

# Oxygenation Experience at Sarah's Pond, Orleans MA

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# OPC Effort

- OPC interested in oxygenation as an alternative for algae control in lakes with excessive internal P cycling
- Judith Bruce has supplied background info
- One year of pre-treatment data but additional data and observations as part of town monitoring effort
- Applied nanobubbles first based on cost, ran 2 years
- Gantzer OST then applied, ran 3 years



# OST

- Water pumped out of target zone in pond and into oxygenation chamber
- Oxygen generated on site, infused into chamber to greatly increase oxygen content of water
- Water returned to target zone in pond with high oxygen content
- Key factors are oxygen demand and thermal structure



## Things to look at in the pond

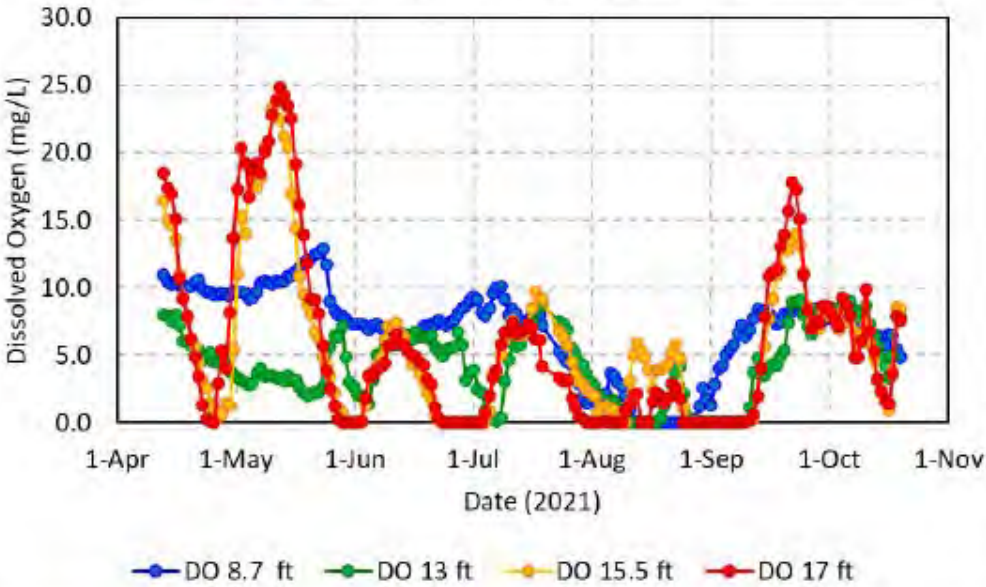
- Oxygen – that is what is targeted with treatment
- Nutrients drive algae production - phosphorus and nitrogen as key nutrients
- Amount and types of algae present as strong indicators of pond quality – chlorophyll and algal groups
- Water clarity is primary determinant of “clean” water for most people – Secchi transparency



# Oxygen

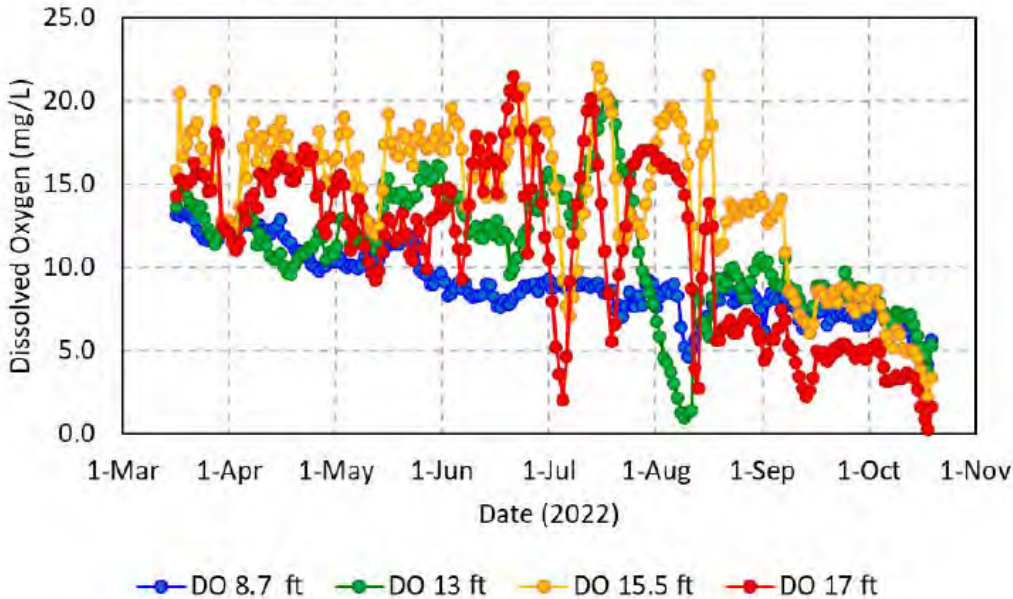
Intermittent operation vs. more continuous operation

