

Ecology of Cyanobacteria in Lakes

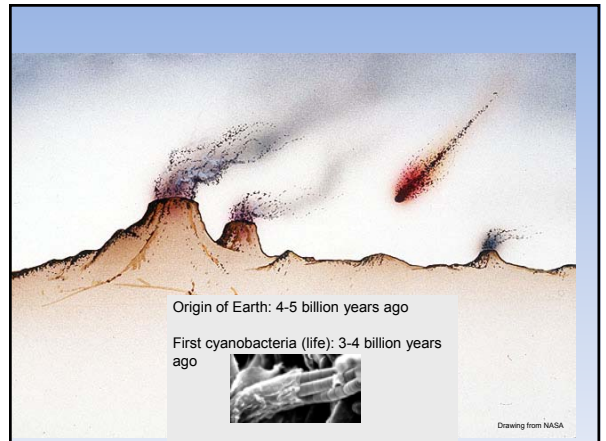
Jim Haney
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What cyanobacteria are not:

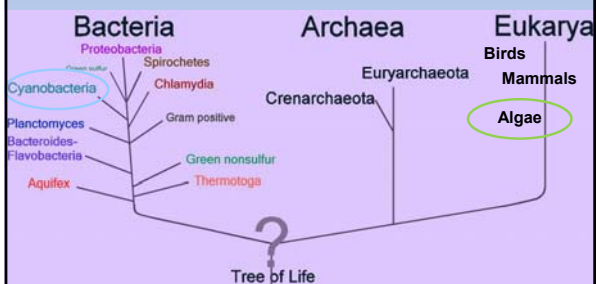
- NOT Infectious Pathogens
- NOT Invasive Species

What Cyanobacteria are:

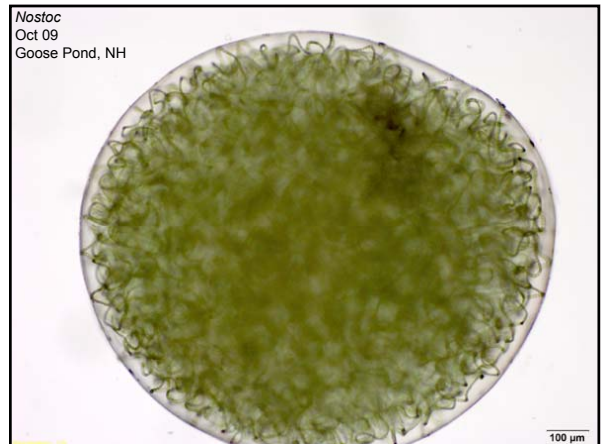
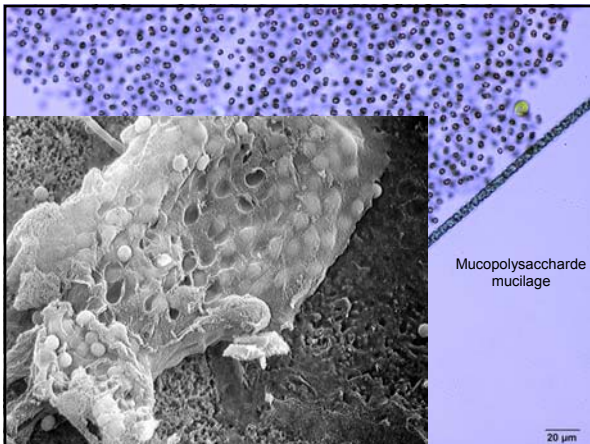
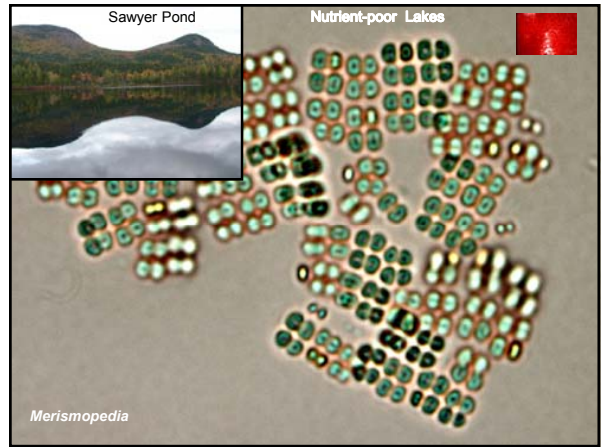
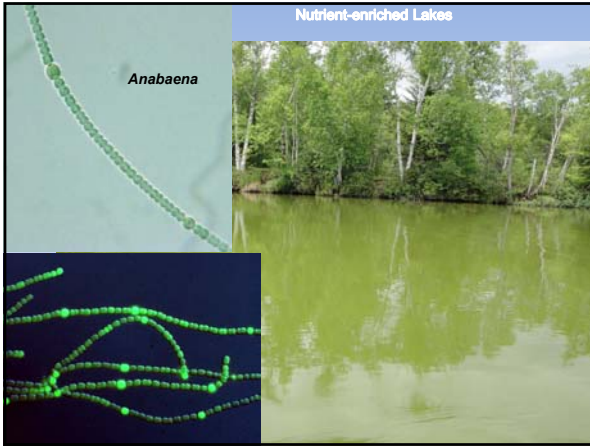
- **Integral** and **natural** components of aquatic ecosystems
- **Successful** and often promoted by human activities
- **Ancient**, and thus deserving of respect

