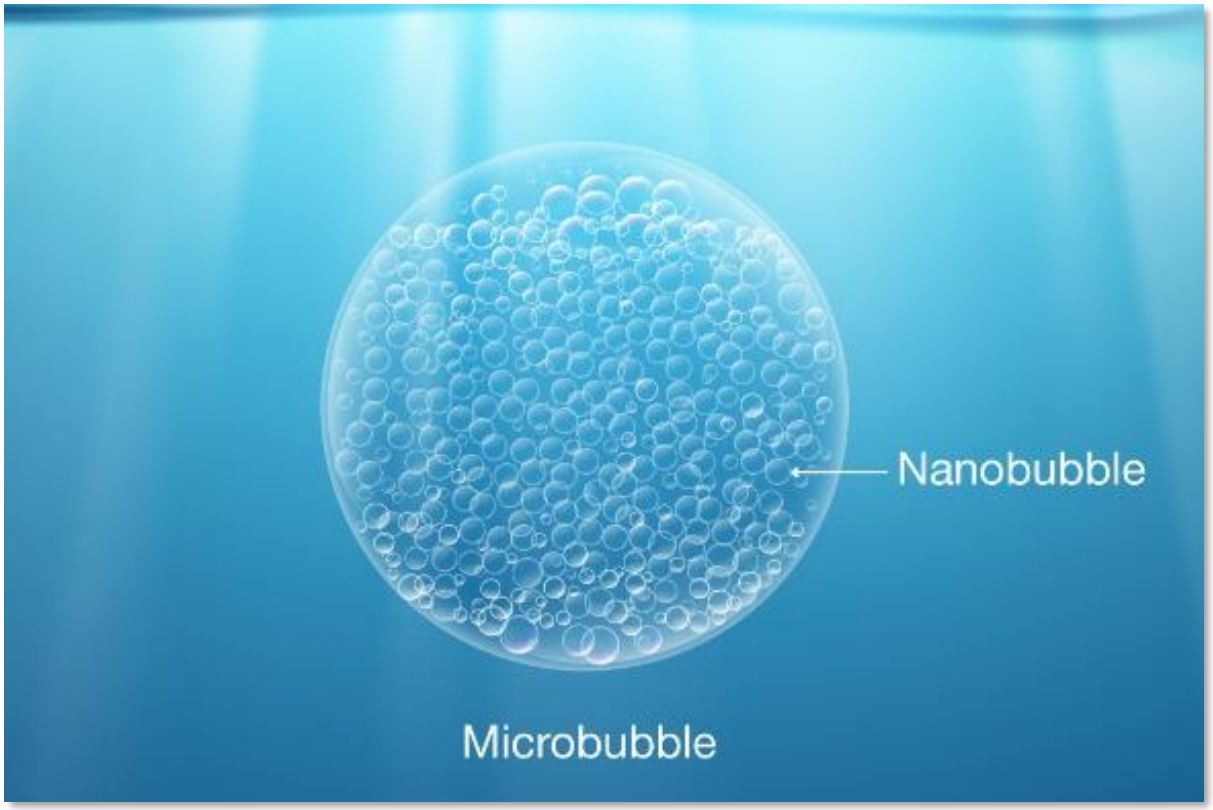
Algae Mitigation Using Air Nanobubbles

Illinois Lake Management Association
Champaign, IL

Nanobubbles

Nanobubbles are nano-sized bubbles that display unique properties in water



- ✓ 1,000 – 10,000x smaller than microbubble
- ✓ 1,000 greater surface area than microbubbles

