Importance Of Cyanobacteria Management In A Trophy Largemouth Bass Fishery

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SŌLITUDE
LAKE MANAGEMENT
Restoring Balance. Enhancing Beauty.

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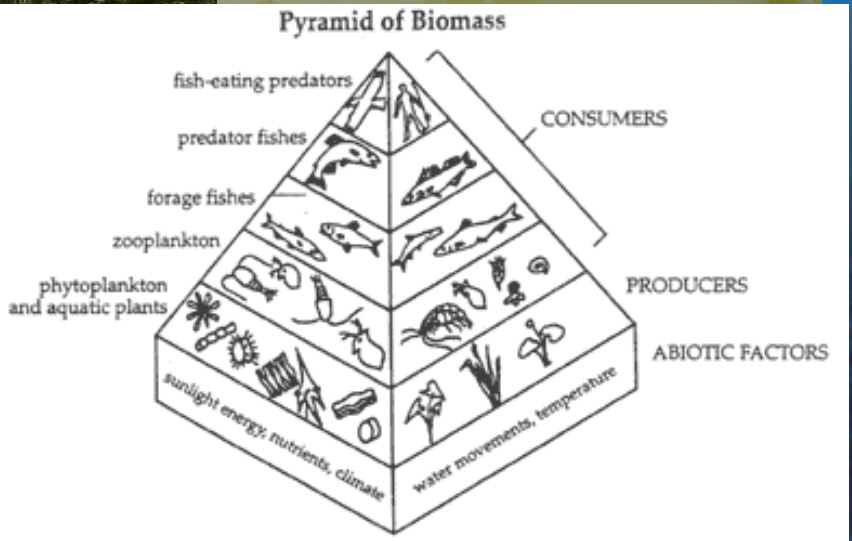
Overview

- Why cyanobacteria (i.e. blue-green algae or cyanos) are problematic
- Cyanos competitive advantage
- Why pond fertilizers can fuel cyano growth
- Keeping cyanos in check

Productivity

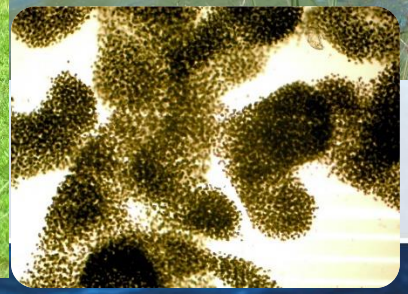
- Multi-dimensional term
  - Stimulating algal growth
  - Movement of energy and biomass up the food chain



Why Cyanobacteria Are Problematic

Common knowledge:

- Many forms produce toxins
- Often form thick scums or mats, congregating toxins
- Human health concerns
- Taste and odor



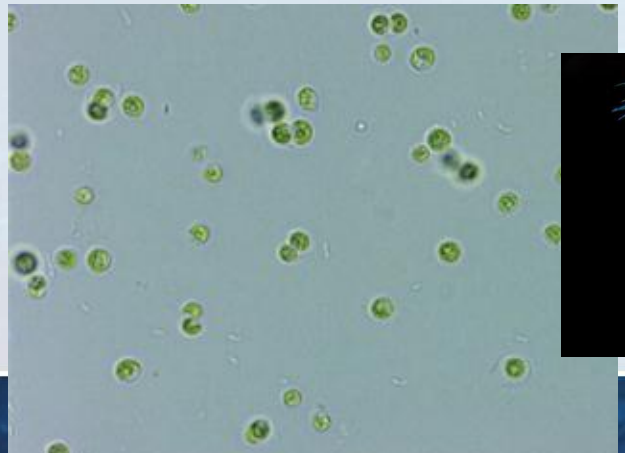
Why Cyanobacteria Are Problematic For Bass?