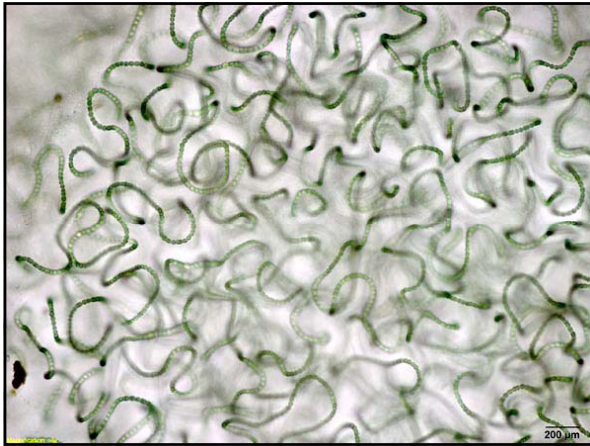


Blue-Green Algae or Cyanobacteria?



Cyanobacteria Diversity





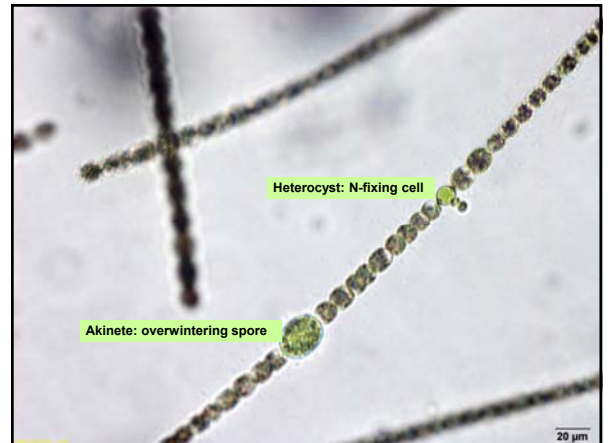
Planktonic cyanobacteria as Competitors

Cyanobacteria Dominance

- Nutrients (high levels of phosphorus followed by low)
- Warm Temperature
- Thermocline Stability (increase w/ temp)
- Low Light (low water clarity)

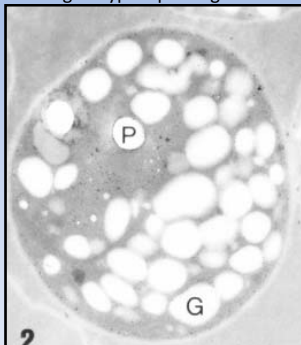
Why are Cyanobacteria so Successful?

- Environmental adaptations



Nutrient storage:

e.g. Polyphosphate granules



Antennal Pigments Phycobillins, e.g. Phycocyanin: low light adaptation



Why are Cyanobacteria so Successful?

- Environmental adaptations
- Chemical warfare

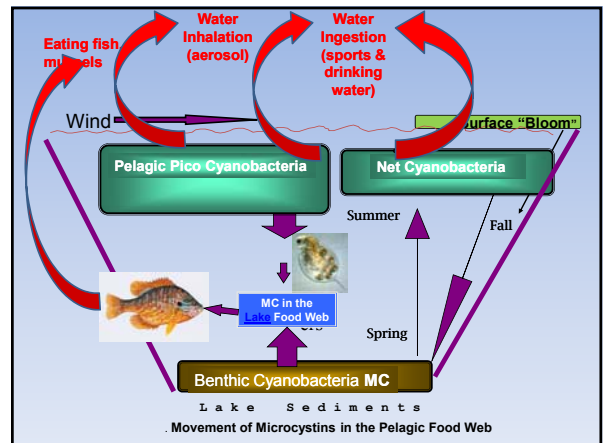
Important Cyanotoxins :

Name	Effect	Reaction t	Comments
1. Microcystins	Hepatotoxin	Hours-Days	acute/chronic
2. Nodularins	Hepatotoxin	Hours-Days	estuaries, brackish
3. Cylindrospermopsin	Hepatotoxin	Hours-Days	invasive
4. Anatoxin <i>a</i>	Neurotoxin	Fast acting (min)	pets & birds
5. Saxitoxin	Neurotoxin	Fast acting (min)	cf. red tide
6. BMAA	Neurotoxin	Fast/Long-term?	Neurological Disorders

