

Lake Ripley Seminar on Lake Systems,  
Algae, Aquatic Plants,  
and Plant Management Laws:

# Algae

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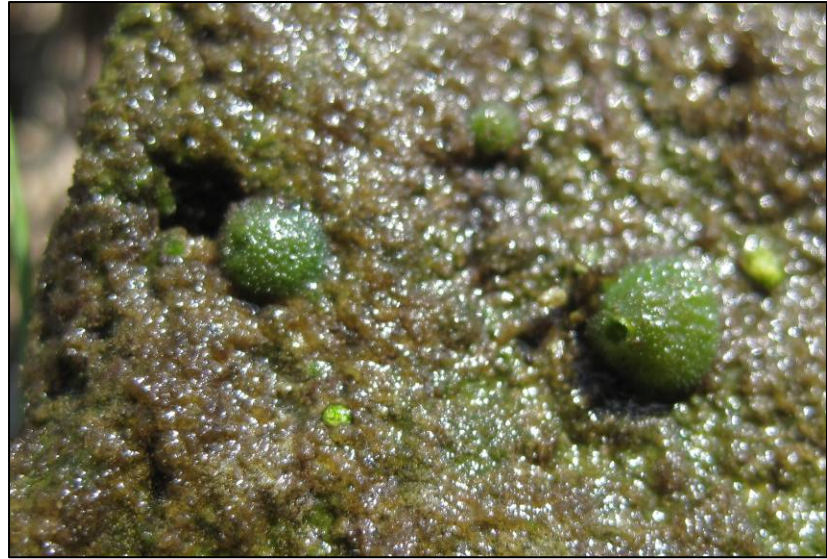


# What are algae?

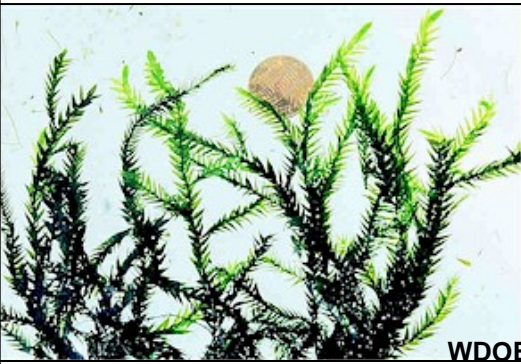
- “Pond scum,” “seaweed,” “blanket weed”
  - Photosynthetic (mostly); O<sub>2</sub> generation
  - Tiniest to largest plant-like organisms
  - Important as food and shelter in lakes
- 
- Types of algae
  - Impacts of zebra mussels
  - Seasonal & regional trends



# These can be mistaken for algae



Freshwater Sponges (*Spongilla*)



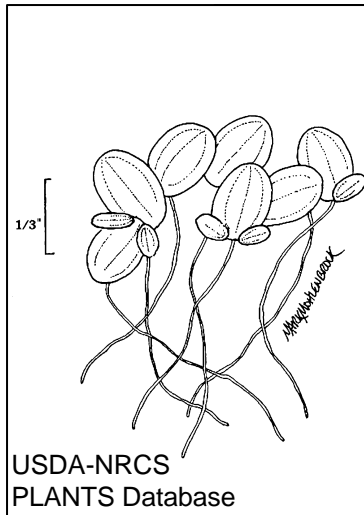
Aquatic mosses (*Fissidens*, *Fontinalis*)



*Ophrydium* (colonial protozoan)



# These can be mistaken for algae



Duckweed (*Lemna*, *Spirodela*)



Virginia Tech Weed I.D. Guide

Watermeal  
(*Wolffia*)