Why Cyanobacteria Are Problematic

- Nutrient-poor for zooplankton and/or unable to be digested by many zooplankton.
  (Lampert 1987)

- Gelatinous colonies, aggregated filaments and other unique structural features designed to avoid being consumed.
  (Webster and Peters, 1978; DeMott et al. 2001)

- Many get caught in filtering structures of zooplankton rather than be fully ingested.
  (Lampert 1987)



Why Cyanobacteria Are Problematic

- Negative impacts on zooplankton growth rates and ability to reproduce.
  (Kilham et al. 1997)

- Internally accumulated toxins (if present) may be detrimental to their fecundity (fertility).
  (Reinikainen et al. 1995)

Why Cyanobacteria Are Problematic

- Negatively impact growth and immune function of juvenile fish (adult exposure).

  (Liu et al. 2014)

- Fish embryo lethality.
  - Various developmental defects

    (Oberemm et al. 1997; Wang et al. 2005)

Why Cyanobacteria Are Problematic

- Physiological stress and damaged gonad tissue in fish following microcystin LR exposure
  - Lesions, cell apoptosis, and testicular ultrastructure alteration in fish have been documented

    (Trinchet et al. 2011; Zhao et al., 2012; Qiao et al. 2013)
  - Endochrine disruption

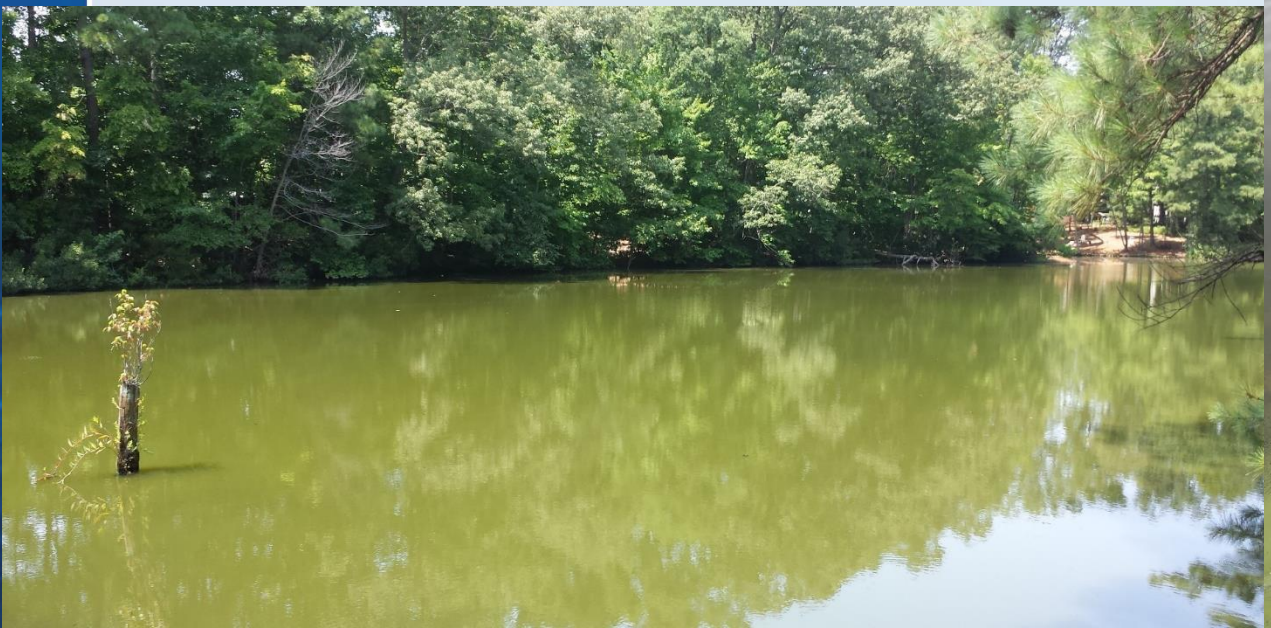
    (Rogers et al. 2011)

Cyanos Competitive Edge

- Daphnia selectively graze on green algae over cyanos.
  (Mitra and Flynn 2006; Wang et al. 2010).

