

Memorial Park Lake Restoration

METAFLOC AND MUCKBIOTICS CASE STUDY



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Study Summary

- Sediment dosing of MetaFloc and MuckBiotics provided significant long-term water quality improvement.
- Within 3 days of sediment dosing MetaFloc, the lake observed a 95% reduction in TP, a 72% reduction in TN, a 77 % improvement in Secchi depth measurements, and a 99% reduction in fecal coliform.
- A shift from high levels of nuisance algae species to a low abundance of beneficial green algae and bacterial floc was observed post-treatment.
- >0.1 mg/L phosphorus and >1.5 mg/L nitrogen have been identified as Memorial Park Lake's key algae bloom thresholds.

95%

Total Phosphorus Reduction

from the water column



Project Overview:

Memorial Park, located in Stuart, FL, is a tranquil park offering grassy areas, footpaths, U.S. war memorials, and, at the center, a small lake (0.5 ac). Memorial Park Lake has seen a decline in water quality over the past five years, where traditional algaecide treatments have become less and less effective. At the beginning of 2024, a collaborative investigation into water quality declines was undertaken by Aquatic Vegetation Control (AVC), Natural Lake Biosciences, and the City of Stuart to address water quality concerns at Memorial Park Lake. Initial environmental assessments at Memorial Park Lake uncovered significant nutrient levels for total nitrogen (TN; 5.8-6.1 ppm) and total phosphorus (TP; 2.18-2.22 ppm), indicating a hypereutrophic state conducive to ongoing algae proliferation. The resulting decline in water clarity, measured at < 10 inches, underscored the significant loss in water quality due to the combined effects of excessive nutrients and dense algae populations (Figure 1). Restoration efforts started with identifying nutrient source loading, which identified two primary sources of nutrients: 1) sediment nutrient recycling and 2) a 2” effluent reclaimed wastewater pipe used to maintain water elevation. Other source nutrient loads included stormwater run-off and waterfowl.



FIGURE 1. PICTURE OF MEMORIAL PARK LAKE BEFORE TREATMENT, APRIL 29, 2024

Objective

Incorporate biological products such as MetaFloc (a probiotic, phosphorus binder, and flocculant) and MuckBiotics (beneficial bacteria) to improve and enhance water quality and provide a more sustainable way to limit algae proliferation.

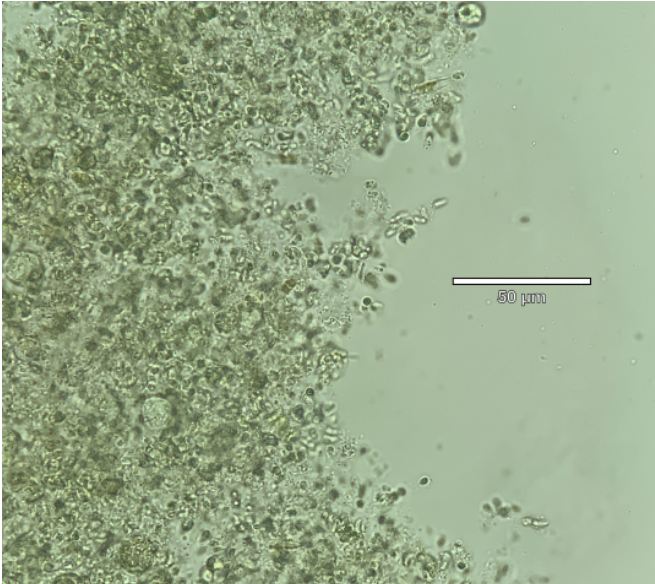


Fig. 2a *Kirchneriella* sp.