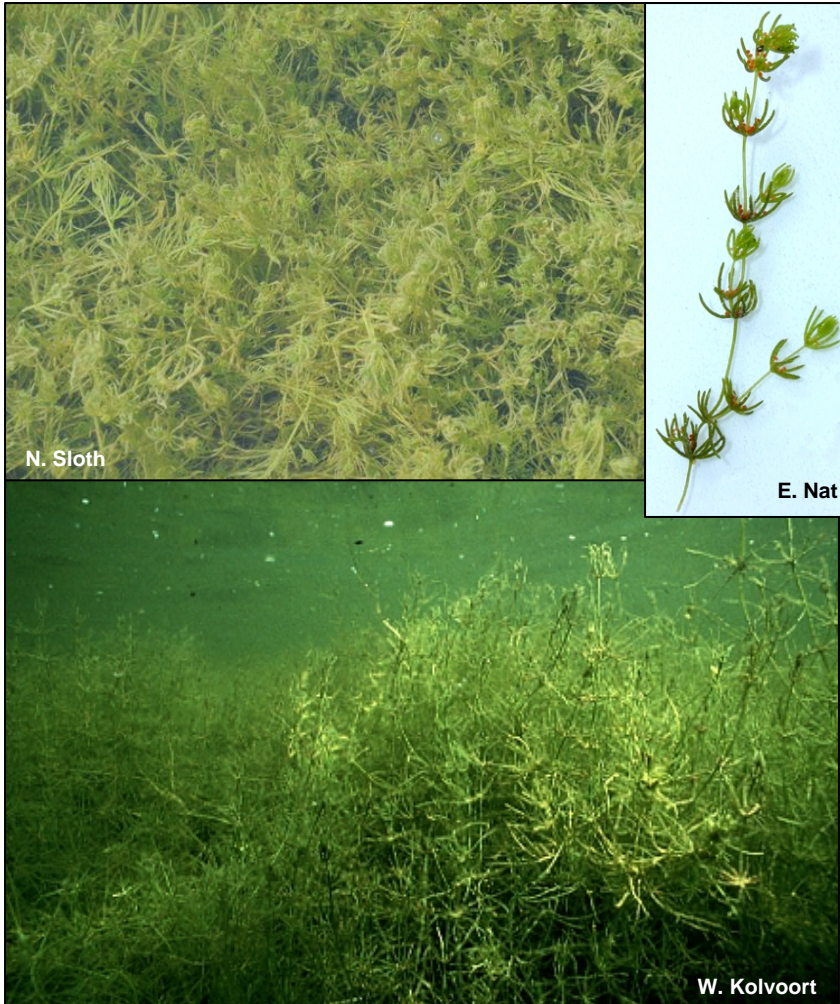


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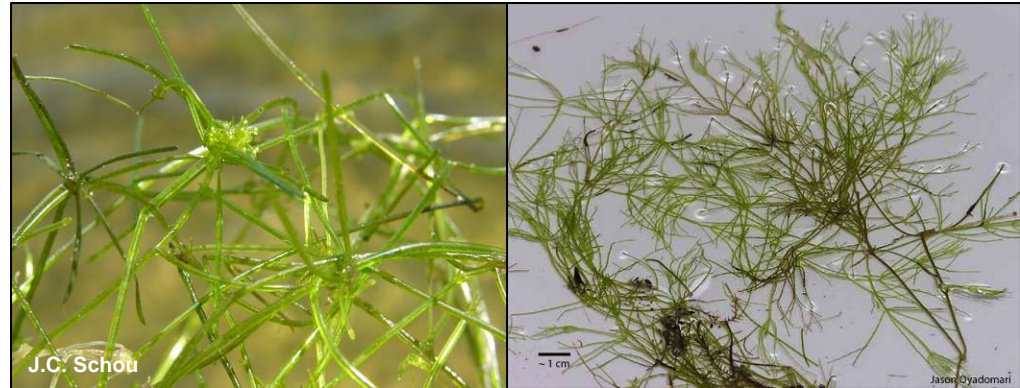


# Plant-like Green Algae

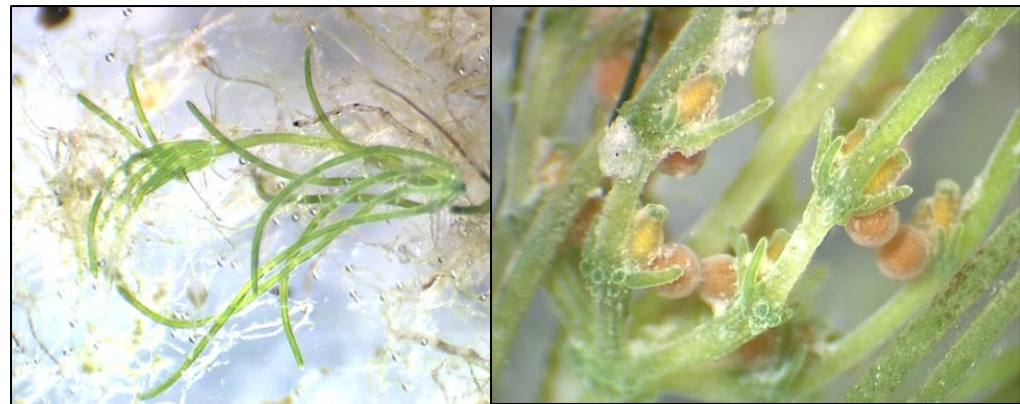
*Chara* (muskgrass, skunkgrass)