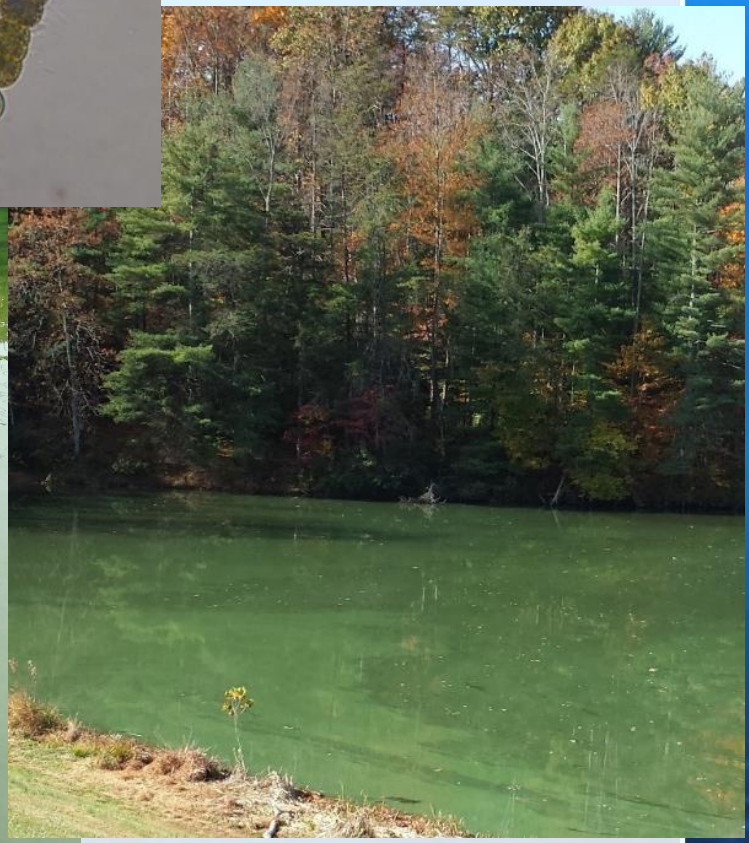
- That ends up giving the cyanos a competitive edge because, over time, they limit competition for light and nutrients
  (Mitra and Flynn 2006; Wang et al. 2010).

- Downward spiral of your algal assemblage.



Cyanos Competitive Edge

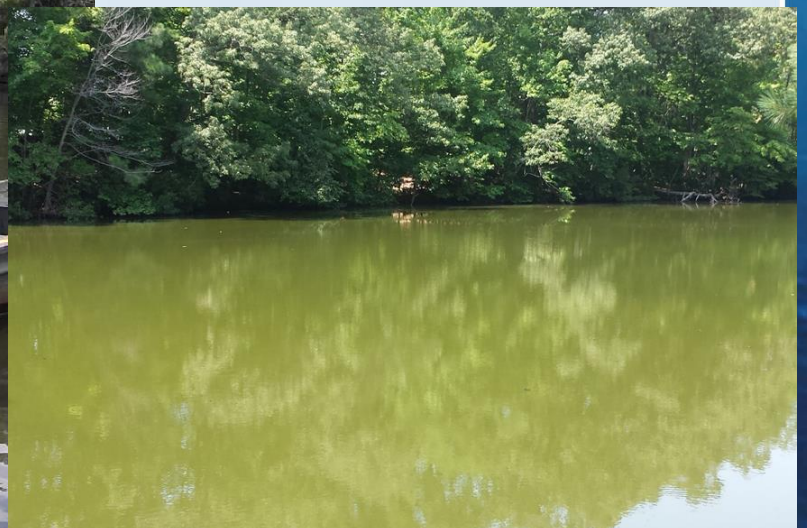
- Many can move around without expending much energy.



Why Pond Fertilizers Tend To Fuel Cyano Growth

- N:P ratios which favor phosphorus are more likely to promote undesired cyanobacteria.
  (Smith 1983; Seale et al. 1987; Paerl 1990, 1991 Ghadouani et al 2003).

- Phosphorus applied when additional phosphorus is not necessary, promotes nuisance cyanos that actually can harm your fish and decrease biomass.



