

Algae: The Good, The Bad, and The Ugly

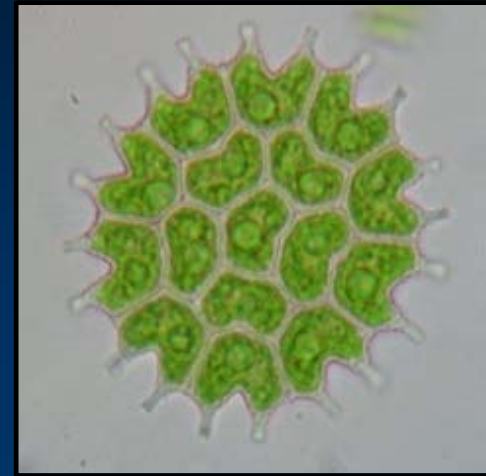


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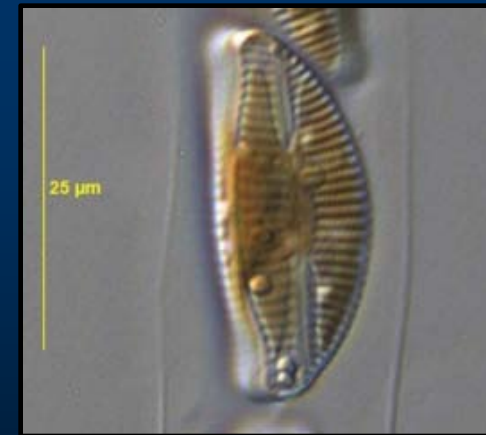
Johnson County Algae and Cyanobacteria Presentation
August 10, 2010

What Are Algae?

- Algae are simple photosynthetic plants.
- Like all plants, algae have chlorophyll, which is a pigment used to capture light for photosynthesis.
- Algae are an important part of the food web in aquatic ecosystems and are eaten by many simple animals and some fish.



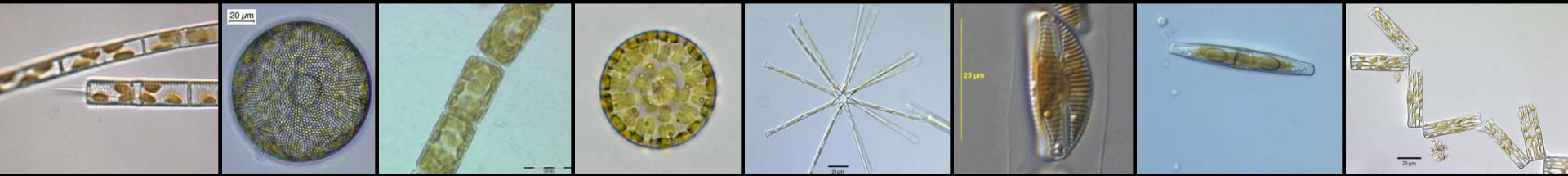
Pediastrum, photo courtesy of N. Clercin



Cymbella, photo courtesy of N. Clercin

What Are The Most Common Types of Algae?

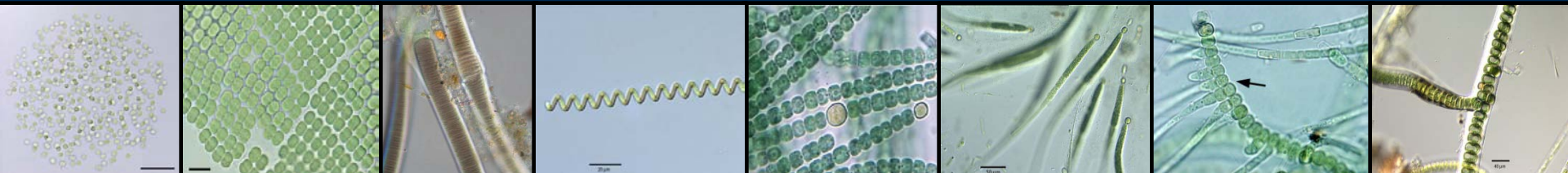
Diatoms (Bacillariophyta)



Green Algae (Chlorophyta)



Blue-Green Algae/Cyanobacteria (Cyanophyta)



What Are Algal Blooms?

