFS modelled currents to move the bloom from the 24 September, 2017



For more information and to subscribe, please visit the NOAA HAB Forecast page: https://tidesandcurrents.noaa.gov/hab/lakeerie.html

https://tidesandcurrents.noaa.gov/hab/lakeerie_bulletins/HAB20170925_2017022_LE.pdf

Cyanobacteria Assessment Network



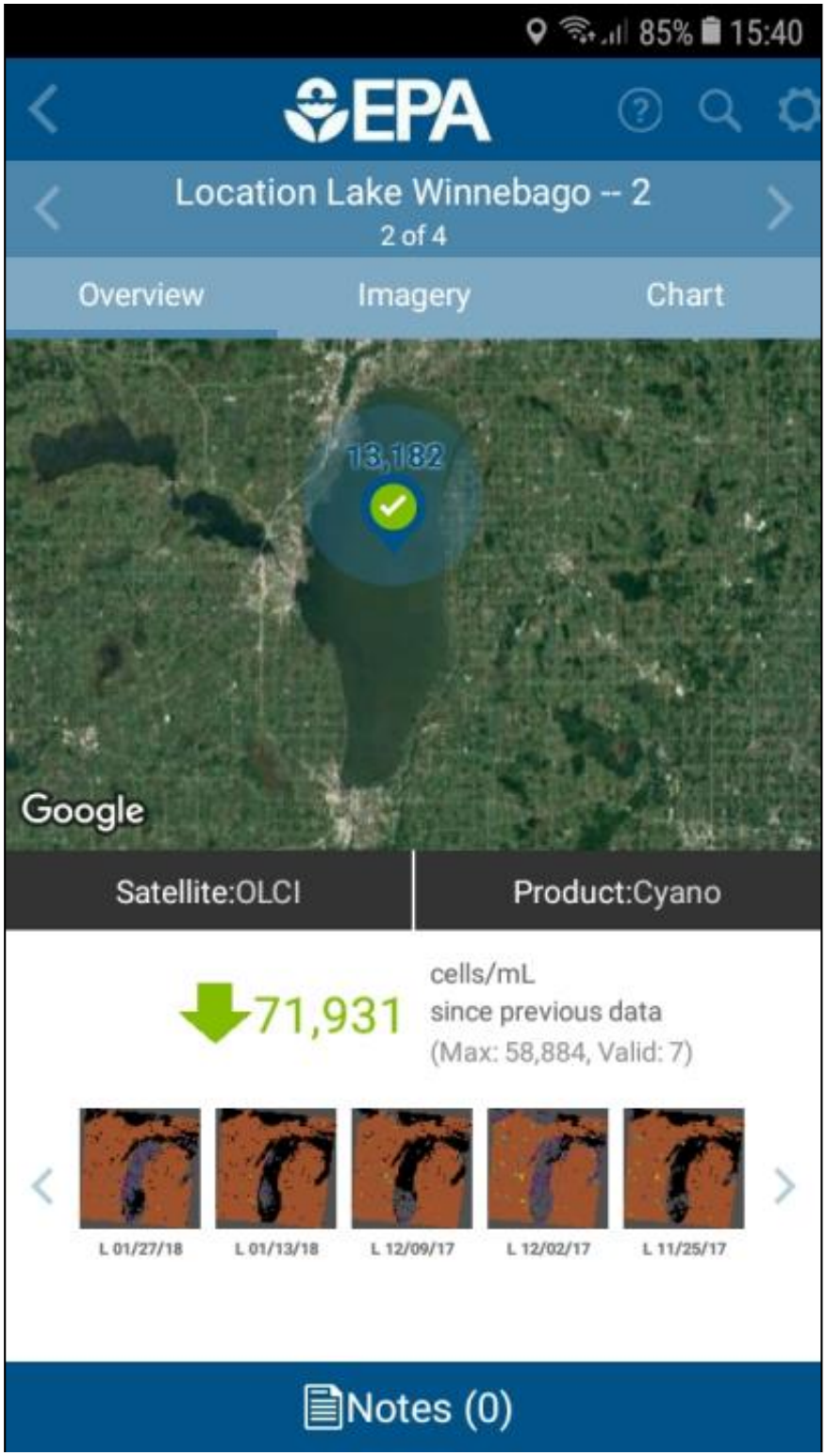
CYAN

EPA, NASA, NOAA, & USGS

Data from NASA/USGS LANDSAT & European Space Agency Sentinel satellite missions

Most inland lakes are too small for satellite monitoring. **Toxins cannot be detected via remote sensing.** Android app is public & web platform is in development.