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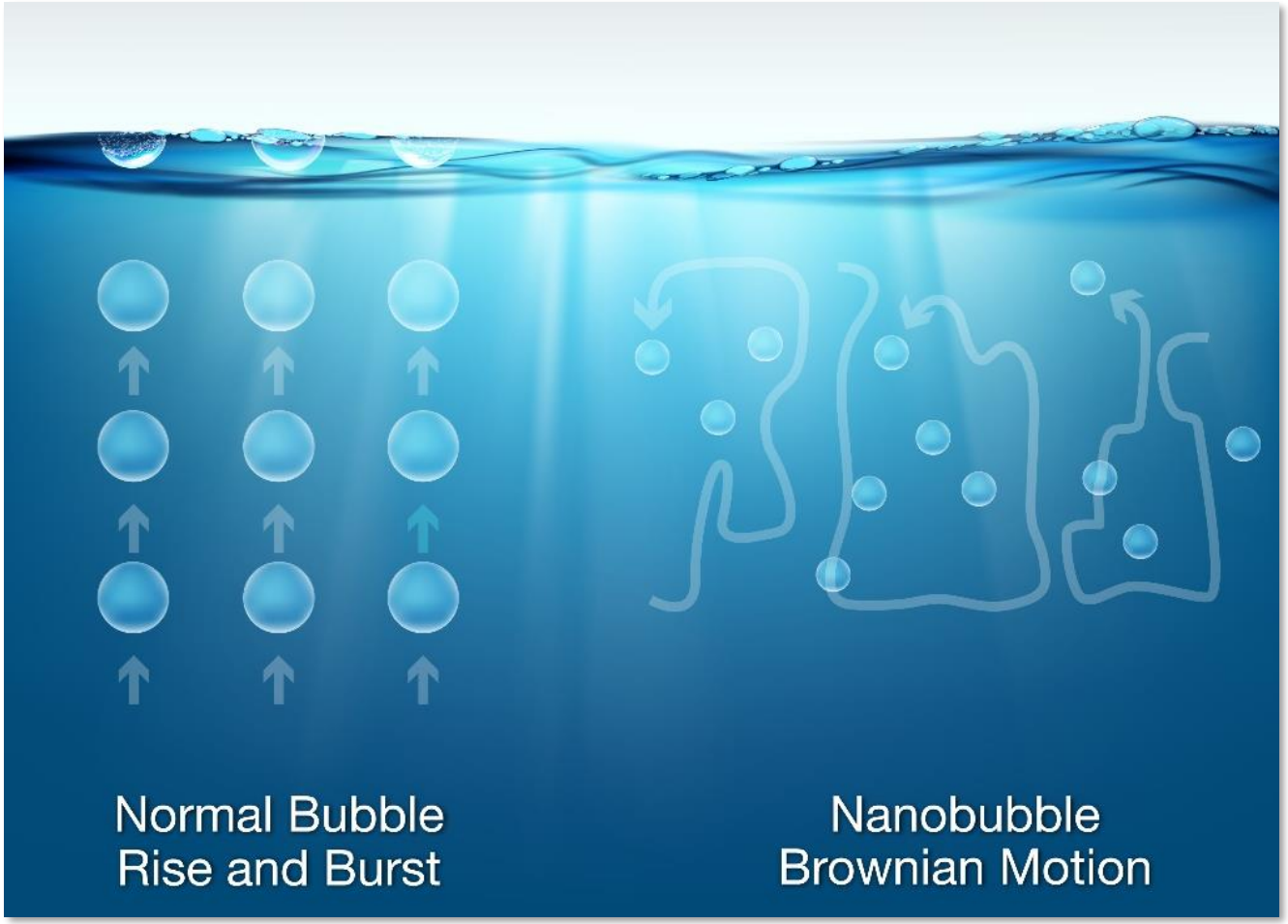
Nanobubbles



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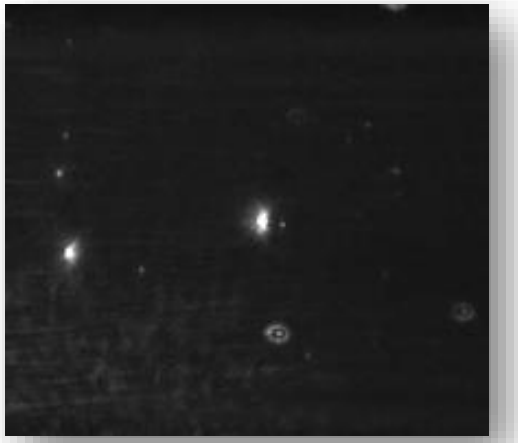
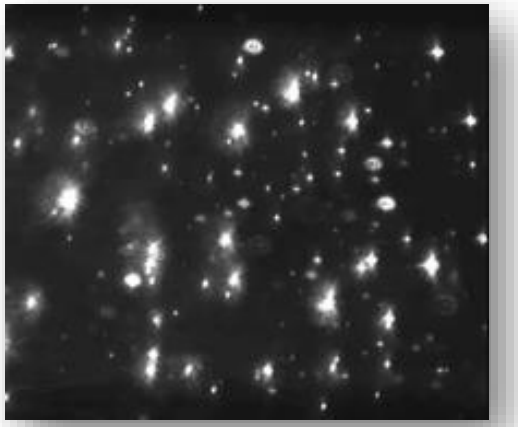
Nanobubbles

Before



After



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Moleaer Clear™ Nanobubble Generator

FEATURES

Clear™

- Available in 50 & 150 gpm
- Air or Enriched O_2 (40% O_2)
- ~1 billion nanobubbles / mL
- <60 dB
- No submerged moving parts
- Plug and Play

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Algae Control Mode of Actions

1. Direct Algae Control
    - Induces algae cell breakdown through oxidation
    - Degrade algae toxins
    - Impact algae's ability to regulate buoyancy