Average Daily Dissolved Oxygen Data



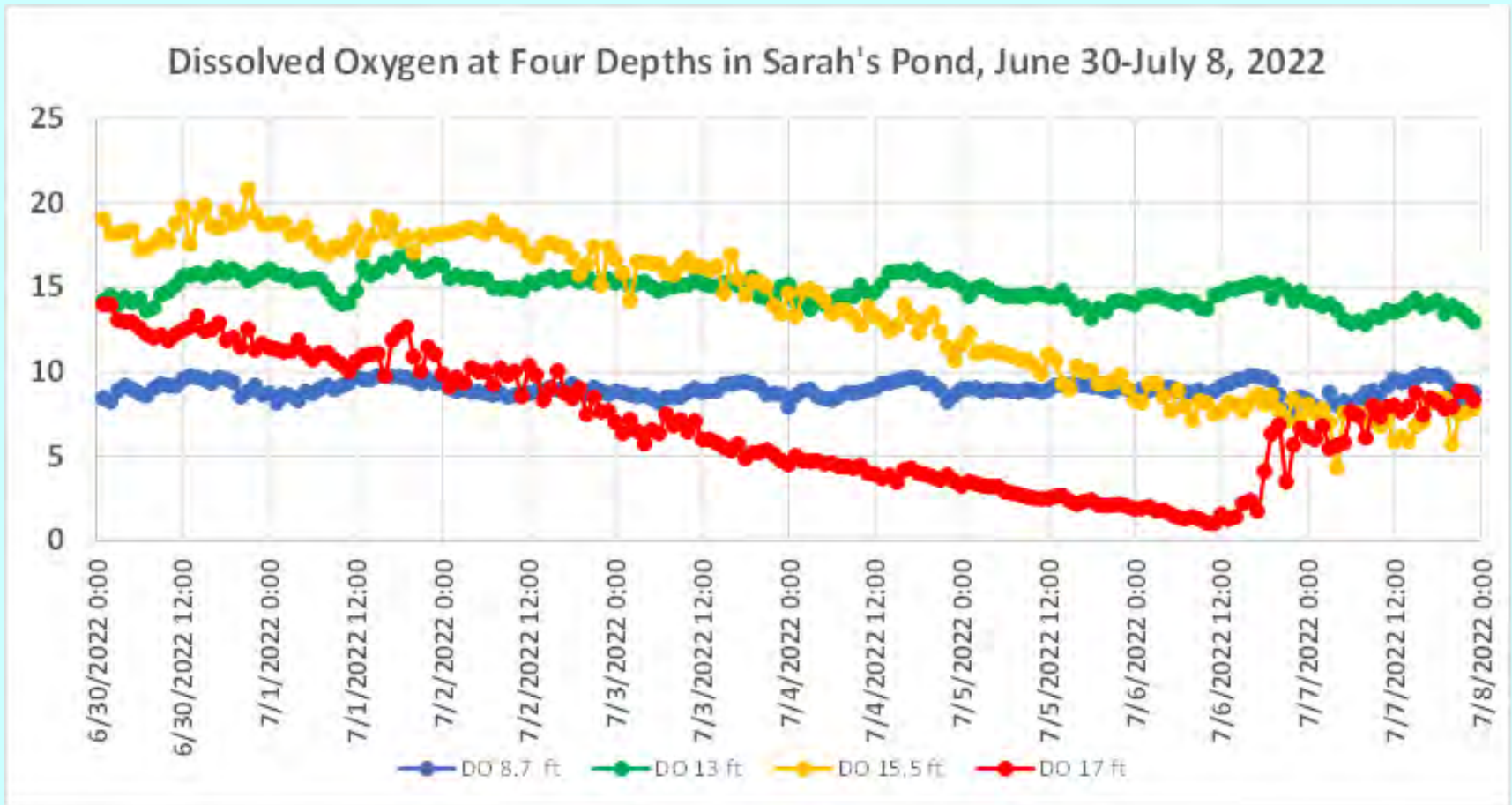
Key is to avoid having oxygen go to zero at sediment-water interface; need extra oxygen over sediment to handle likely shutdown periods