https://www.epa.gov/water-research/cyanobacteria-assessment-network-cyan



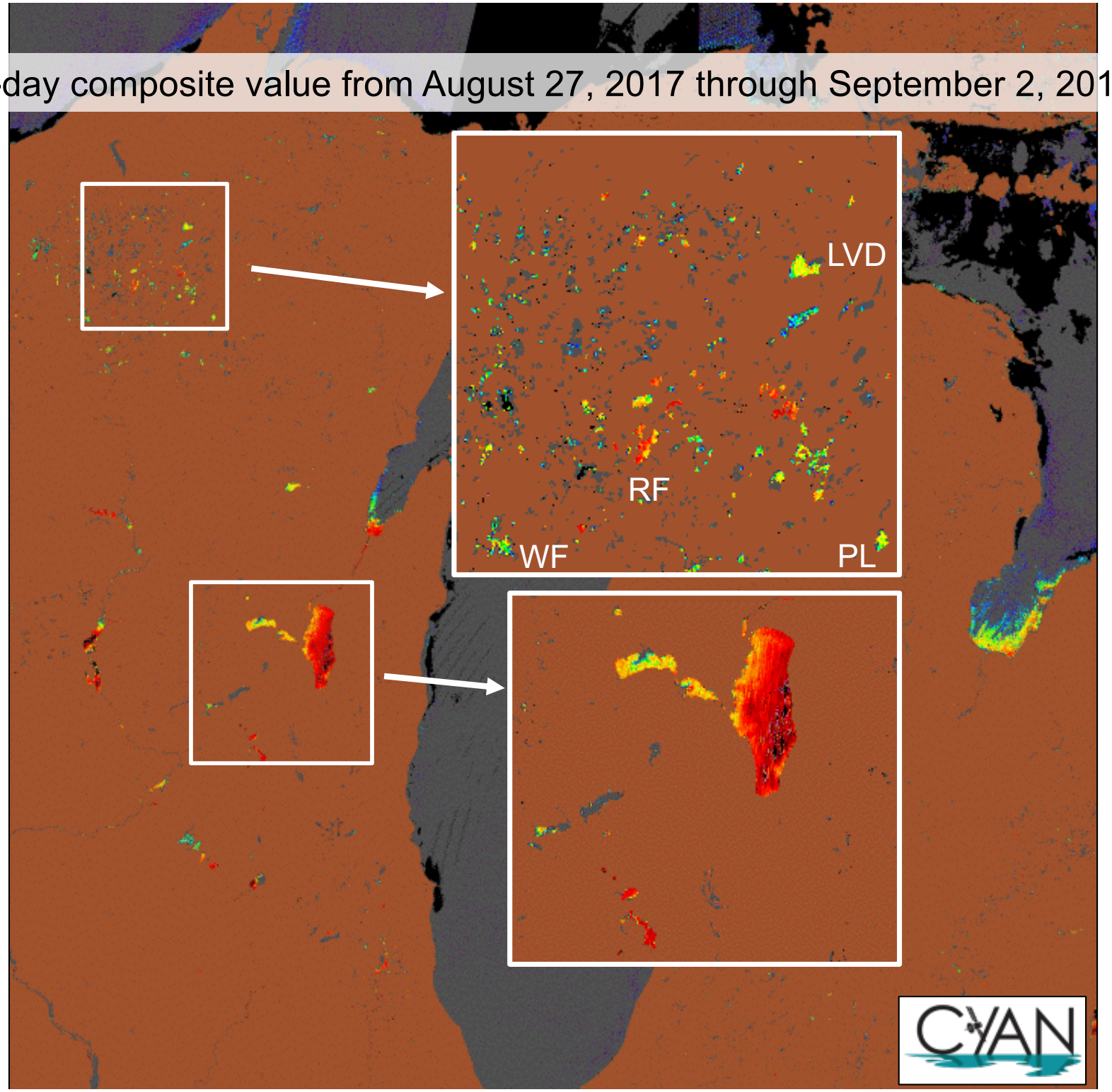
CYAN

Composite cyanobacteria cell count maximums (over 1 week) are updated weekly.