2. Algae Bloom Mitigation
    - Delivers oxygen throughout entire water column and water body
    - Sediment Digestion
        - Improved sediment color
        - Eliminate sediment odor
        - Reduce muck levels
    - Increased oxygen levels improve overall lake health
    - Promotion of healthy bacteria and organisms to outcompete algae

1.3 Acre Pond, Naples, FL

BEFORE

AFTER

DETAILS

Location	▪ Naples, FL
Treatment Time	▪ 8 weeks
Lake Volume	▪ 7.7 acre-feet
Lake Applicator	▪ SOLitude Lake Management
History	▪ Max Permitted Copper ▪ Aeration: 3 Diffusers, 8CFM

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1.3 Acre Pond, Naples, FL

OXYGEN SAMPLING POINTS

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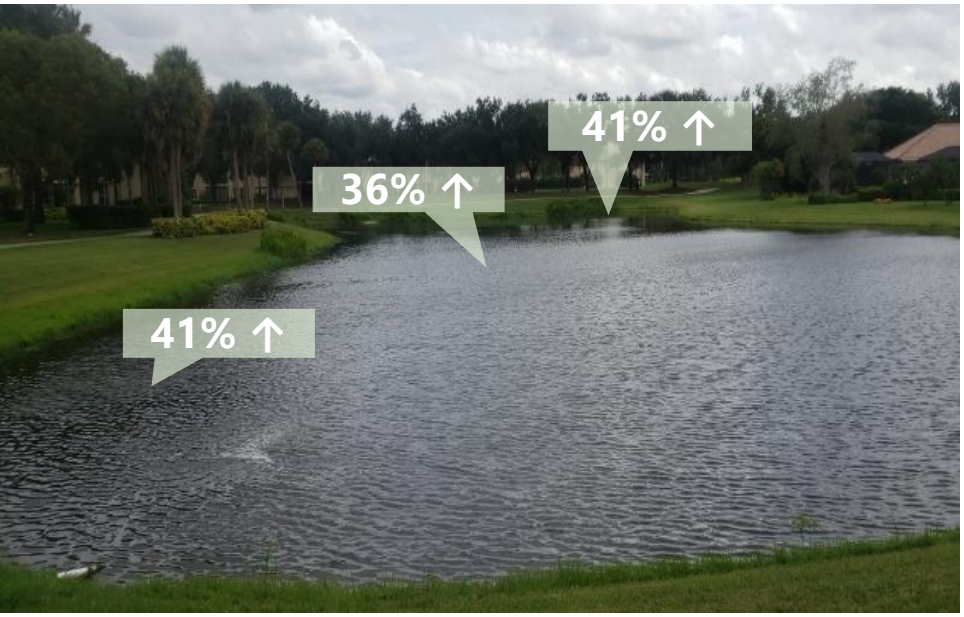
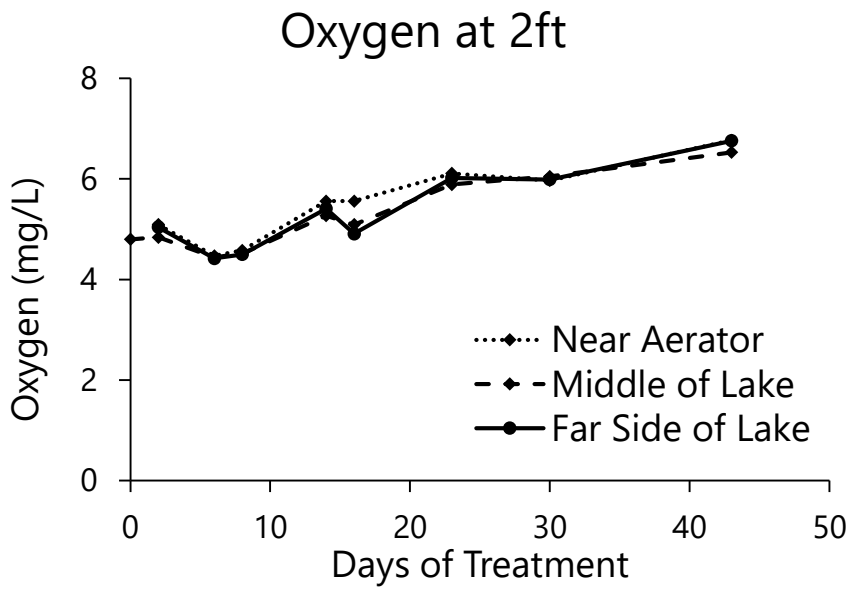
1.3 Acre Pond, Naples, FL