- Algal blooms occur when:
 - Algae have extremely high cell densities (20,000 to 100,000 cells per milliliter)
 - Proliferation of algae is dominated by a single or a few species
 - There is a visible accumulation of algae



South Dakota - green algae bloom



Idaho - cyanobacteria bloom
photo courtesy of F. Wilhelm

The Bad

What Types of Algae Cause Blooms?

All types of algae can cause blooms under the right conditions.

Diatoms



Green Algae



Cyanobacteria



When Do Algal Blooms Occur?

- Algal blooms can occur any time of the year.
- Green algae blooms are common in the spring.
- Cyanobacterial blooms are common during summer and early fall.



**Missouri Lake
January, 2007**



**Missouri Lake
June, 2000**



**Kansas Lake
August, 2006**



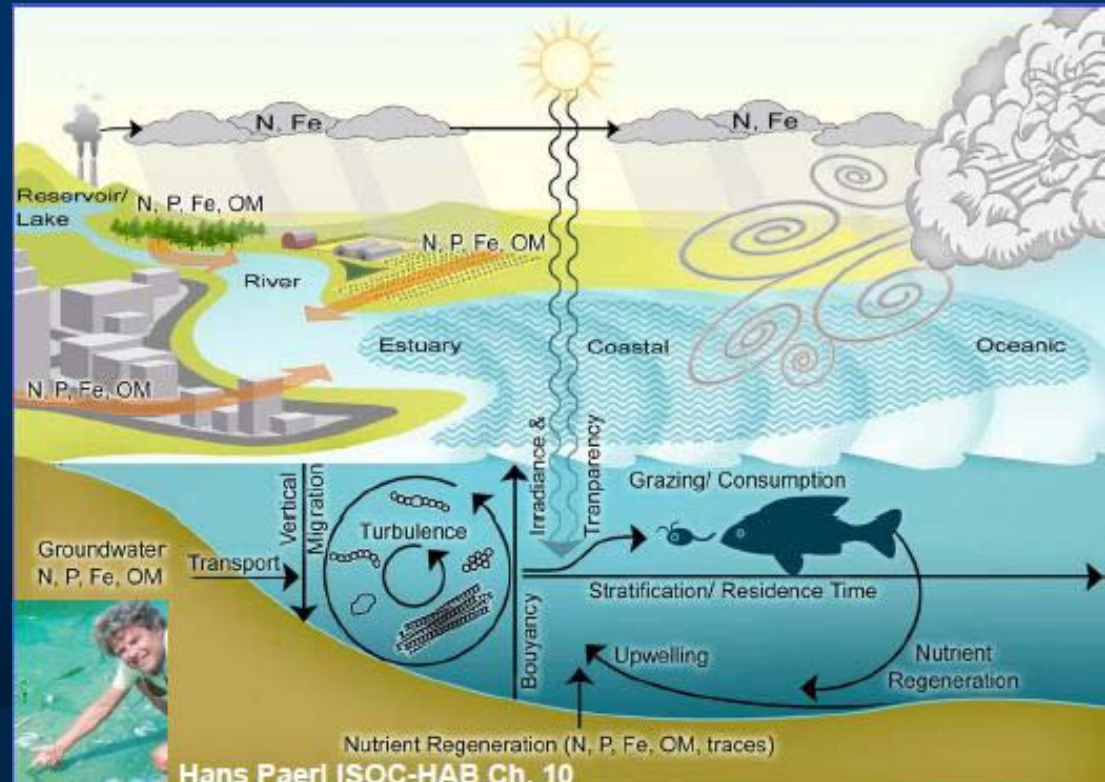
**Missouri Lake
October, 2001**

What Causes Algal Blooms?

Many environmental factors influence the occurrence of algal blooms.
In general, an algal bloom indicates an ecosystem imbalance.