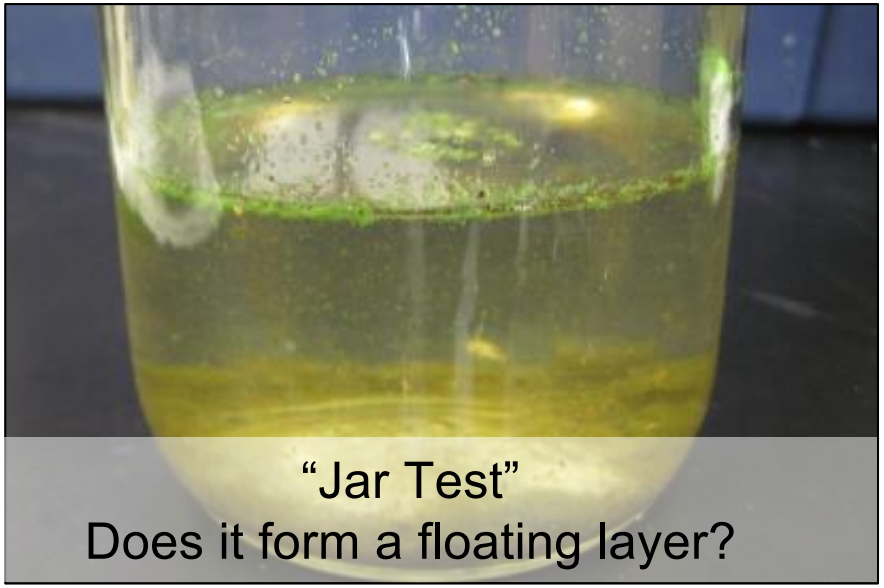
<u>Caveats:</u>

Thin clouds & ice may register as blooms. Data better for lakes > 900m (0.56 mile). **Data are most reliable for open water in the middle of a lake.** Pixels containing land & water are not accurate so **this is not suitable for assessing blooms near the shore.**

Consider this a research level tool that's appropriate for the largest ~150 lakes in Wisconsin.


7-day composite value from August 27, 2017 through September 2, 2017
LVD
RF
WF
PL
CYAN

How can I help track blooms in Wisconsin?



"Jar Test"
Does it form a floating layer?

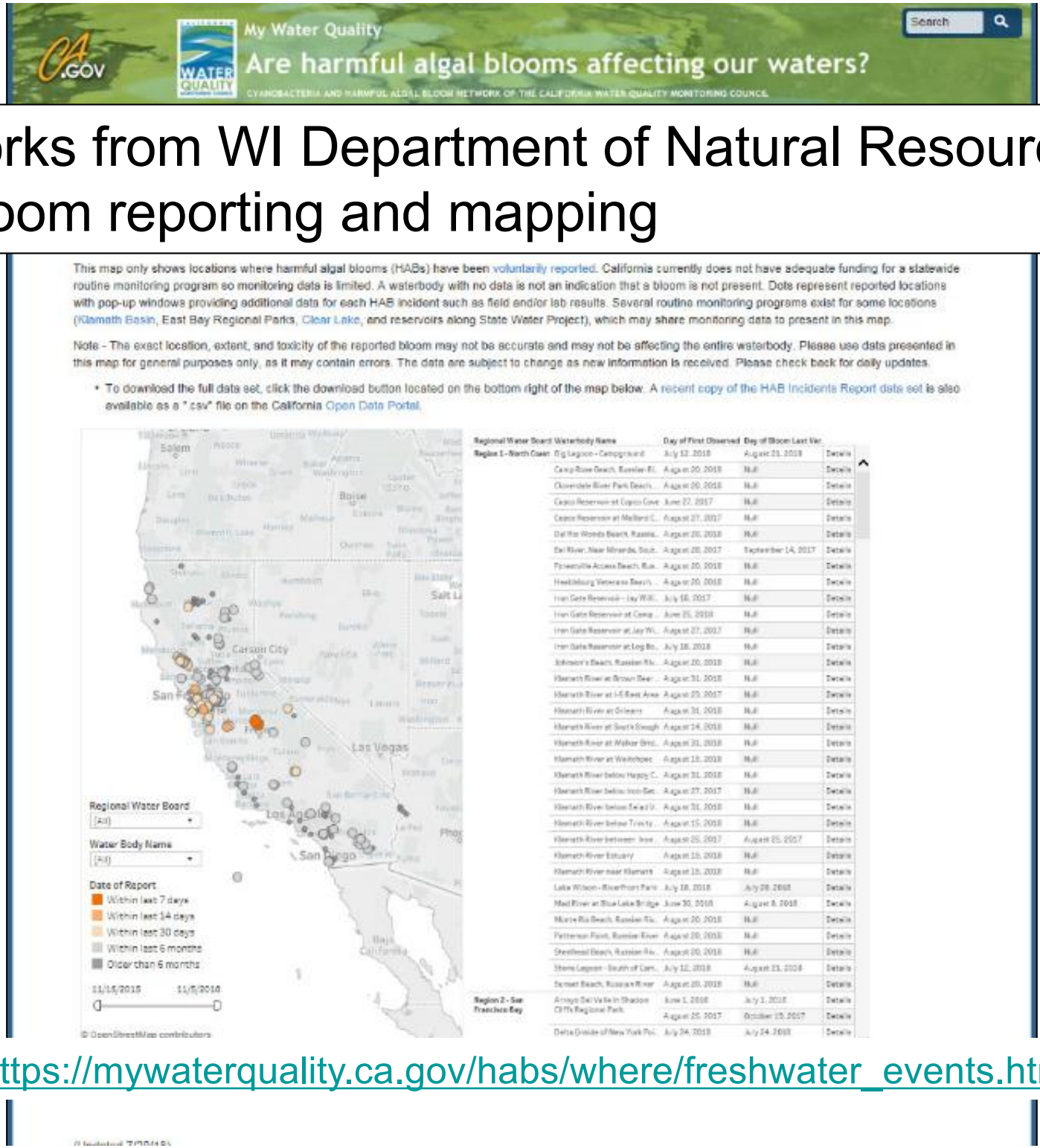
"Stick Test"
Is it filamentous green algae?

