


Water Quality as it Pertains to Algae Management

By: Sam Sardes
Weed Science Director

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LAKE MANAGEMENT
Restoring Balance. Enhancing Beauty.



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AGENDA

- Overview of algae blooms
- Basic nutrients
- Nutrient interactions
- Stratification and oxygen
- Miscellaneous WQ parameters
- Predicting blooms and their types
- Management of blooms by manipulating WQ



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Overview of Algae

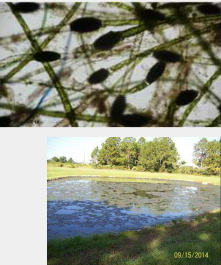
Green Algae (Chlorophytes/Charophytes)

- Eukaryote (complex organism)
- A lot of similarities to **plants**

A few of the most common bad actors:


- Cladophora sp.
- Rhizoclonium sp.
- Pithophora sp.
- Oedogonium sp.
- Spirogyra sp.
- Mixed planktonic communities
- Chlorella sp.
- Chroococcus sp.
- Chlamydomonas sp.
- Pediastrum sp.

- **Euglenoids**- algae/animal organisms



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Overview of Algae



Blue-green Algae (Cyanobacteria)

- Prokaryote (simple organism)
- A lot of similarities to **bacteria**
----- it is bacteria

A few of the most common bad actors:


- *Lyngbya* sp.
- *Phormidium* sp.
- *Leptolyngbya* sp.
- *Oscillatoria* sp.
- *Microcystis* sp.
- *Scytonema* sp.
- *Cylindrospermopsis* sp.
- *Anabaena* sp.
- *Dolichospermum* sp.

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Overview of Algae

You need to look at it under a microscope to be moderately sure of what your target algae is.


Many look super similar out in the field.



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Basic Nutrients - Phosphorus

- One of the requires atoms for all living organisms
- -----found in DNA, cell membranes, ATP (biological gasoline)
- Too much of a good thing leads to major algal blooms
- Often the limiting factor for HAB's
- Comes from many sources: reclaimed water, septic tanks, fertilizer, animal input, underground!!!!, etc.



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Basic Nutrients - Phosphorus

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Basic Nutrients - Phosphorus v Phosphate



Two common parameters measured:
 1. Total phosphorus
 2. Phosphates (FRP, SRP, ortho-, DRP, DOP, etc.)

Sample ID	Sample Location	Unit	Method	Result	Sampling Date / Time
CTSD465	Surber	Total Phosphorus (TP)	EPA 183.1	3.2	09/11/2009
		Orthophosphate (OP)	EPA 183.1	0.9	
		Total Reactive Phosphate (TRP)	EPA 183.1	0.9	
		Ortho Phosphate (OP)	EPA 183.1	0.6	
		Ammonia N (mg/L)	EPA 440	0.5	
		Total Phosphate (mg/L)	EPA 183.1	0.5	
		Ammonia N (mg/L as N)	EPA 183.1	0.5	
		Total Dissolved (mg/L as CaCO3)	EPA 183.1	31.5	
		Total Nitrate (mg/L as Nitrate)	CompuLab et al 2004	0.82	
		Nitrite (mg/L)	CompuLab et al 2004	0.02	
		Nitrate (mg/L)	CompuLab et al 2004	0.78	
		Total Carbon (mg/L as C)	EPA 183.1	0.2	
		Total Nitrogen (mg/L)	CompuLab et al 2004	0.2	
		pH	EPA 183.1	7	

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Basic Nutrients - Nitrogen

- Is an element and forms a variety of different molecules both organic and inorganic
 - nitrates, nitrites, ammonia, ammonium, nitrogen gas, etc.
 - amino acids, nucleic acids, chlorophyll, etc.
- Nitrogen is often one of the limiting factors of a lake
 - hypothesized to have something to do with toxin production in algae

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Basic Nutrients - Nitrogen v Nitrate/-ite v TKN v NH3