Factors influencing the occurrence of algal blooms include:

- Nutrients
- Water Clarity (Sediment)
- Circulation Patterns
- Hydrology
- Biological Community Interactions
- Weather



Why Are Algal Blooms Bad?

- Ecologic Concerns
 - Low dissolved oxygen
 - Fish kills
- Economic Concerns
 - Loss of recreational revenue
 - Taste and odor
 - Added drinking water treatment costs
- Health Concerns
 - Toxicity (cyanobacteria only)



Iowa - cyanobacteria bloom



Kansas - cyanobacteria bloom

What Types of Toxins Do Cyanobacteria Produce?

- **Hepatotoxins (liver toxins)**
 - **Common toxins:** microcystins, cylindrospermopsins
 - **Symptoms of exposure:**
 - Vomiting
 - Diarrhea
 - Fever
 - Cramps
- **Neurotoxins**
 - **Common toxins:** anatoxins, saxitoxins
 - **Symptoms of exposure:**
 - Paralysis
 - Seizure
- **Dermatotoxins**
 - **Common toxins:** lipopolysaccharides, lyngbyatoxin
 - **Symptoms of exposure:**
 - Irritation to eyes, ears, throat
 - Rashes
 - Skin Lesions



Photo courtesy of L. Merchant-Masonbrink

How are People and Animals Exposed to Cyanobacterial Toxins?

- Ingestion and inhalation during recreational activities
- Inhalation of aerosolized toxins
- Consumption in drinking water
 - Drinking-water treatment processes effectively remove most toxins