Average Daily Dissolved Oxygen Data



# Oxygen

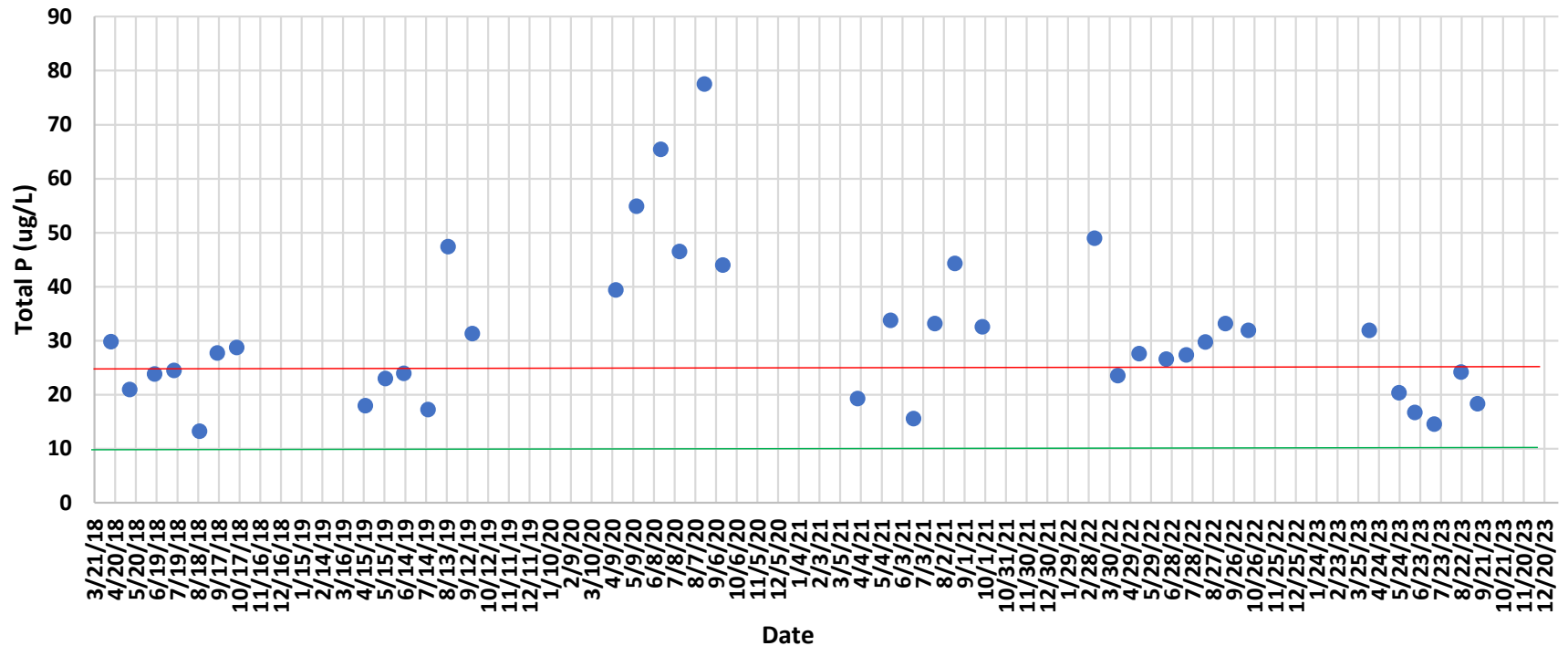
Gradual decline in deeper water with system off