Please let the DNR know about significant bloom events!
DNRHABS@wisconsin.gov

Bloom location, size, duration, photos

- DNR cannot test for each bloom, but knowledge of blooms helps us to track where HABs are a public health burden.
- Most bloom-tracking apps/websites DO NOT report to DNR.
- The exception is bloomWatch: https://cyanos.org/bloomwatch/ BUT follow-up information by states to bloom reporters is not supported.

In the works from WI Department of Natural Resources… online bloom reporting and mapping

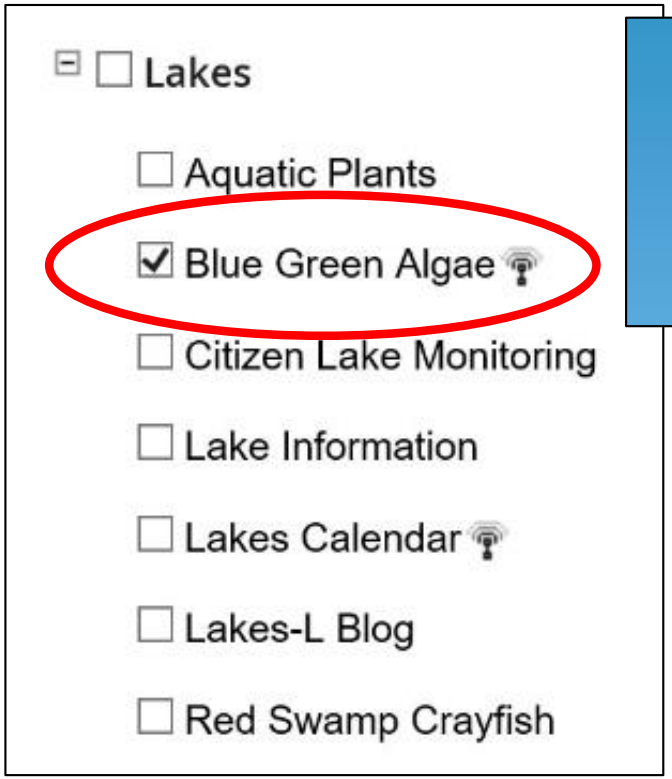


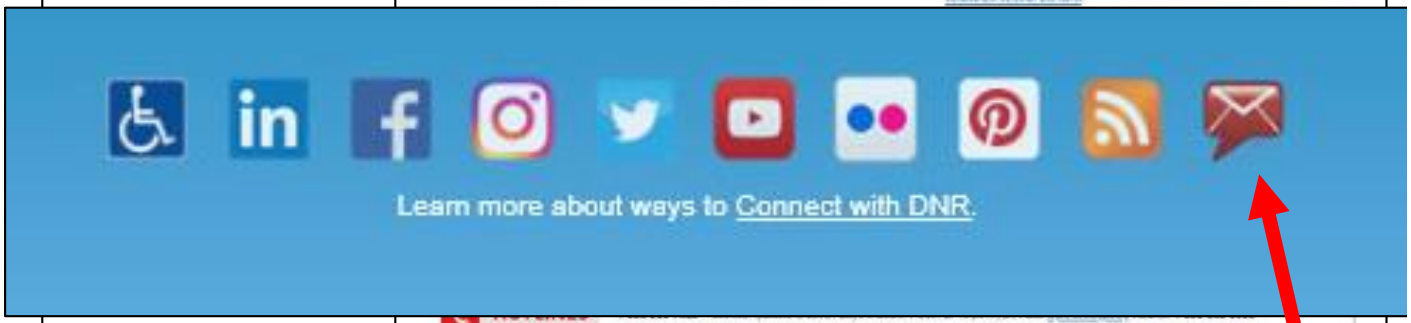
https://mywaterquality.ca.gov/habs/where/freshwater_events.html

How can I get updates?

Updates to the DNR blue-green algae website, HAB tracking, and webinars will be posted to GovDelivery.

Subscribe to email or text updates – check the box for “Blue Green Algae” under the Lakes heading, and submit.





dnr.wi.gov

If there's no public health testing, how can you stay safe?