*Nitella*

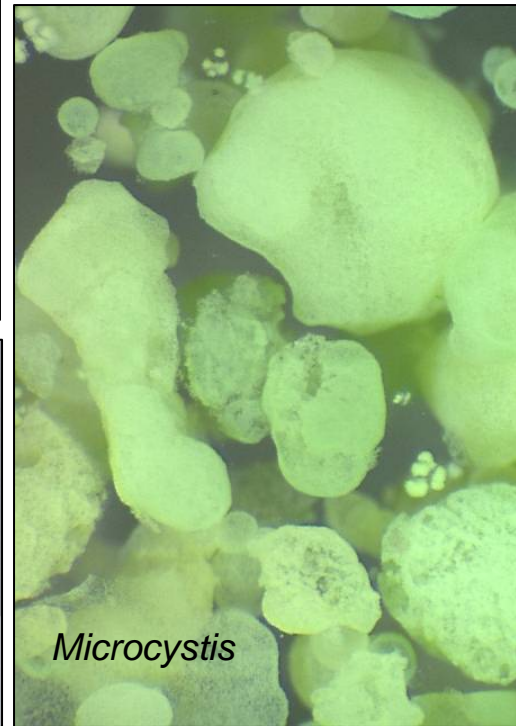
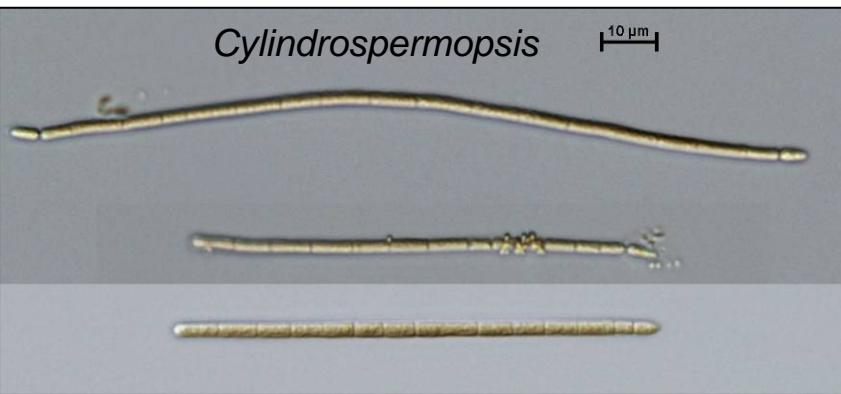
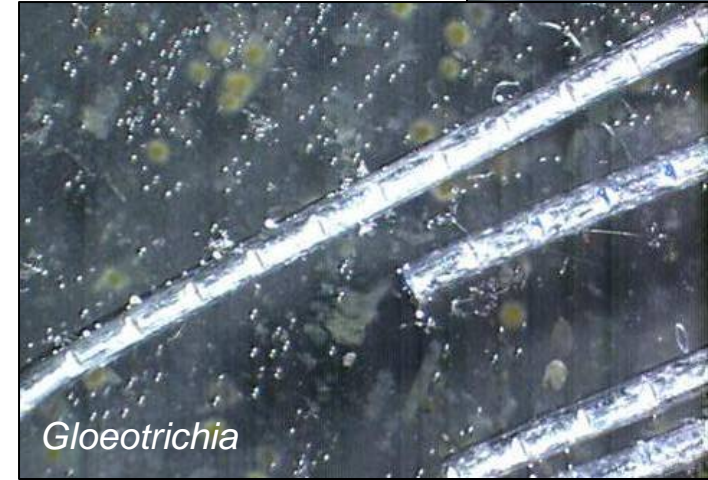
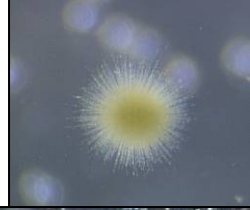


*Tolypella*





# Planktonic Algae: Blue-green Algae



# Why are blue-green algae of concern?

- They may form nuisance blooms given enough nutrients and the right conditions.
- Compounds in cell walls of all blue-green algae may irritate the skin in sensitive individuals.
- Some strains can make liver, nerve, or cell toxins if conditions are right (grazing, nutrient stress, other factors).
- **Not all blue-green algae make toxins.**





# 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 contact, or at least avoid ingesting any water.
- Always shower off with soap and water after swimming in a lake.
- Don’t let pets drink water during blooms or eat algal scum, and wash them off immediately if they swim or wade in water during a bloom.
- **When in doubt, keep out!**