POND SURFACE





- Temp Range: 26-32 °C

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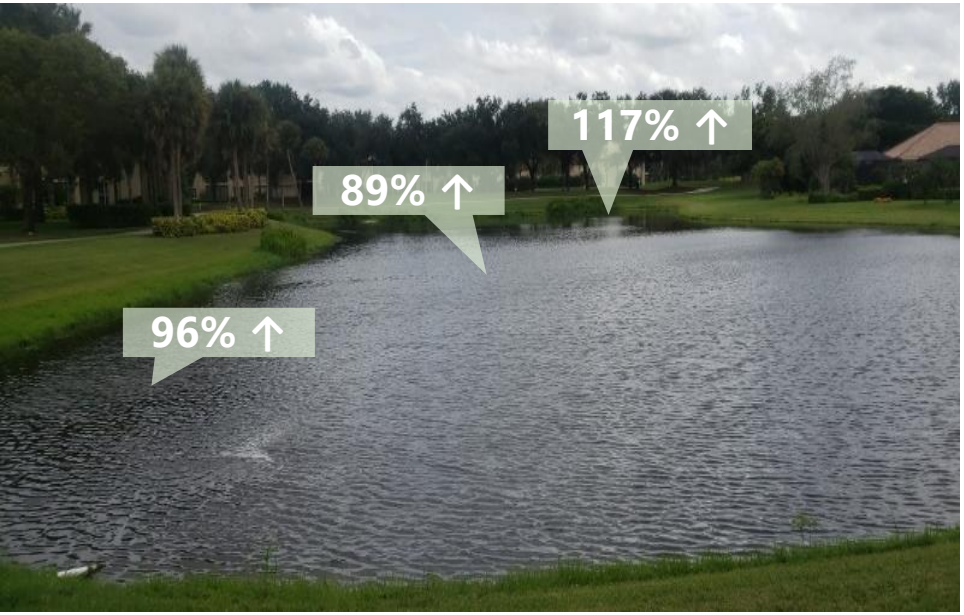
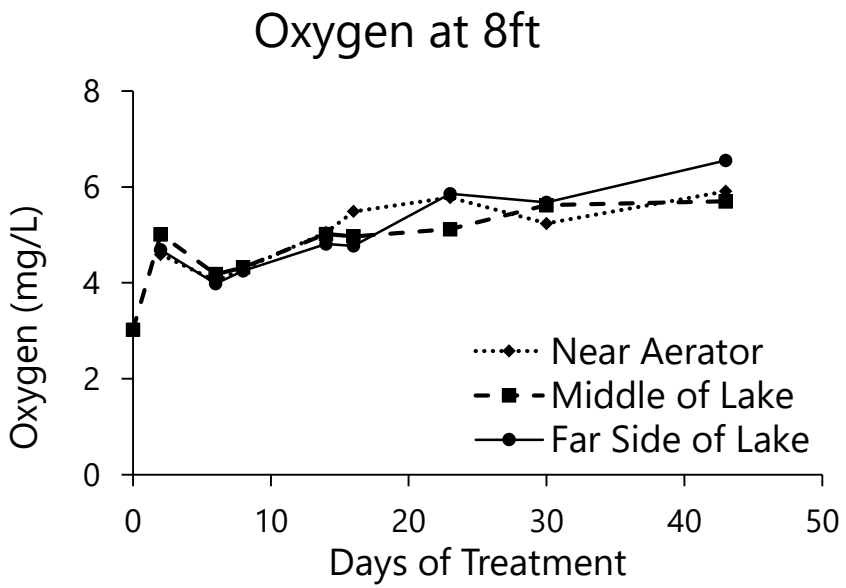
1.3 Acre Pond, Naples, FL

POND FLOOR





- Temp Range: 26-32 °C

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1.3 Acre Pond, Naples, FL

CONCLUSIONS

- Treatment Time: 8 weeks
- No more chemical treatments
- DO at 8-ft depth within 15% of DO at surface