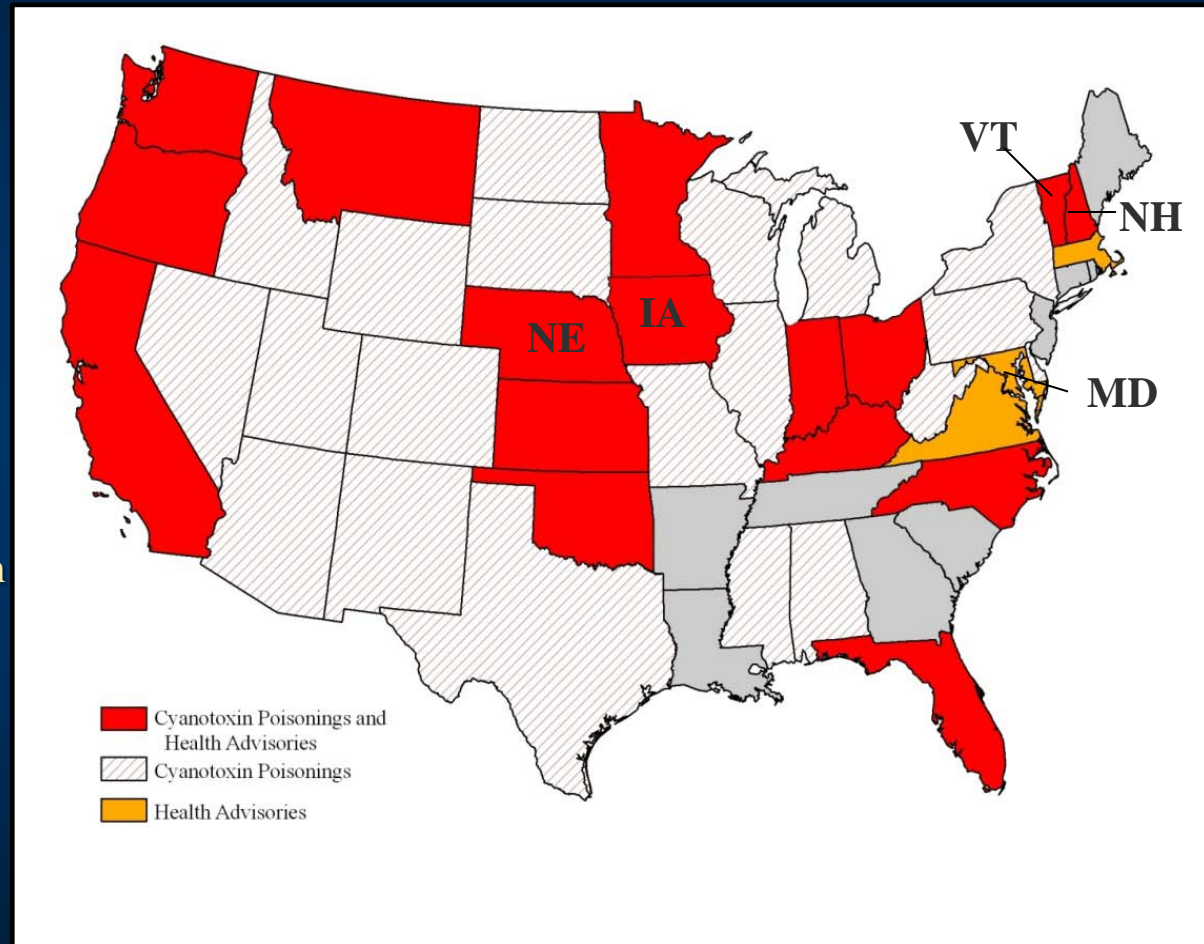


Do not try this at home (or anywhere else)!

How Common are Toxic Cyanobacterial Blooms?

At least 36 U.S. states have anecdotal reports of human or animal poisonings associated with cyanotoxins, but there are not good records of how frequently cyanotoxin-related poisonings occur.

- 5 states have routine monitoring programs for cyanotoxins.
- 17 states have action plans and/or public education programs for cyanotoxins, including Kansas
- USGS has measured cyanotoxins in most states, including 5 that have not had poisonings or advisories (AK, AR, LA, GA, and DE).



What Are the Common Bloom Forming Cyanobacteria in Kansas?

- All of these common cyanobacteria produce toxins
- You cannot tell if a cyanobacterial bloom is toxic just by looking at the bloom or even the community composition



What Do Cyanobacterial Blooms Look Like?

- Cyanobacterial bloom appearance varies, but common characteristics include:
 - Bright green or blue green in color
 - Thick scums or accumulations that may look like spilled paint
 - May be accompanied by earthy, musty, septic, or sulfurous odors



What Do Cyanobacterial Blooms Look Like?

Common Bloom Appearance



What Do Cyanobacterial Blooms Look Like?

Johnson County Blooms



**Johnson County Golf Course
October 2004**



**Pond near Overland Park
October 2008**



**Pond near Shawnee
July 2010**

What Do Cyanobacterial Blooms Look Like?

Less Common Bloom Appearance

- Red or brown color
- Occurrence in old river channels
- Occurrence in winter under ice



What Do Cyanobacterial Blooms Look Like?

Other Aquatic Plants May Look Like Algal Blooms from a Distance,
but Have Distinct Roots and Leaves Upon Closer Inspection

Water Fern (*Azolla*)



Duckweed (*Lemna*)



Do Toxic Cyanobacterial Blooms Occur in Kansas?

- YES!
- Three Kansas reservoirs have been closed for recreation (no fishing, boating, or swimming) this summer because of toxic cyanobacterial blooms:
 - Lovewell Reservoir (Jewell County)
 - Centralia City Lake (Nemaha County)
 - Meade State Lake (Meade County)
- KDHE uses a combination of cyanobacterial cell counts and microcystin concentrations.



What Should I Do If I See a Cyanobacterial Bloom?

- Avoid direct contact with the affected area (especially children and pets).
- Have a plan in place to deal with worst case scenarios prior to an event.
 - Verification that cyanobacteria are present.

Johnson County Environmental :
Besty Betros (913-715-6900)

- Toxicity testing?

USGS

CyanoPros (www.cyanopros.com)

- Course of action – post warnings?

KDHE:

Julie Coleman (785-842-4600)

Ed Carney (785-296-5575)





Additional Information:

USGS Core Cast on Harmful Algal Blooms:

<http://www.usgs.gov/corecast/details.asp?ep=129>

USGS Algal Toxin Team Web Page:

<http://ks.water.usgs.gov/studies/qw/cyanobacteria/>

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