# Phosphorus

- Values <10 ppb excellent, <25 ppb acceptable
- 2023 is best year so far

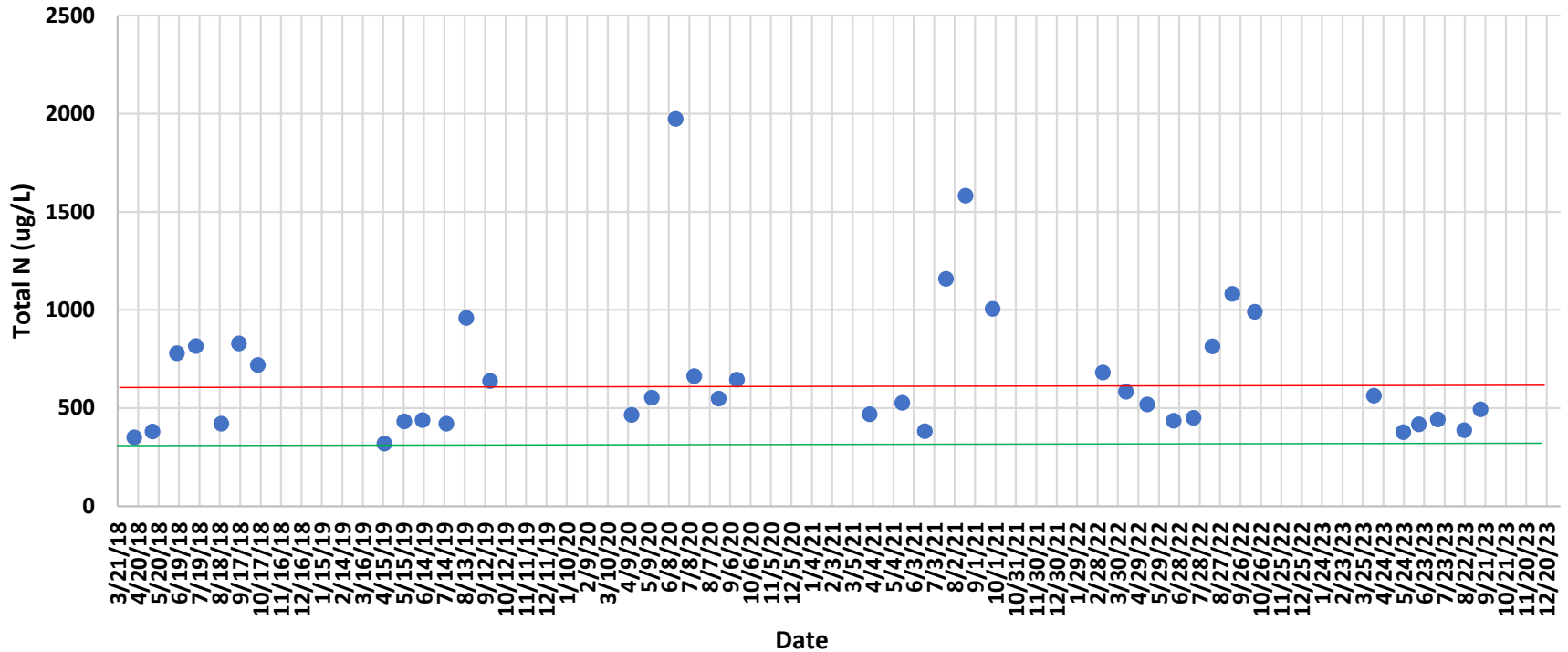
Total Phosphorus near surface of Sarah's Pond