20+ Acre Golf Course Lake

Spring 2019

Fall 2019

- 12’ average depth, 264 acre-feet

20+ Acre Golf Course Lake

- Moleaer 1000GPM Optimus

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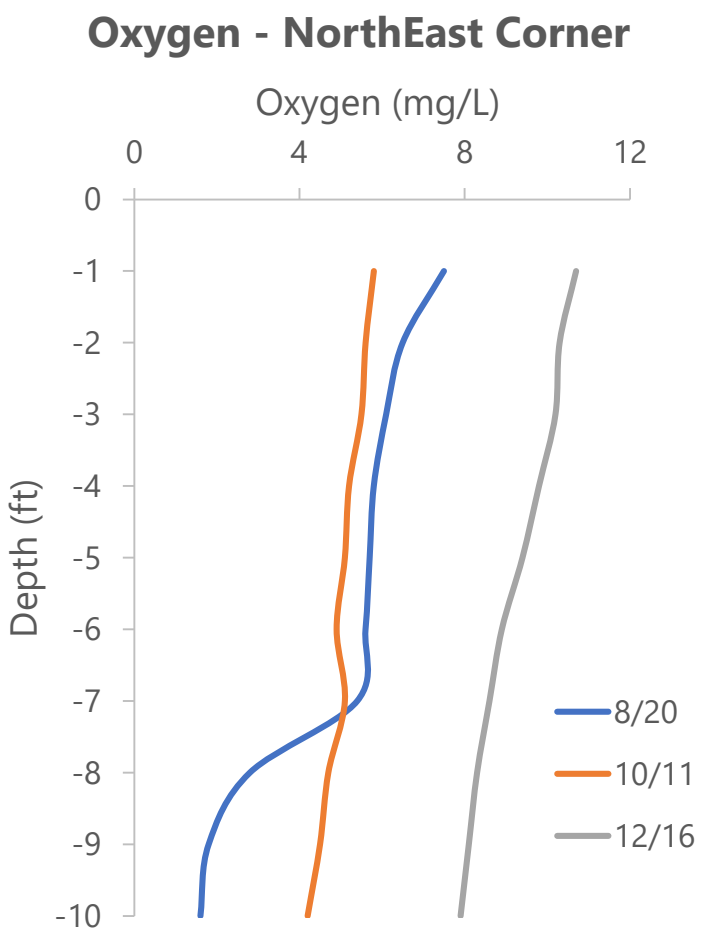
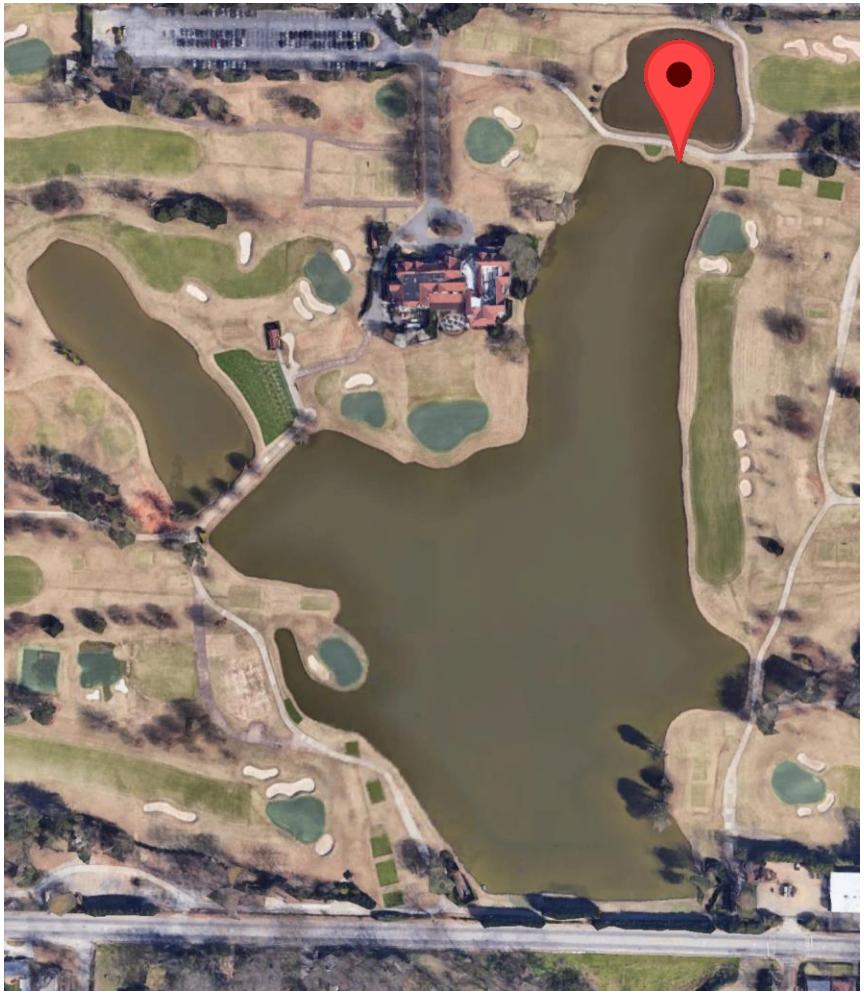
20+ Acre Golf Course Lake