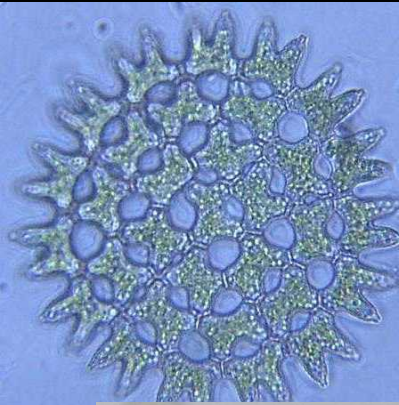
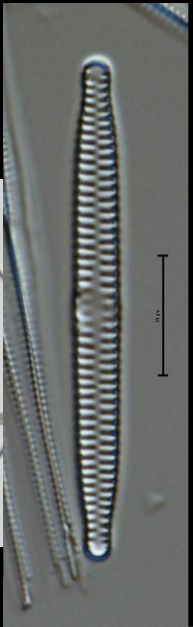
# Other Planktonic Algae



Euglenoids



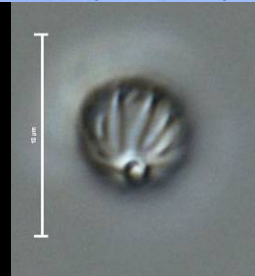
Diatoms



Green Algae



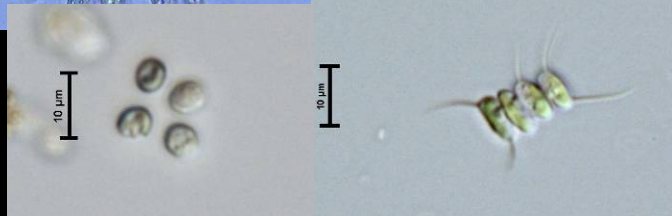
Chrysophytes



Cryptomonads

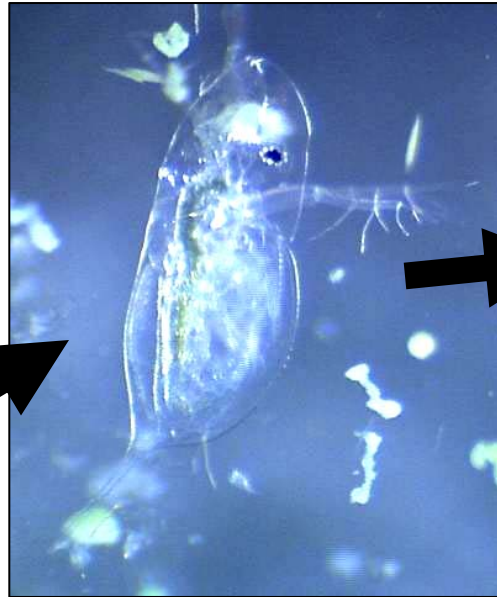


Dinoflagellates



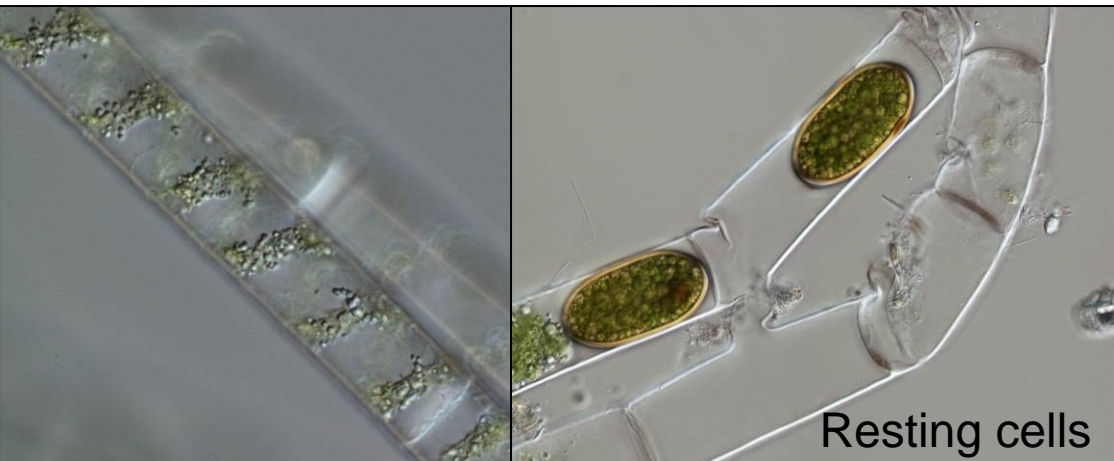


# Algae in the food web





# Filamentous Green Algae: *Spirogyra*



Resting cells

“Water silk,” “frog spit”  
Loose green “clouds” or mats  
Float to surface and break down  
Feels slippery, not cottony  
Unbranched  
Strands curl at bottom



# Filamentous Green Algae: *Cladophora*



Many branches  
Rough, cottony texture  
May support heavy epiphyte loads  
Grows attached to rocks, other surfaces  
Widespread in WI lakes & rivers  
*Cladophora glomerata* is problematic in Lake Michigan