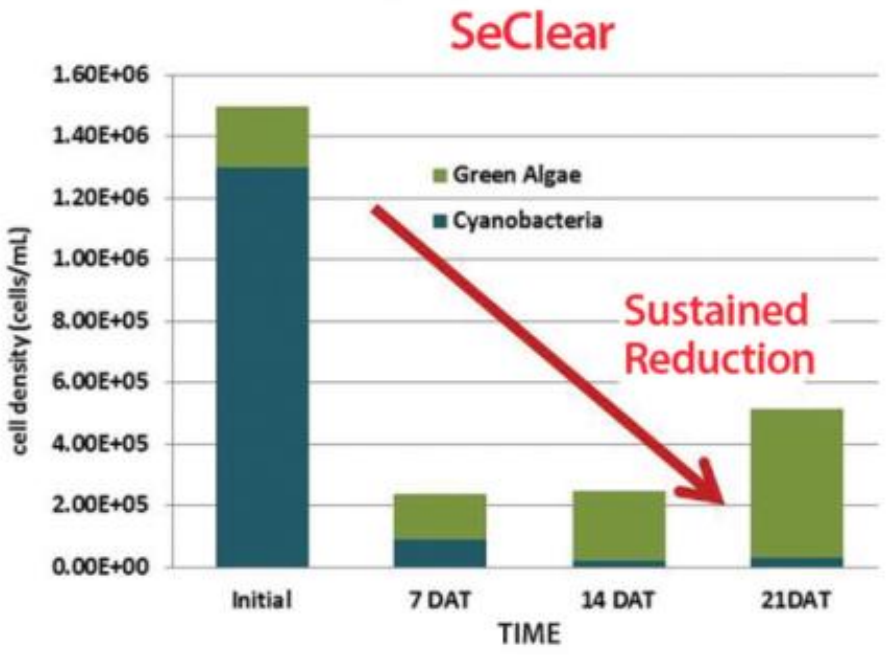
Keeping Cyanos In Check

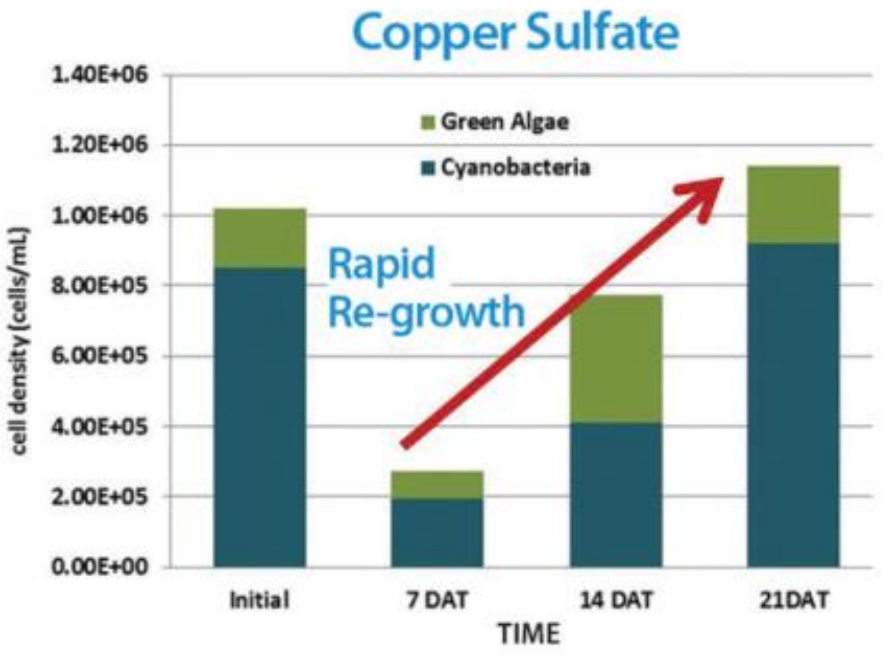
- Verify cyanos are present
  - Visual clues
  - Handheld meters
  - Laboratory analysis

Keeping Cyanos In Check

- Effective solutions to help get cyanobacteria in check.
  - Target nuisance cyanobacteria