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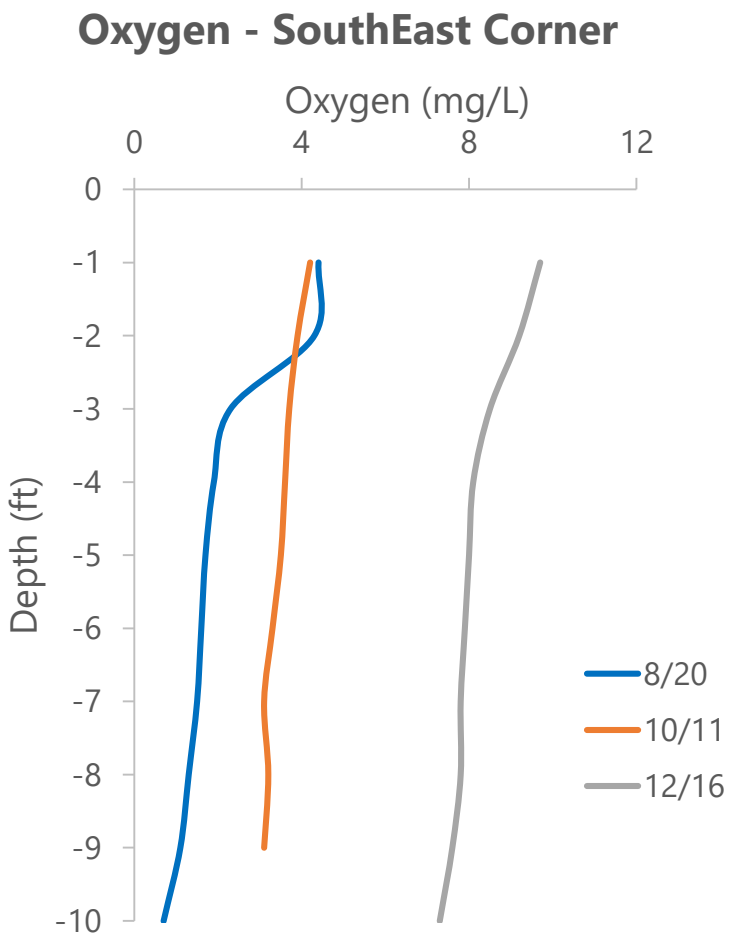
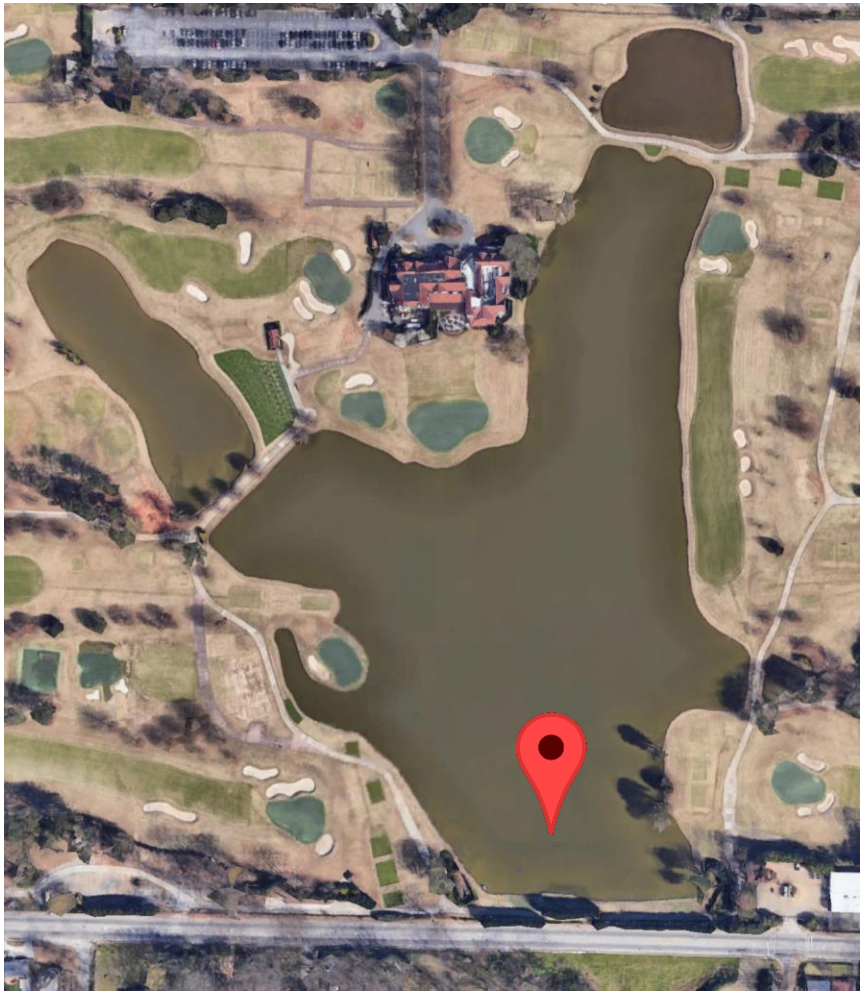
20+ Acre Golf Course Lake





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How do NBs Impact Algae & Toxins?