- Total nitrogen – all nitrogen regardless of type of molecule
- Nitrates/nitrites and ammonia/ammonium = inorganic nitrogen
- Total Kjeldahl Nitrogen (TKN) = organic nitrogen molecules plus ammonia/ammonium

351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2 Preparation Method: EPA 351.2	
Nitrogen, Kjeldahl, Total		Pace Analytical Services - Ocmulgee Beach	
0.66	mg/L	0.50	0.086 1 09/21/20 11:30 09/22/20 10:12 7727-37-9
353.2 Nitrogen, NO2/NO3 unpres		Analytical Method: EPA 353.2	
Nitrogen, NO2 plus NO3		Pace Analytical Services - Ocmulgee Beach	
0.033 U	mg/L	0.050	0.033 1 09/16/20 18:49
0.028 U	mg/L	0.050	0.025 1 09/16/20 18:49 1479755-8 (JL1)
0.028 U	mg/L	0.050	0.025 1 09/16/20 18:49 1479765-0

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Stratification

- Density difference in a lake causing the lake to separate into layers horizontally by density
- Florida is almost always with warm water on top and cooler water beneath

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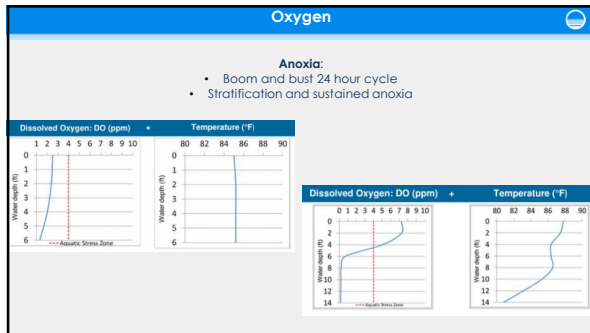
Oxygen

Oxygen is the major player in a lot of chemical reactions within a lake.

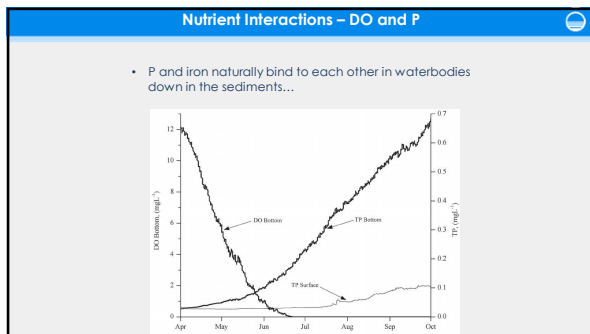
Biggest concerns with algae management for oxygen is nutrient release.

Loss of oxygen or little oxygen (<2ppm) is referred to as anoxia.

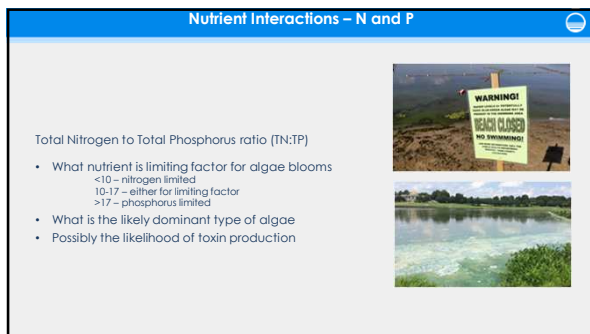
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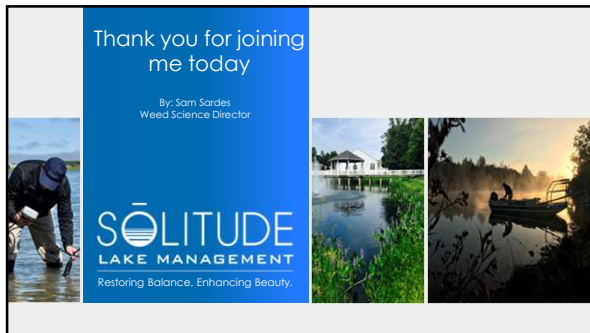
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