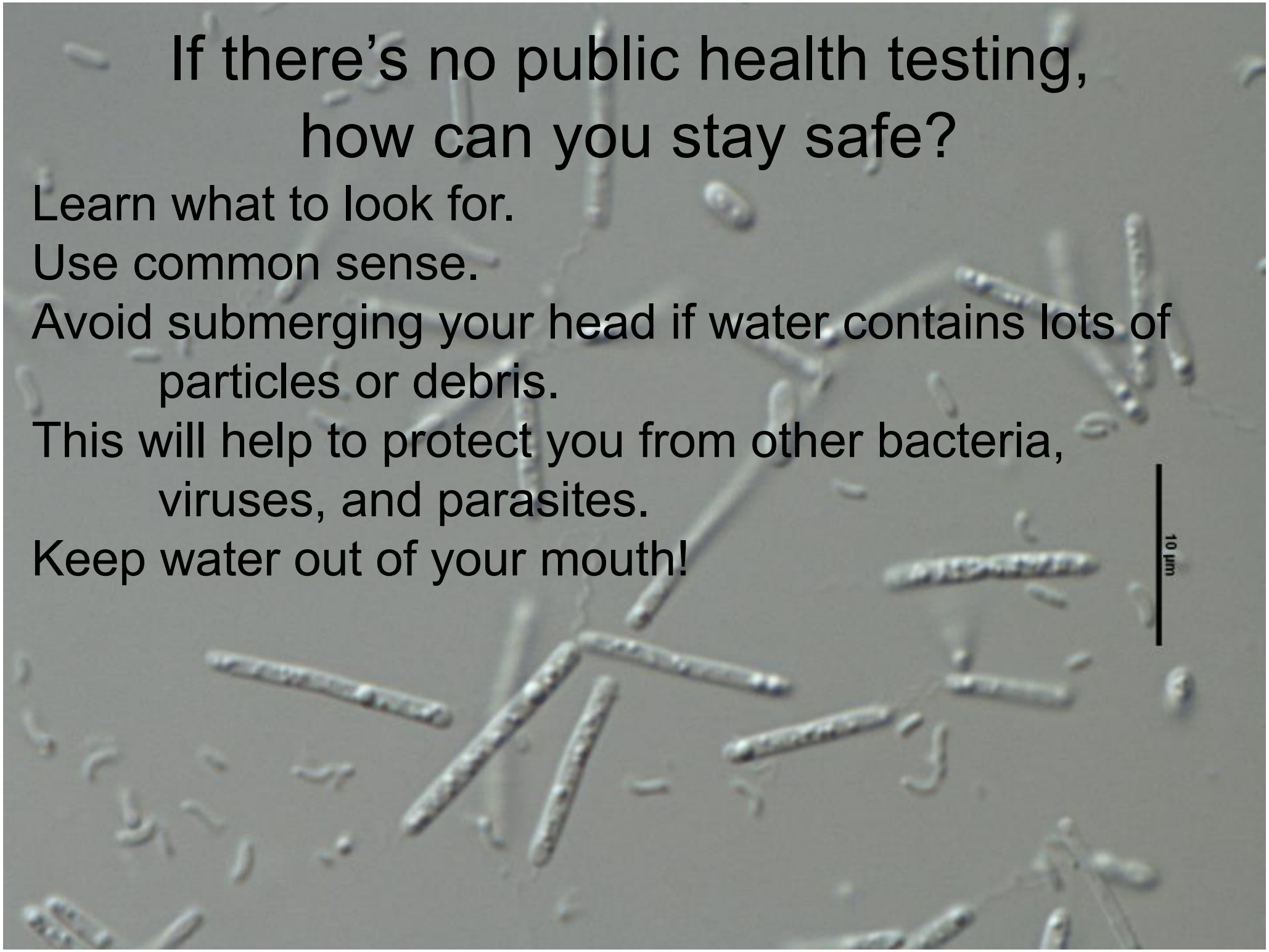
Learn what to look for.

Use common sense.

Avoid submerging your head if water contains lots of particles or debris.

This will help to protect you from other bacteria, viruses, and parasites.