	DETAILS
Parameters Tested	▪ Microcystis & Microcystin Toxin
Lab Analysis	▪ Bend Genetics, Sacramento, CA
Date Tested	▪ August, 2019

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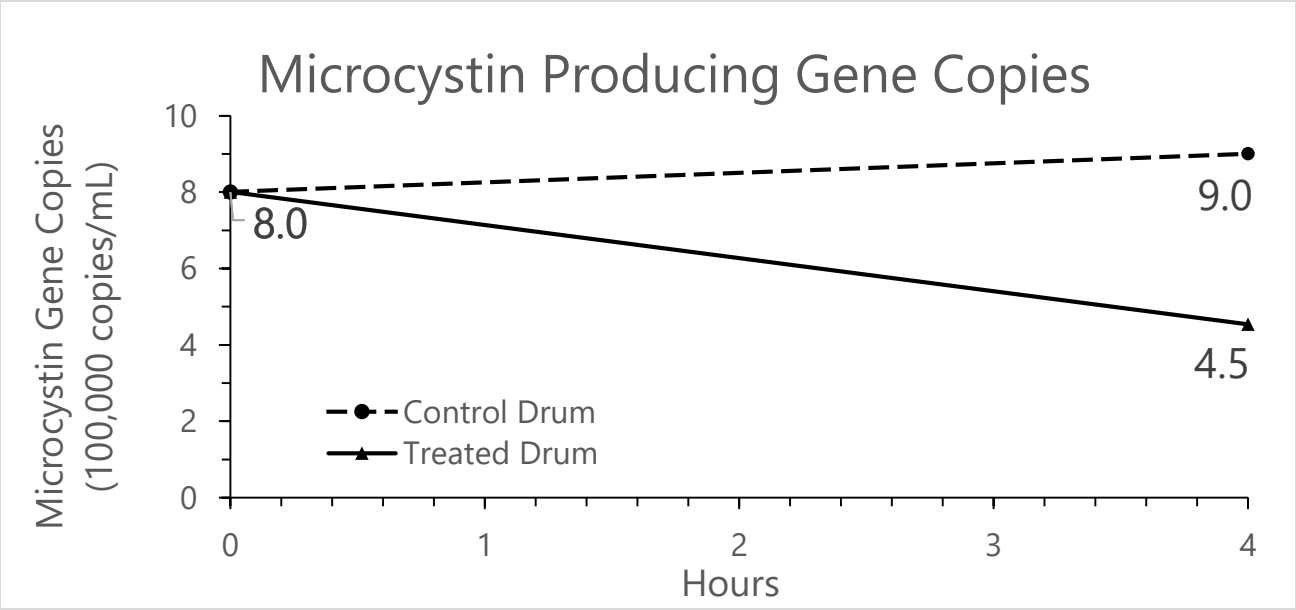
Algae & Toxin Nanobubble Impact