# Nitrogen

- Values <300 ppb excellent, <600 ppb acceptable
- 2023 is best year, key is reduced ammonium

Total Nitrogen near surface of Sarah's Pond

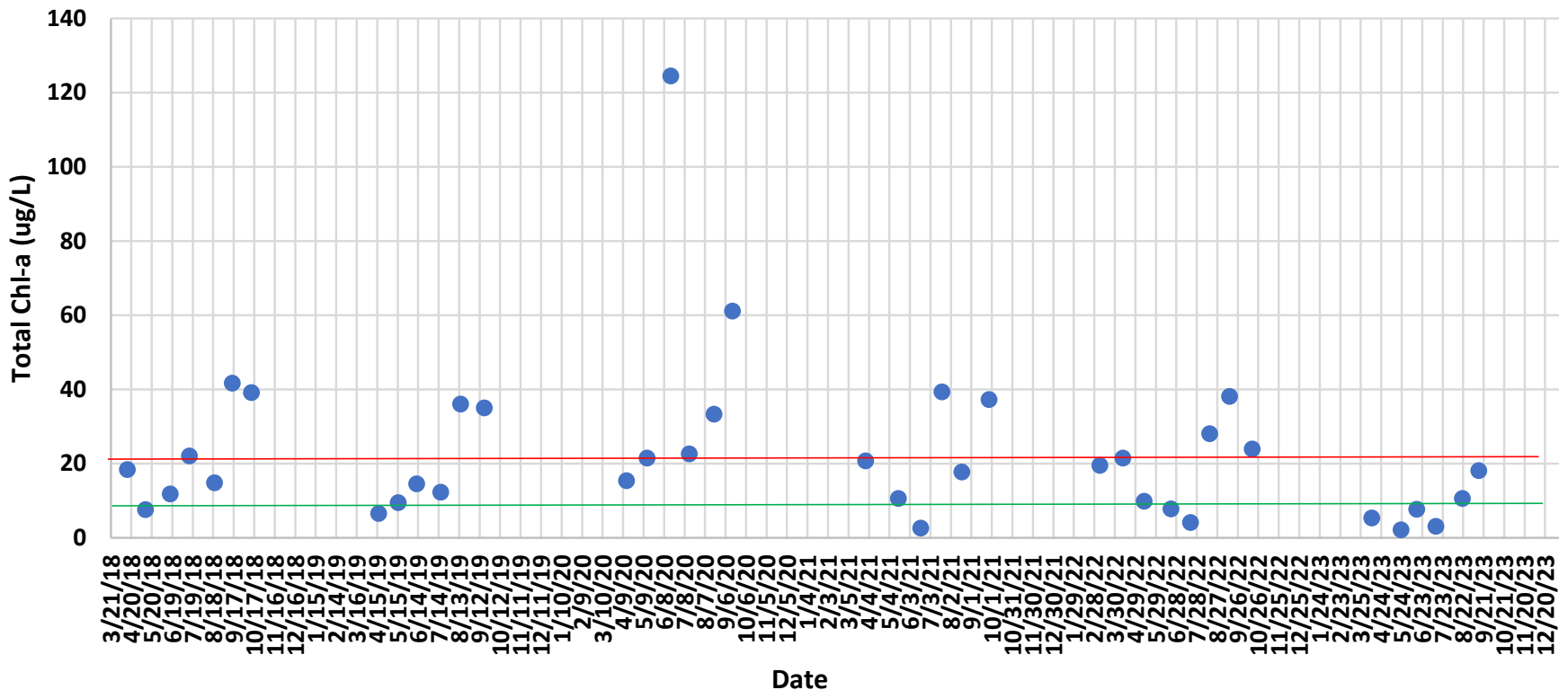