# Filamentous Green Algae: *Oedogonium*



Unbranched  
Rough, cottony texture  
May support heavy epiphyte loads



*Oedogonium* filaments growing on coontail plants





# Filamentous Green Algae in Lakes



Green clouds on bottom  
or attached to plants



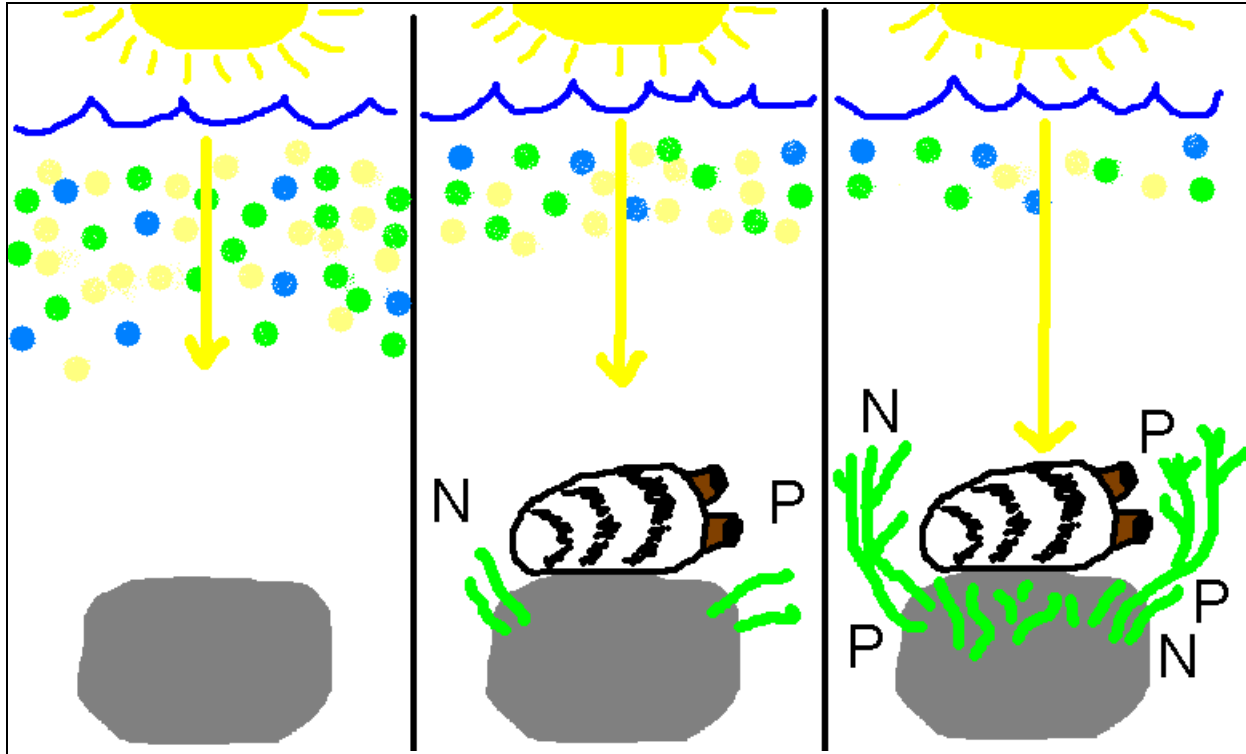
Oxygen bubbles from  
photosynthesis make  
algae float to surface.



At the surface, filaments  
undergo  
sexual reproduction,  
produce resting cells,  
and then break down.



# How zebra mussels promote growth of filamentous algae



- Mussels eat phytoplankton, increasing water clarity
- Nutrients are cycled close to the lake bottom