FINDINGS

Cyanobacteria

- Nanobubble Treated: -40%
- Control: +12.5%

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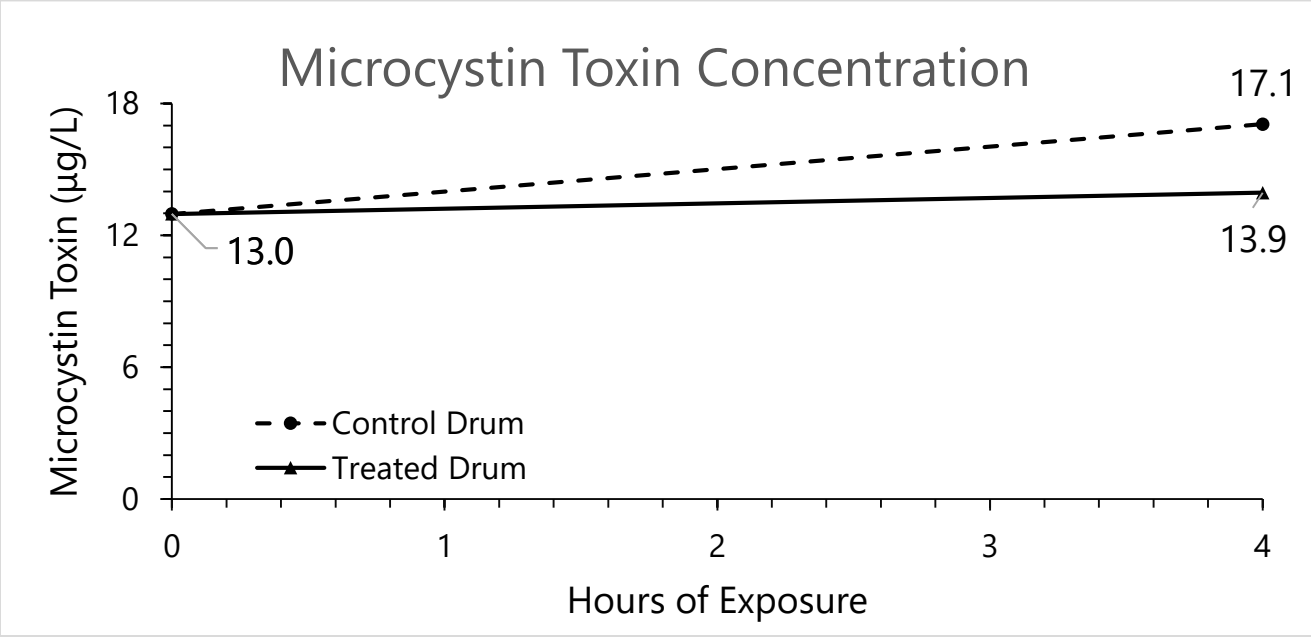
Algae & Toxin Nanobubble Impact



FINDINGS

Microcystin Toxin

- Nanobubble Treated: +7.5%
- Control: +32%

40% algae lysis with no toxin increase suggests air nanobubble's ability to break down algae toxins

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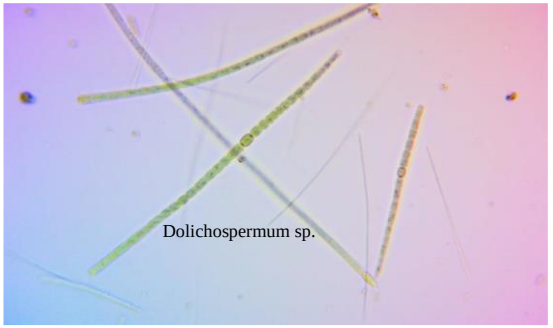
Microscopy Photos

Dolichospermum

Before:



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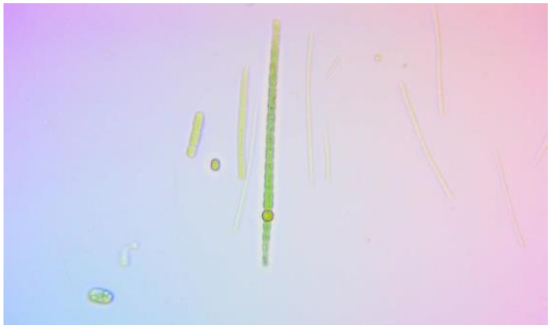
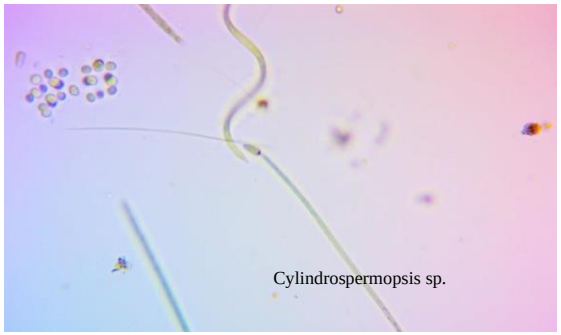


High -> Moderate

Cylindrospermopsis

Before:



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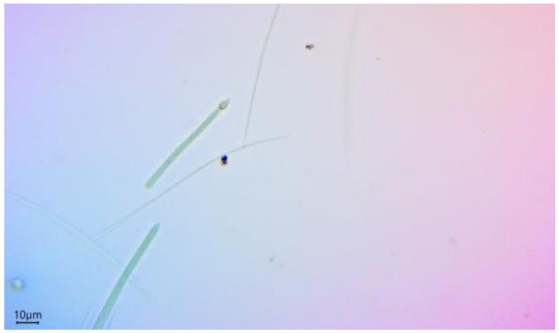

Moderately High -> Low

Microcystis: Moderately High -> Very Low

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Before & After

Aquatic Management Applications

- Fish
  - Recreational fishing ponds (private and public)
  - Koi ponds and commercial aquariums
  - Hatcheries
  - Sea pens (salmon, shrimp)
  - Bivalves and mollusks
  - Bait fish – increasing vigor
- Midge fly control
- Support sediment decomposition, delay or improve dredging
- Water parks, resorts, commercial swimming pools

Thank You

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