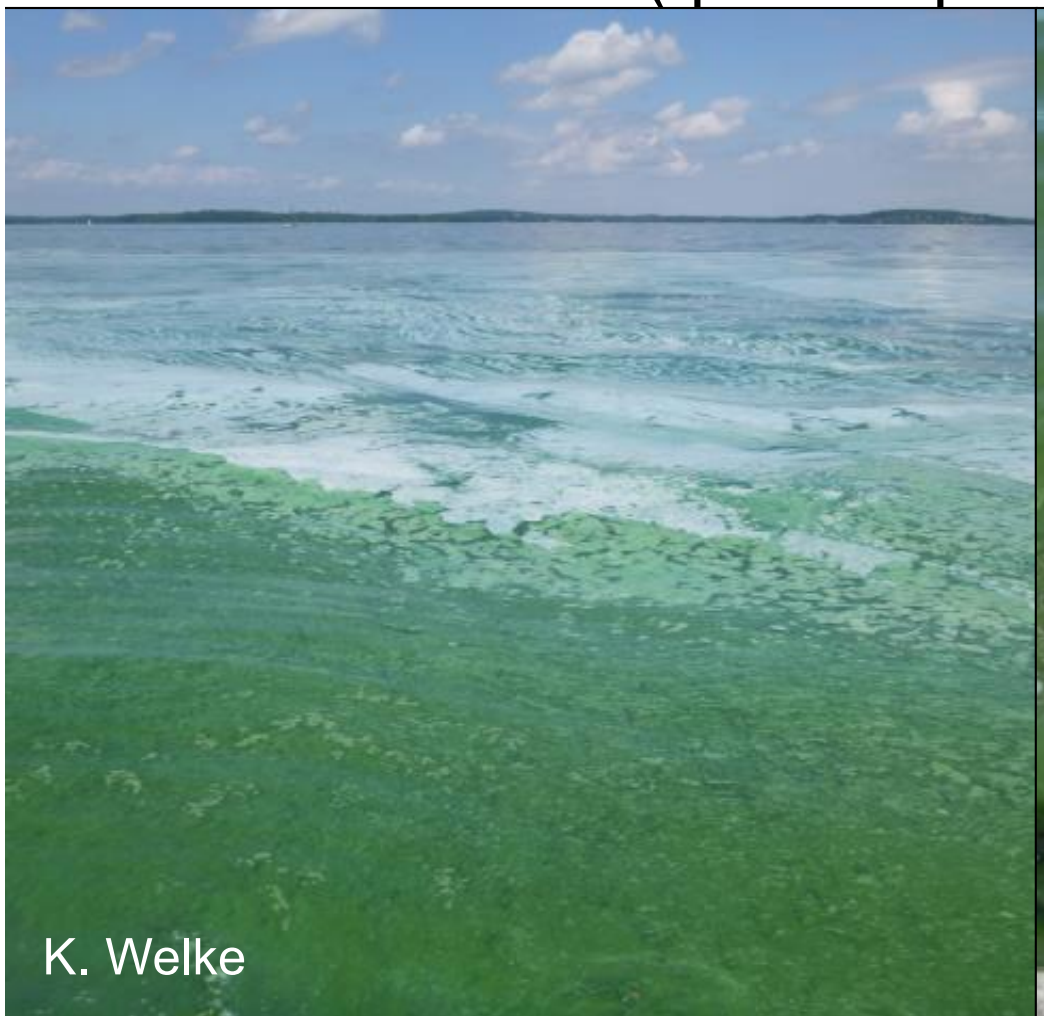
Keep water out of your mouth!