Keeping Cyanos In Check

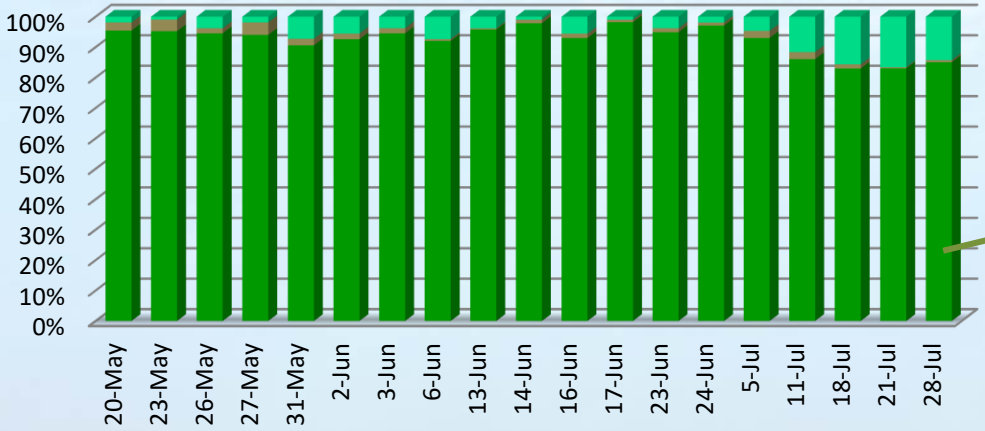


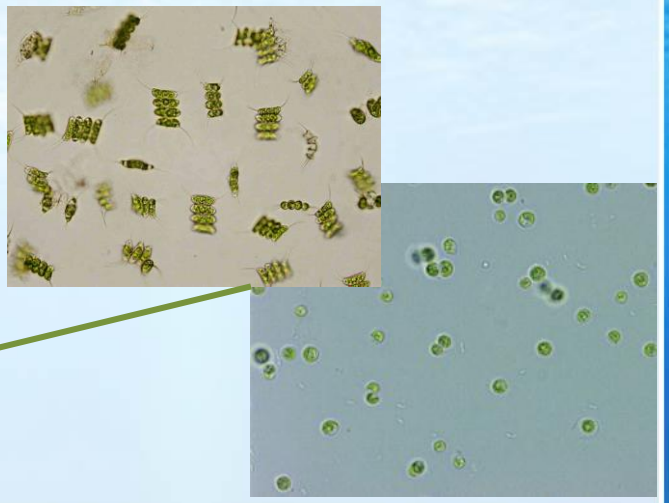


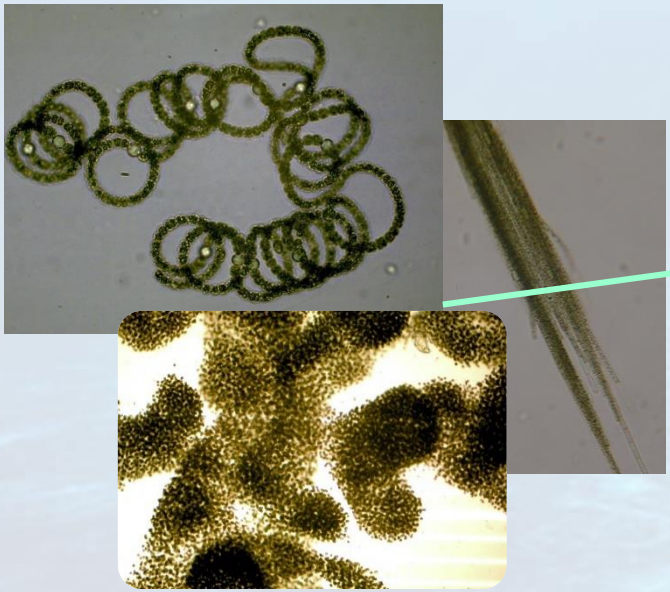
Cyanobacteria (Blue-green algae)

