Harmful Algae Blooms in Rhode Island's (fresh) Waters

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Presentation Outline

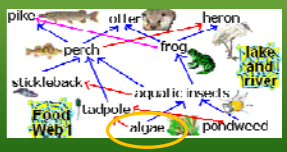
- What are (harmful) algae?
- Why are they growing so bloomin' well?
- What are their impacts?
- Options for treatment?
- Blooms in Rhode Island
- RI's response to the issue

Melville Pond, Portsmouth RI

What Are Algae?

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

Gloeotrichia echinulata



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What is an Algal Bloom?

- Extremely high cell densities (70,000 to 1,000,000+ cells per milliliter)
- Dominated by a single or a few species
- Visible accumulation of algae

It's green and yucky

Slack's Pond, Smithfield –J. Sawyers

Idaho - cyanobacteria bloom - F. Wilhelm

USGS

What Types of Algae Cause Blooms?

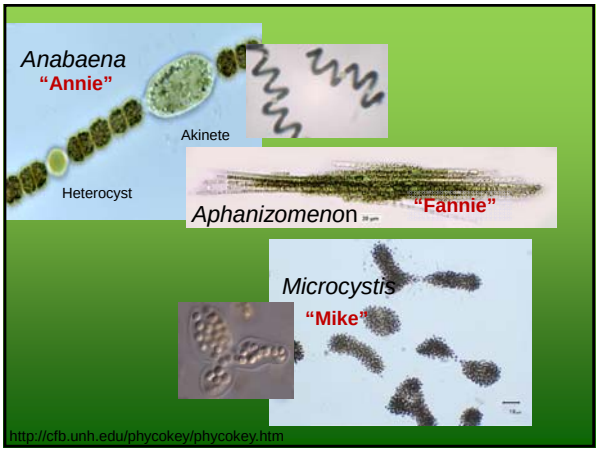
ALL types of algae can cause harmful algal blooms under the right conditions.

USGS

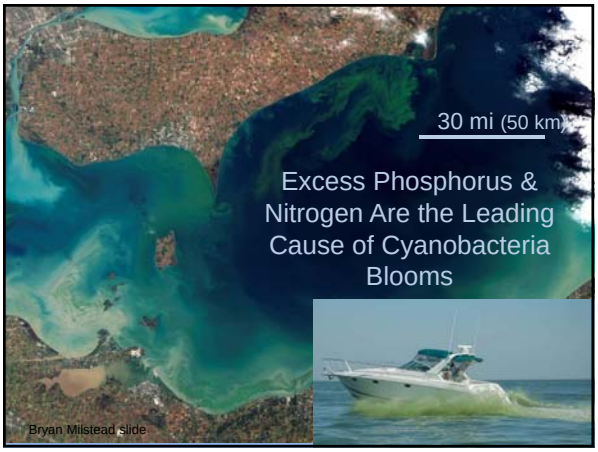
Cyanobacteria – Blue Green Algae

- Prokaryotic photosynthetic bacteria
- ~3.5 billion years of evolution
- Amazing diversity of life forms and habitats
- Many can fix nitrogen
- Resting spores, also quite mobile
- Produce over 80 known toxins

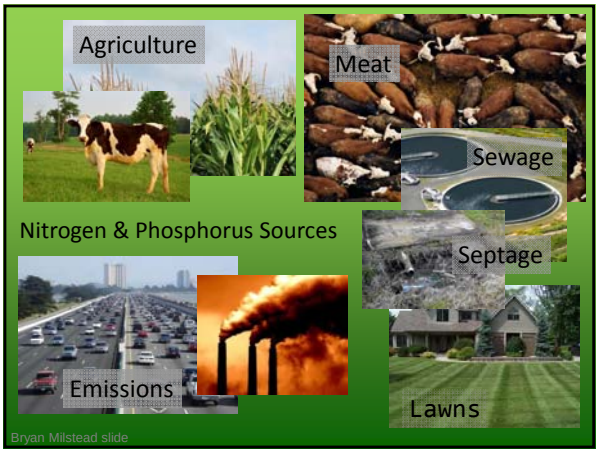
Yawgoo Pond Oct 2005



http://cfb.unh.edu/phycokey/phycokey.htm



Bryan Milstead slide



Bryan Milstead slide

CLIMATE CHANGE seems to favor blue-green blooms

- **Warmer average temperature of surface water limits mixing and increases growth rates; cyanos like it *hot.***
- **More intense storms produce more *runoff*, add more nutrients; cyanos prefer high nutrient levels, esp P.**

However, erratic inputs, fluctuating winds, and variable oxygen loss lead to less predictable conditions.

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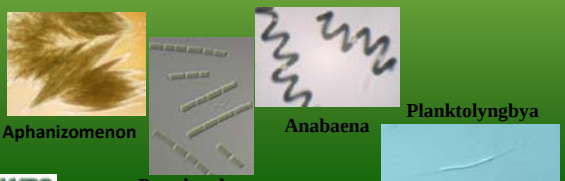
Although excess nutrients are the leading cause of cyanobacteria blooms, other factors can play a major role

- Size, shape, depth, residence time,
- Sunlight, rain, wind, wind direction,
- Limited mixing,
- Seasonal loss of oxygen in bottom waters,
- Nutrient cycling from sediment into water,
- Water residence time

Surface Bloom Formations

- Starter population usually from upstream or sediment.
- Population starts small, grows into bloom over 3-4 weeks
- Water column nutrients/light control bloom severity



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Mid-Depth Bloom Formation

Moves into upper water layer:

- Starter population normally from sediment, rises to near thermocline (mid-depth)
- Growth at depth depends on high efficiency of light use but capitalizes on generally higher nutrient levels

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Bottom Bloom Formation

Bottom growth of planktonic forms followed by synchronized rise into the upper water layer:

- Resting stages germinate on sediment surface, grow in place to fully formed colonies.
- Gas vesicles form synchronously and create buoyancy; colonies float to surface quickly.

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Bottom Filamentous Blooms

Filamentous blue-greens (and green algae) mats form, trap gases, float to surface as mats or "chunks."

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Thanks
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USGS
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