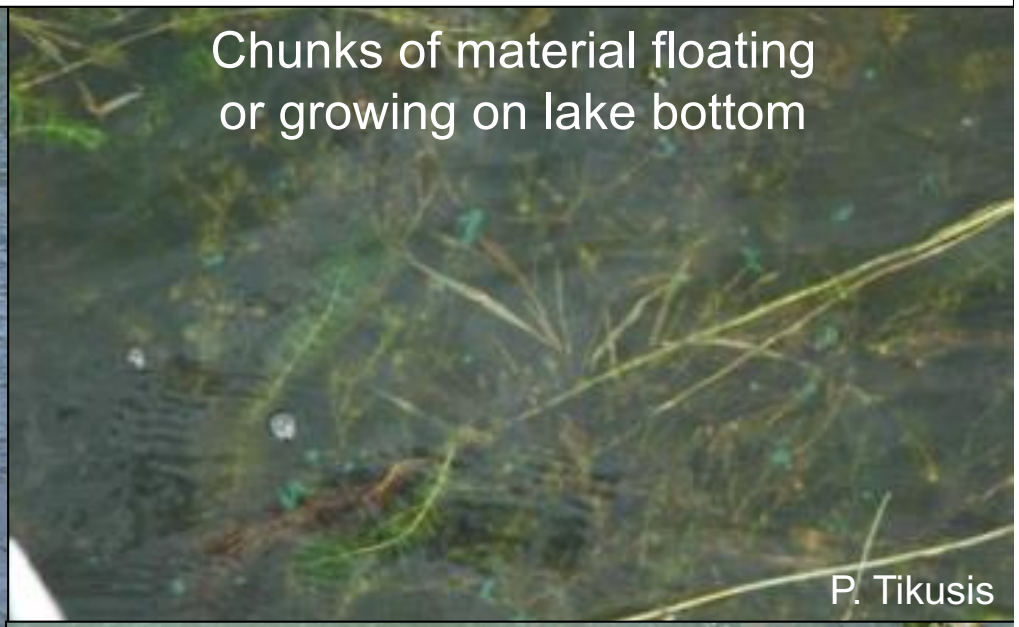

Sometimes the risk is obvious.
2014 North Carolina
Division of Water Quality

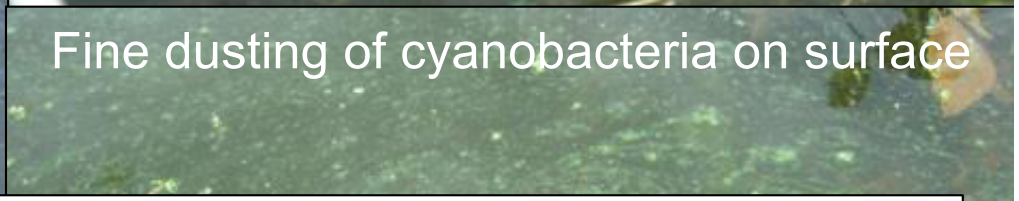
You can see the blooms that are of highest concern

Planktonic (free-floating) blooms are visible either as surface scums or mixed into water in high concentration ("pea soup" appearance)

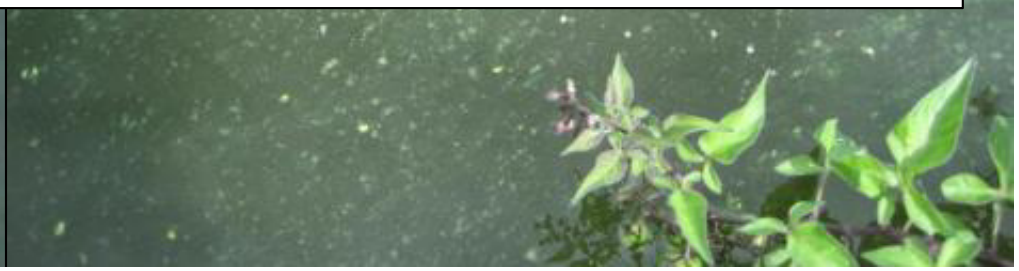


What about other situations?





Judgment call – account for health vulnerabilities, ability to keep water out of the mouth. Consider choosing another area for recreation if better conditions are available.



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, choose a better place to swim.
- Choose the **clearest** water possible for small children and pets. **Avoid swimming in shallow, warm, stagnant water bodies.**
- Always shower after swimming in a lake, river, or pond.
- Try to avoid swallowing water, no matter how clean it looks (especially after a rainstorm!)

K. Schreiber, WDNR

Keep your pets safe!

Water intoxication and **heat stroke** share symptoms with cyanotoxin poisoning.

Give your dog frequent breaks from playing in water.

Use flat objects for retrieval to minimize water ingestion.

Provide access to shade.

Do your dogs or cats eat grass? Don’t use lake water to irrigate your lawn during a bloom.

Reduce risks from cyanotoxins & waterborne pathogens:

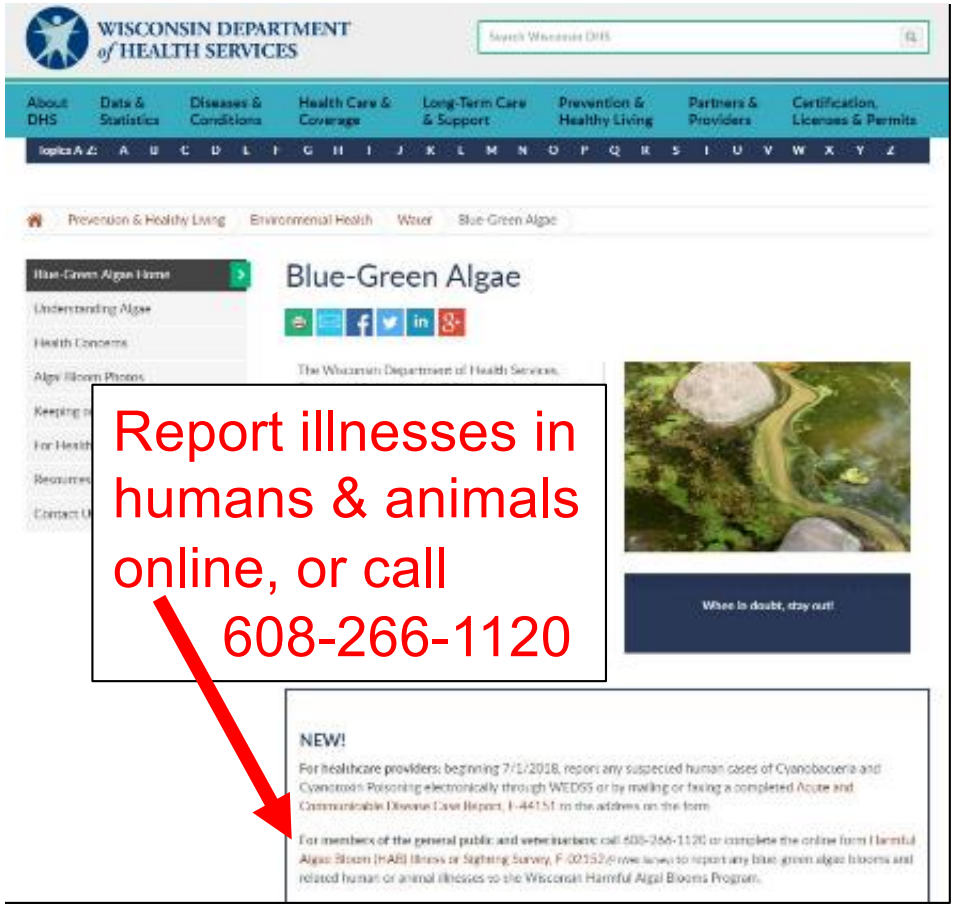
Supervise dogs & keep them out of unsafe conditions.