# Dreissenid mussel effects in Lake Michigan:

## *Cladophora glomerata*



1986  
Turbid water

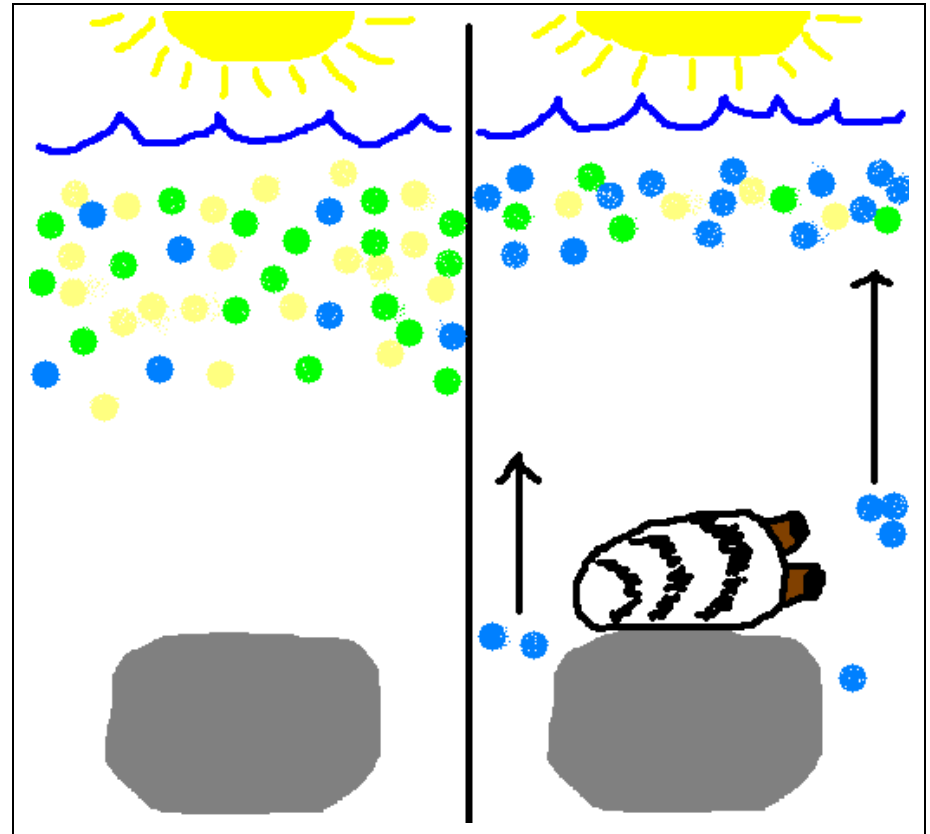
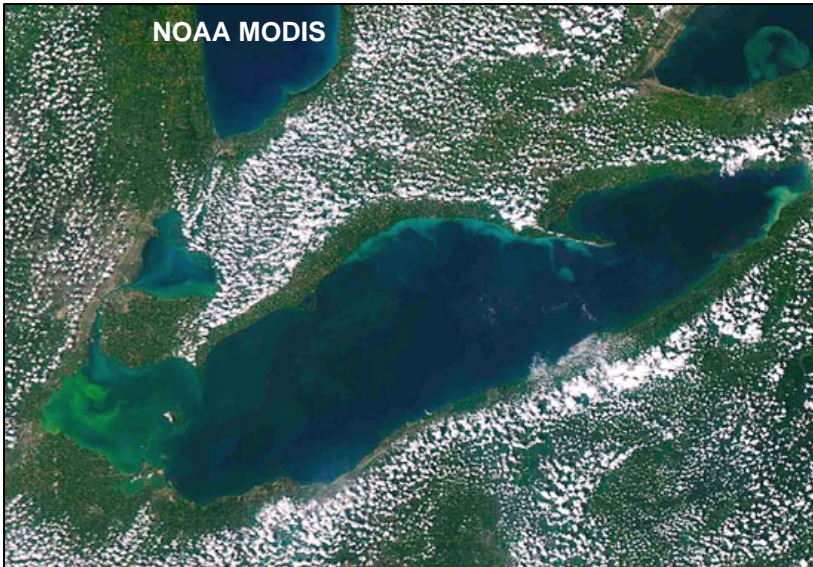