# Algal quantity

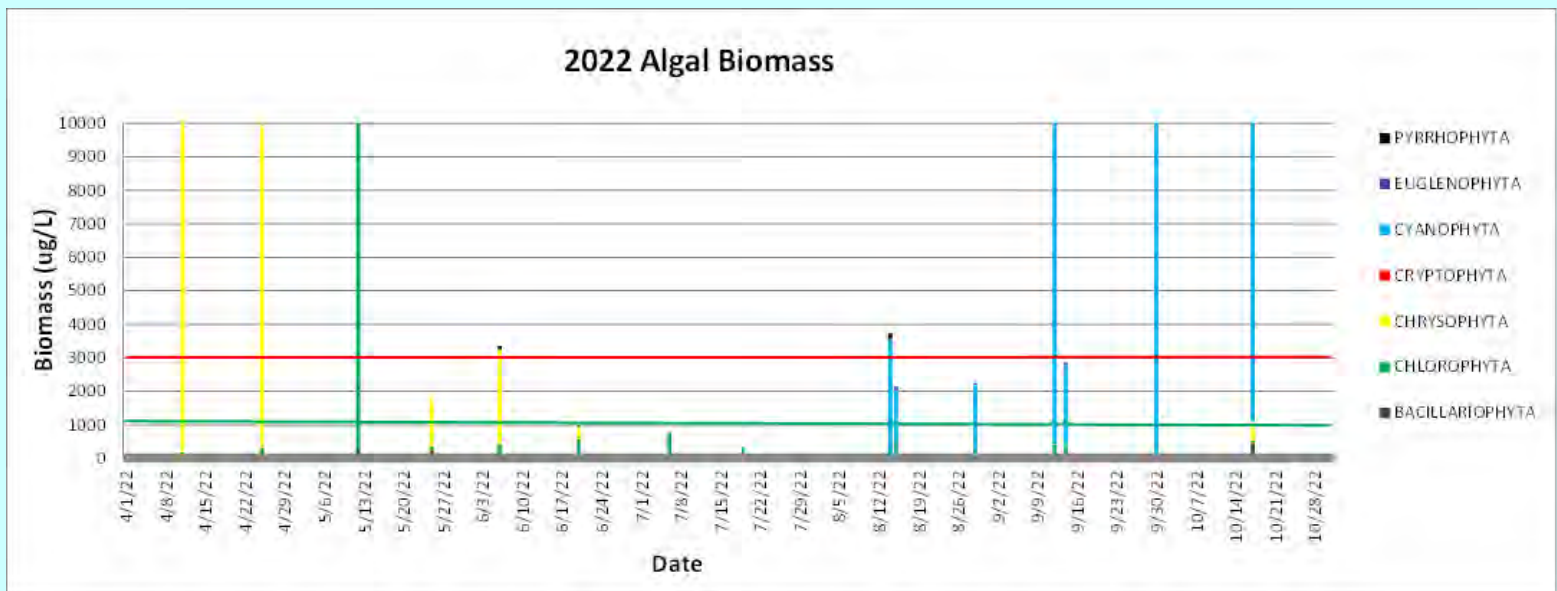
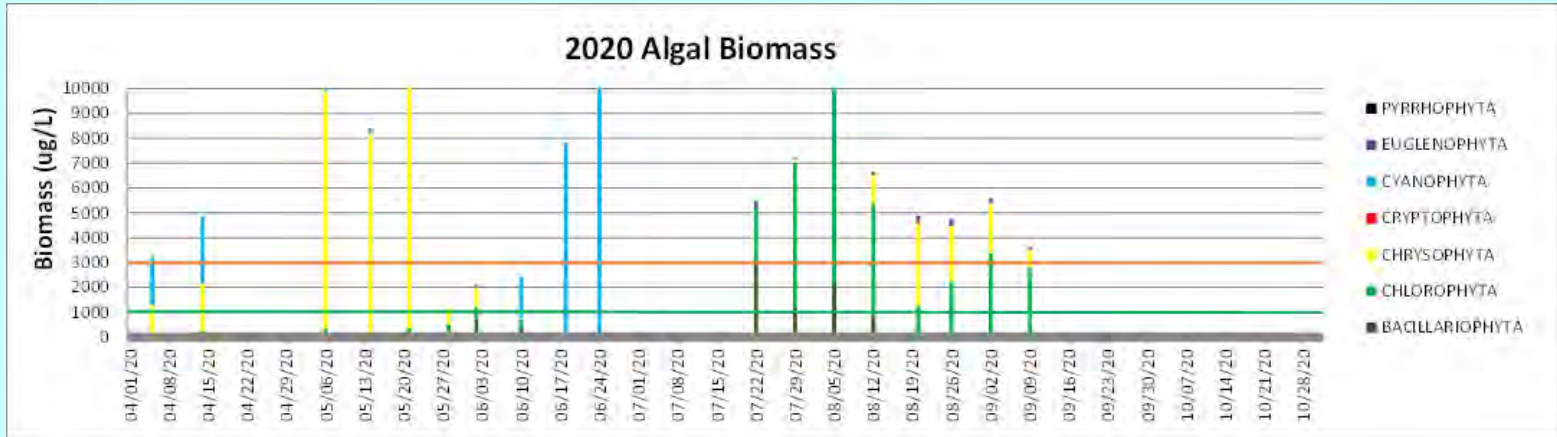
- Values <10 ppb “normal”, values >20 ppb = bloom
- Blooms prevented in 2023