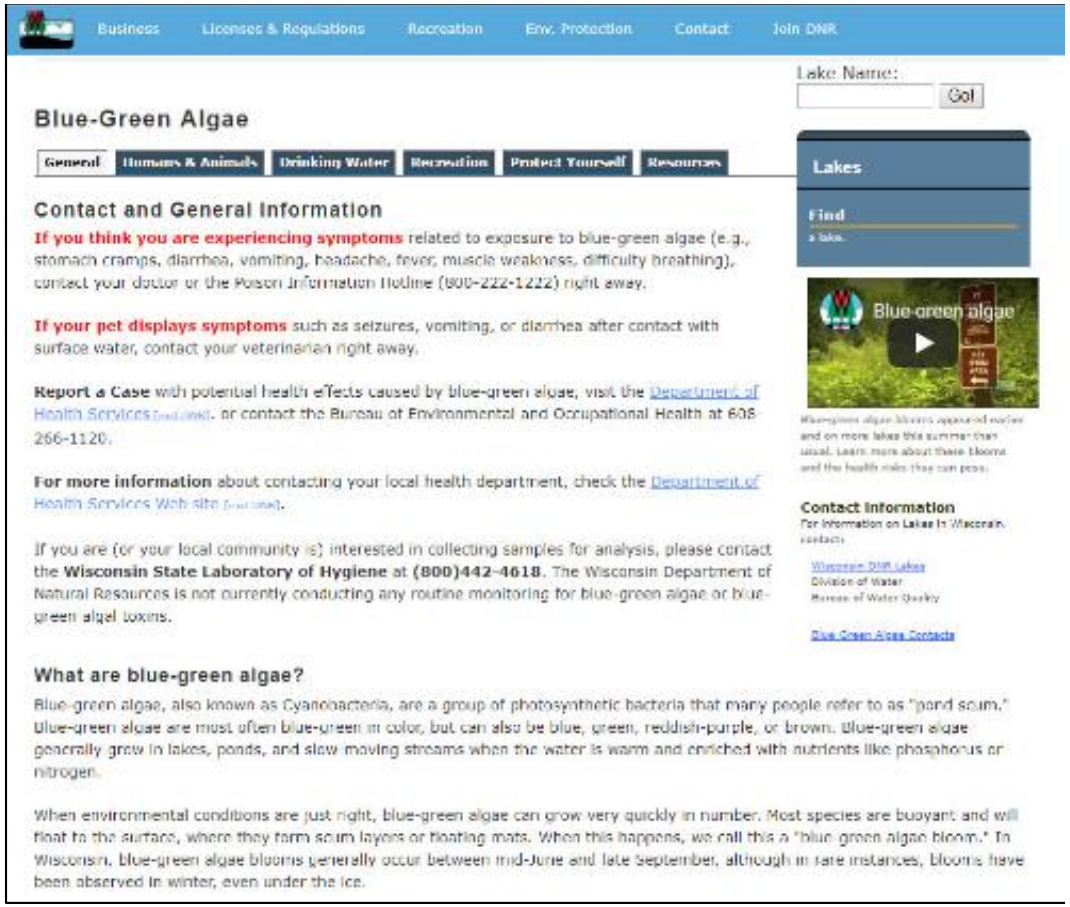
Choose the clearest, cleanest water you can find for dogs to swim in. **Avoid swimming in shallow, warm, stagnant water bodies.**

Always provide clean drinking water.

Prevent pets from drinking untreated water to protect against parasites, waterborne diseases, & cyanotoxins.

Wash dogs off with clean water after swimming, so they don't ingest cyanobacteria from their fur.





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

Please let the DNR know about significant bloom events!

DNRHABS@wisconsin.gov or (in the works) DNR website

Bloom location with lake, town, & county name, size, duration, photos

DNR cannot test for each bloom, but knowledge of blooms helps us to track where HABs are a public health burden.

Gina.LaLiberte@wisconsin.gov