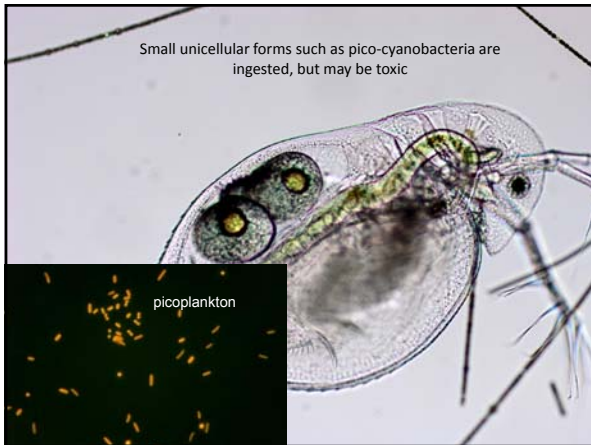
Life History

Planktonic/Meroplanktonic Cyanobacteria

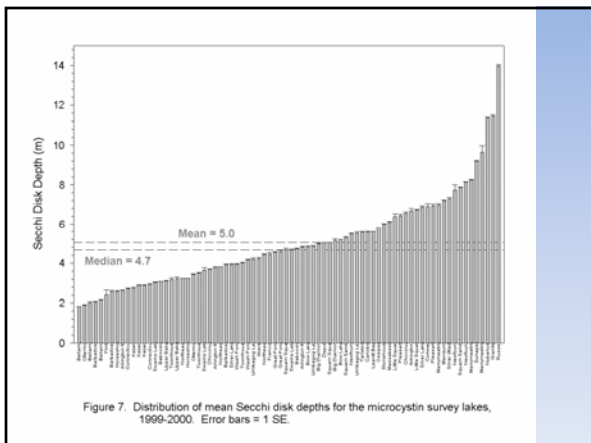
Lake Sediments



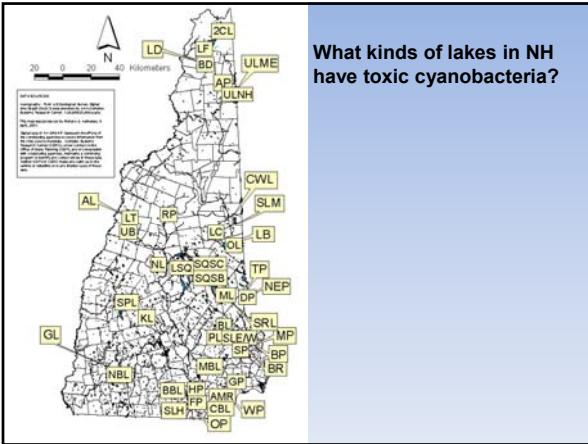
Food Web Interactions



Lakes of the Northeast

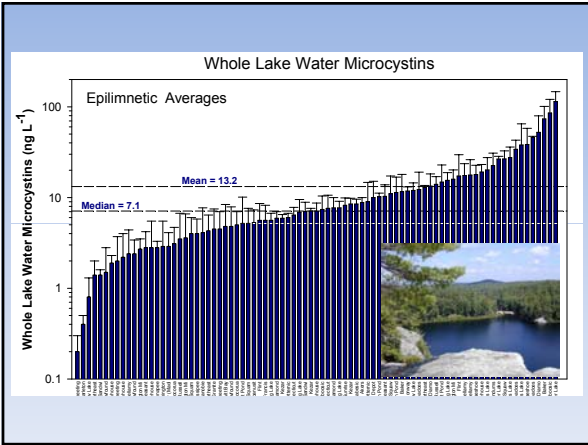


Are there microcystins in the food web?



Finding:

Cyanobacteria toxins were found in **all** NH study lakes (62), from the most pristine to the most polluted



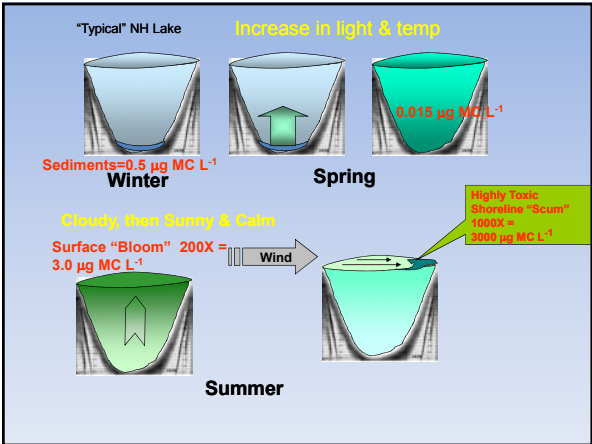
Finding:

There was a significant trend of **increasing microcystins** with **increasing phosphorus** concentration

Conclusion:

Reducing phosphorus loading is one way to reduce the toxic cyanobacteria in a lake

CyanoBlooms: how do they occur?



Needed: Better Understanding of

- Bloom ecology: Causes, spatial and temporal distributions of cyanoblooms
- **Toxicity of “Invisible” Pico-cyanobacteria (<2 um** and movement through food web; potential role in human illness

Thanks!

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- Members of the Biotoxins Lab at UNH