Total Chlorophyll-a near surface of Sarah's Pond



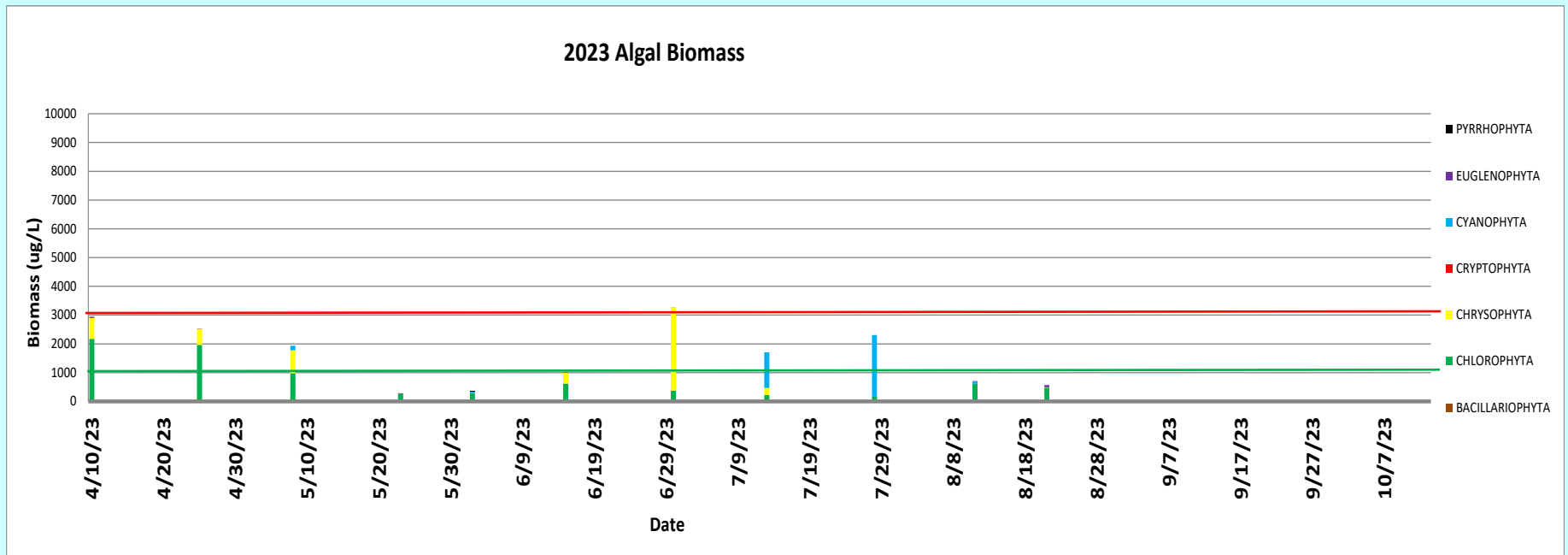
# Algal types

➤ Timing and types of blooms affected by oxygenation



# Algal types

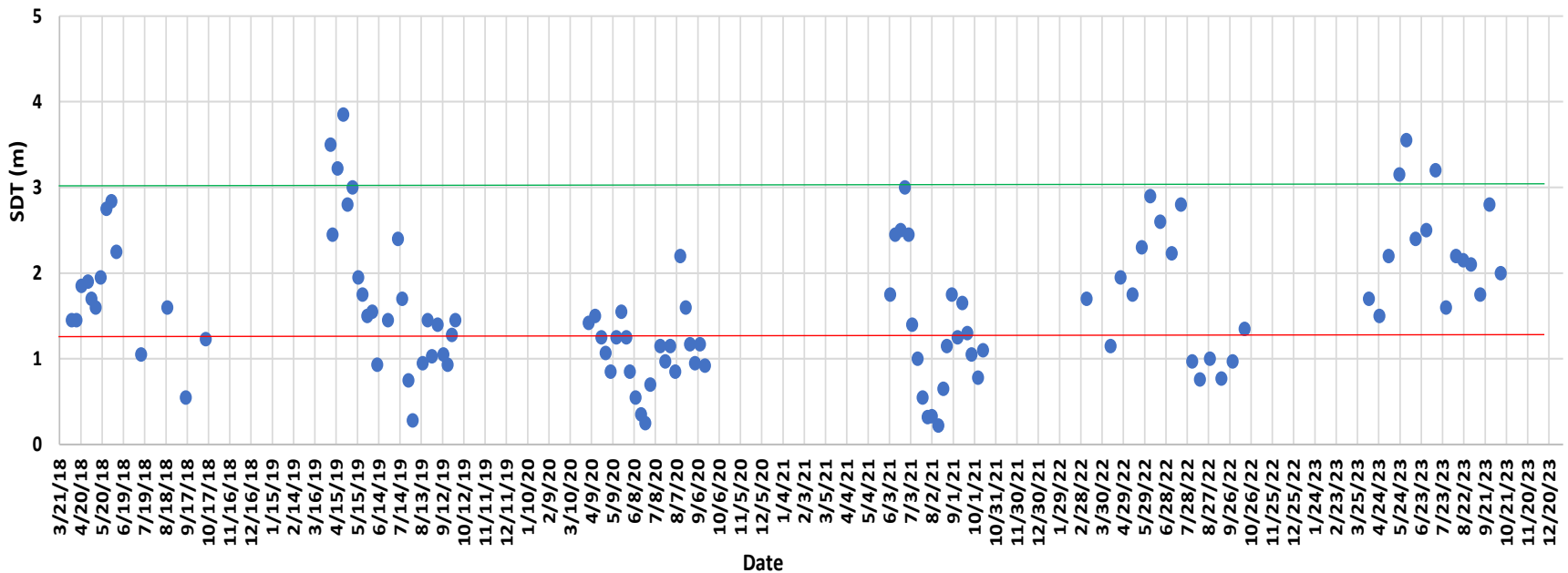
- 2023 exhibits much less alga and shift away from cyanobacteria
- Scale the same as last two graphs; changes obvious
- Minimal cyanobacteria but still have samples to do



# Water clarity

- Most people rely on clear water as best indicator
- Considerable variation; oxygenation not sole factor
- Clarity best in 2023

Secchi Disk Transparency in Sarah's Pond



# Summary

- Sarah's Pond has been an experimental testing ground for oxygenation for 5 years
- Nanobubbles did not provide adequate oxygen, did not improve conditions
- OST has had implementation challenges (materials used, operational response, oxygen buffer targeted) but has been improved each year
- Goals largely met in 2023
- Knowledge gained used to advance both system features and operational aids
- Oxygenation alone cannot be assumed to cure all lake problems; part of holistic approach



Does yours  
taste a little  
under-  
oxygenated?

**QUESTIONS?**