Green algae

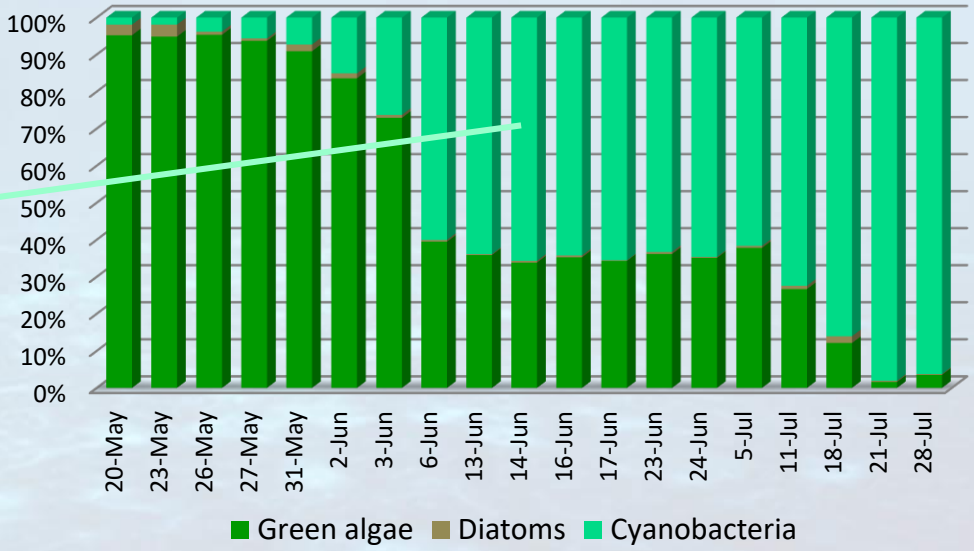
SeClear Program: Healthy Algal Assemblage