2001  
Clear water  
*Cladophora* covering bottom





# Dreissenid mussel effects in Lake Erie: *Microcystis*



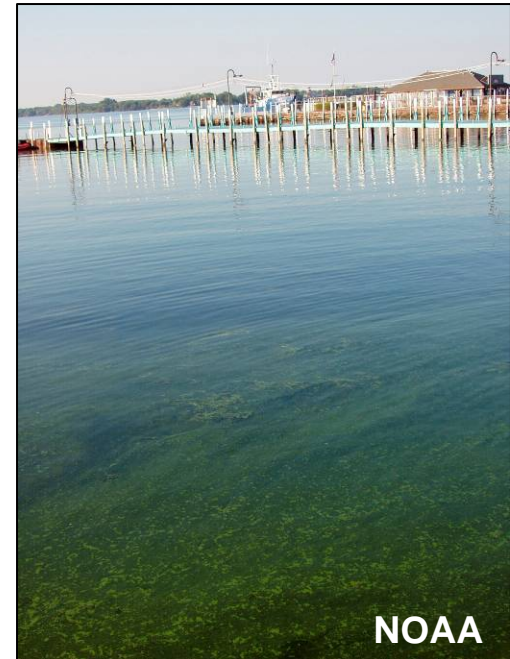
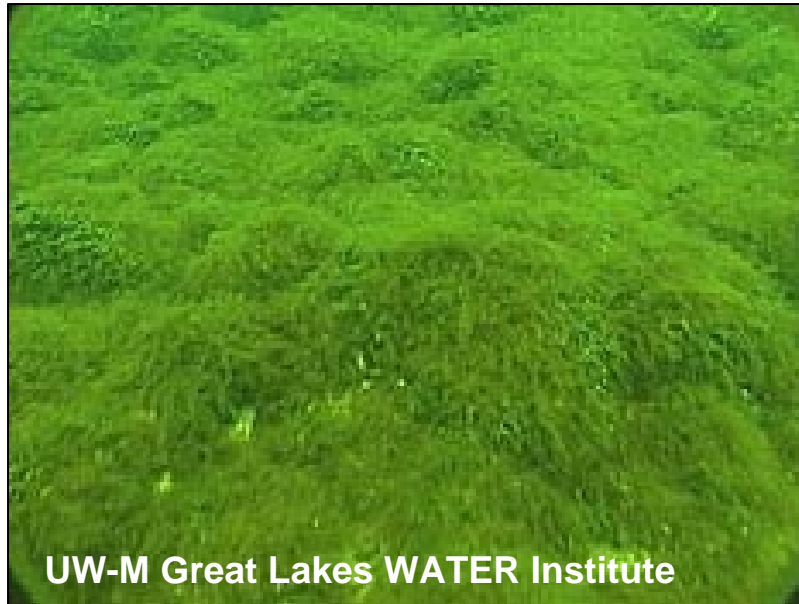
Mussels reject *Microcystis* when feeding  
*Microcystis* regulates its buoyancy and  
can move back up in the water column.



# Can similar problems occur in inland lakes?

Filamentous algae problems were reported in Wisconsin lakes in 2010.

MSU research: zebra mussels promoted dominance of *Microcystis* in low-nutrient Michigan lakes, so this is something to watch out for in the future.



# Lakes are dynamic— so are algal populations

## Physical

- Temperature
- Light
- Turbulence
- Substrate

## Chemical

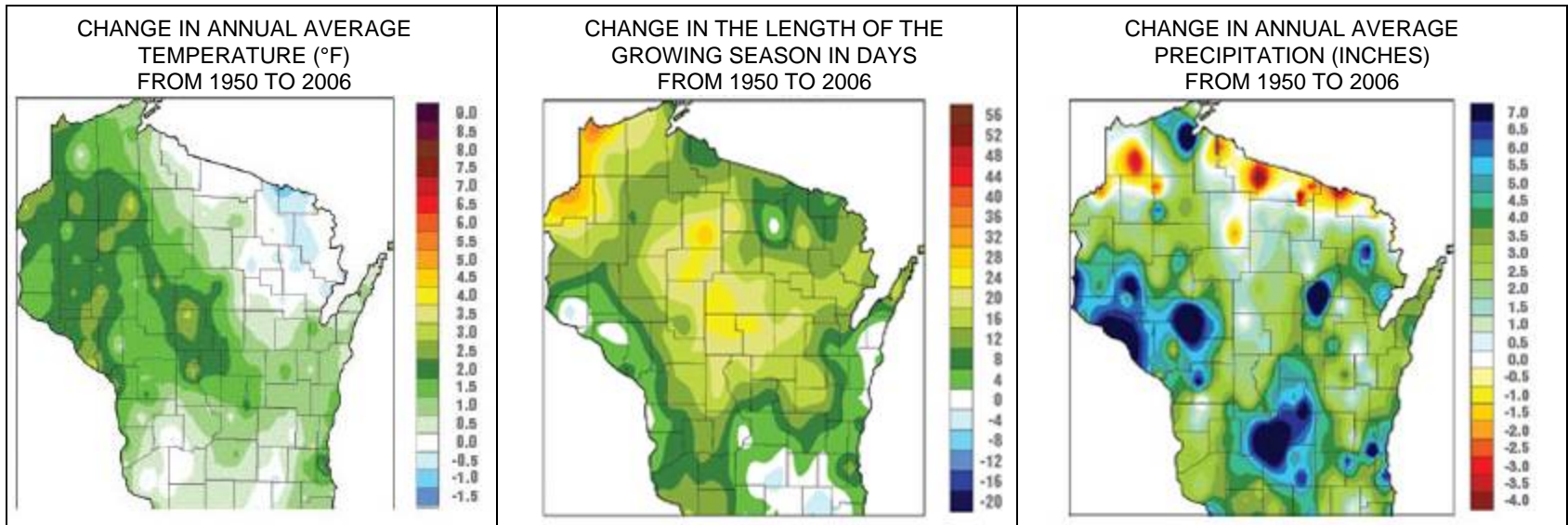
- **Nutrients**
- N:P ratios
- CO<sub>2</sub> & O<sub>2</sub>
- pH

## Biological

- Genetics
- Grazing
- Viruses,  
bacteria,  
fungi
- Chemical  
defenses



# Seasonal & Regional Trends



- Climate change will have unknown effects
- Heavy rains & snowmelt: extra nutrients
- Earlier warming & extended warming may lead to blooms
- Invasive species?