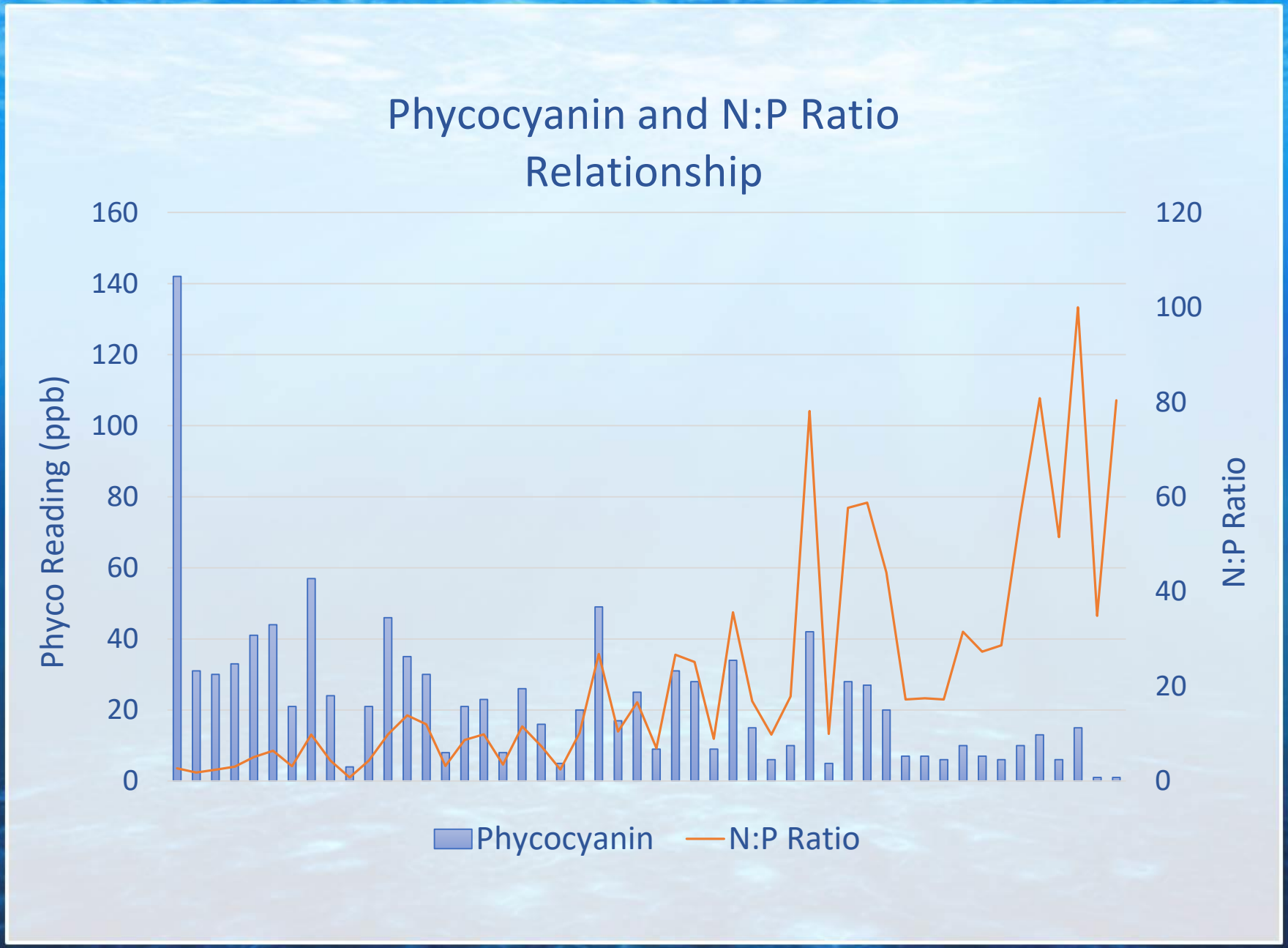
Copper Sulfate: Poor Algal Assemblage



Keeping Cyanos In Check

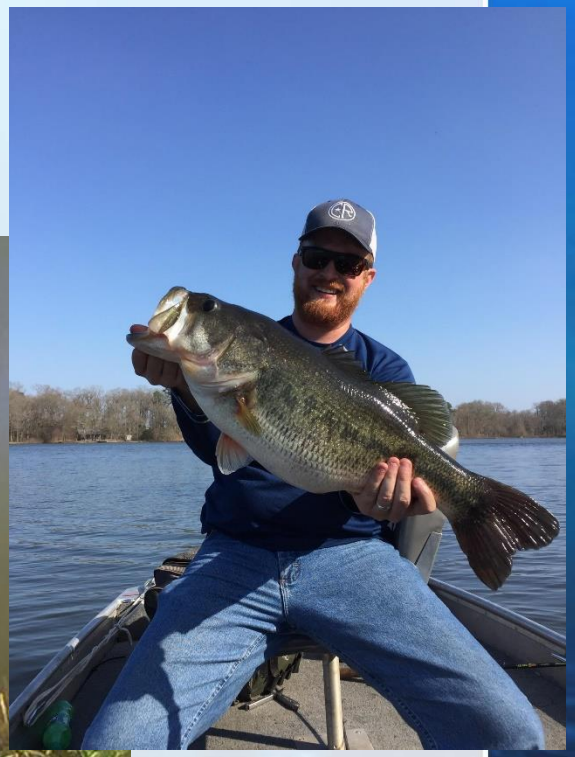
- Monitor Nitrogen and Phosphorus levels
- Alter N:P ratio if necessary
  - Remove or add P if needed
  - Add N if needed

  - Consider other ratios such as Si:P, NH3:P, NO3:NH3
    - Si:P < 25:1 Microcystis dominantes
      (Holm & Armstrong 1981)


Phycocyanin and N:P Ratio Relationship
Phyco Reading (ppb)
N:P Ratio
160
140
120
100
80
60
40
20
0
120
100
80
60
40
20
0
Phycocyanin
N:P Ratio

Summary

- Cyanos are equip to out compete green algae species.
- Understand your water chemistry
- Manipulate the water chemistry to improve the odds of green algae succeeding.
- Selectively control cyanos using algaecides.
- Stay vigilant.



Please Share Your Takeaways

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