# Online Resources

WDNR blue-green algae info (also see additional links at the top of the page):

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

Wisconsin Department of Health Services blue-green algae info:

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

Michigan State University fact sheet about blooms in southwest Michigan:

<http://www.kbs.msu.edu/community-outreach/extension-land-and-water/information-resources/microcystis-in-southwest-michigan-lakes>

MSU study of zebra mussels effects on blooms in low-nutrient Michigan lakes:

[http://www.aslo.org/lo/toc/vol\\_49/issue\\_2/0482.pdf](http://www.aslo.org/lo/toc/vol_49/issue_2/0482.pdf)

World Health Organization book, *Toxic Cyanobacteria in Water* (downloadable) - technical information on blue-green algae:

[http://www.who.int/water\\_sanitation\\_health/resources/toxiccyanbact/en/](http://www.who.int/water_sanitation_health/resources/toxiccyanbact/en/)

*Wisconsin's Changing Climate: Impacts and Adaptations:*

<http://www.wicci.wisc.edu/>

*How to Know the Freshwater Algae and Algae of the Western Great Lakes Area* (downloadable):

<http://www.biodiversitylibrary.org/item/26337#page/1/mode/1up> and  
<http://www.biodiversitylibrary.org/item/23616>



# Photo Credits

*Spongilla*: R. Korth, UW-Extension <http://dnr.wi.gov/org/es/science/citizen/>  
Watermeal: Virginia Tech Weed ID Guide [http://www.ppws.vt.edu/scott/weed\\_id/wolsp.htm](http://www.ppws.vt.edu/scott/weed_id/wolsp.htm)  
*Fissidens*: Jan-Peter Frahm [http://www.jan-peter-frahm.de/Arbeitskreis/Besondere\\_Moosfunde.htm](http://www.jan-peter-frahm.de/Arbeitskreis/Besondere_Moosfunde.htm)  
*Fontinalis*: Washington State Department of Ecology  
<http://www.ecy.wa.gov/programs/wq/plants/plantid2/photopages/fontinalis.html>  
*Lemna minor*: USDA-NRCS PLANTS Database / USDA NRCS. *Wetland flora: Field office illustrated guide to plant species*. USDA Natural Resources Conservation Service.  
<http://plants.usda.gov/java/profile?symbol=LEMI3>  
*Chara*: N. Sloth <http://www.biopix.dk/Photo.asp?Photoid=74518>  
*Chara*: Emile Nat <http://web.ku.edu/~ifaa/jpg/Nat/Nat.html>  
*Chara*: Wim Kolvoort <http://www.kranswieren.nl/>  
*Nitella*: J.C. Schou <http://www.biopix.com/photo.asp?photoid=35186&photo=nitella-translucens>  
*Nitella*: Jason Oyadomari  
[http://www.keweenawalgae.mtu.edu/ALGAL\\_IMAGES/charophyceans/Nitella\\_n21\\_swedetownplant0\\_dc.jpg](http://www.keweenawalgae.mtu.edu/ALGAL_IMAGES/charophyceans/Nitella_n21_swedetownplant0_dc.jpg)  
Bluegill Fish Fry: Riverfront Pizzeria Bar & Grill, Milwaukee  
<http://milwaukeefishfrylist.com/riverfront-pizzeria-and-bar/>  
Lake Michigan 1986 & 2001: UW-Milwaukee Great Lakes WATER Institute  
<http://www.glwi.uwm.edu/research/aquatic ecology/cladophora/>  
Lake Erie satellite: NOAA-MODIS posted at <http://www.lakescientist.com/2009/satellite-imagery-will-help-track-lake-erie-algae-growth>  
Lake Erie: Thomas Archer posted at  
[http://www.surfriderlakemichigan.org/news/phosphates\\_blamed\\_for\\_recent\\_algae\\_bloom\\_on\\_lake\\_erie](http://www.surfriderlakemichigan.org/news/phosphates_blamed_for_recent_algae_bloom_on_lake_erie)  
South Bass Island: NOAA <http://www.noaanews.noaa.gov/stories2006/s2706.htm>

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# Questions?