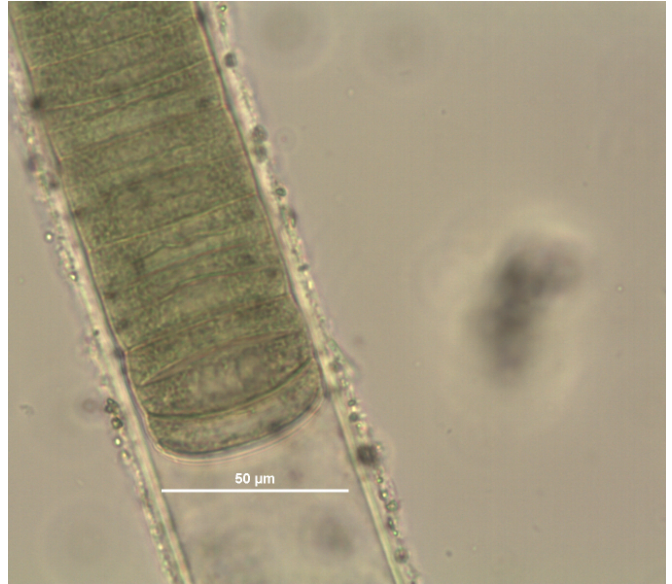


Fig. 2b *Lyngbya* sp.

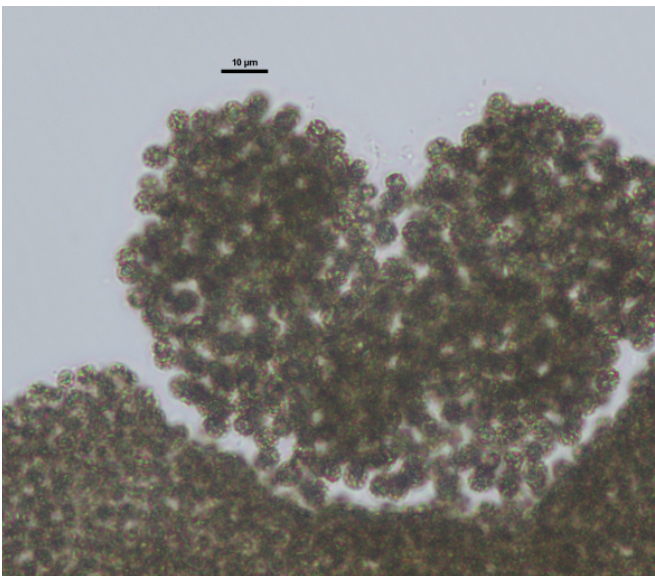


Fig. 2c *Microcystis* sp.

FIGURE 2. PRE-RESTORATION DOMINATE ALGAL GROUPS

Treatment Plan and Results:

The initial treatment plan was to incorporate MetaFloc and MucBiotics into the already established algaecide treatment program. Label rates of copper and peroxide algaecides were applied first, followed by MetaFloc, MuckBiotics, and dye shortly after on April 29, 2024. MetaFloc and MuckBiotics were dosed based on water column nutrient data at the time (27 lbs. of P). Despite significant reductions in nutrients and algae, the treatment fell short of the City’s desired goals, and within 30 days, the lake was back to prior levels. This was due to only dosing for water column nutrients, not the sediments, where the shallow depth of the pond (average depth 4.5ft.) allowed sediment nutrients to refuel the algae immediately. Algaecide resistance was also observed, with no visual impact from algae cell lysing or browning post-treatment. This is likely due to the decades-long use of algicides on the lake.

A second treatment was implemented to target sediment nutrients using only MetaFloc and MuckBiotics due to algaecide resistance. 3 days after treatment, the lake observed a 95% reduction in Total Phosphorus (TP), a 72% reduction in Total Nitrogen (TN), a 77 % improvement in Secchi depth measurements (Figure 3), and a 99% reduction in fecal coliform (Figure 3). A shift from high levels of nuisance algae species to a low abundance of beneficial green algae and bacterial floc was observed post-treatment (Figure 5). Water quality conditions have met City goals and have eliminated the need for algaecides post-treatment. Management has switched to all-natural products, with only maintenance dosing rates being needed to maintain conditions. This consists of MetaFloc (12 gal/acre) being added each quarter, monthly Muckbiotics (30 lbs./acre), and the occasional use of aquatic dye to keep up with the 2” effluent reclaimed wastewater pipe.

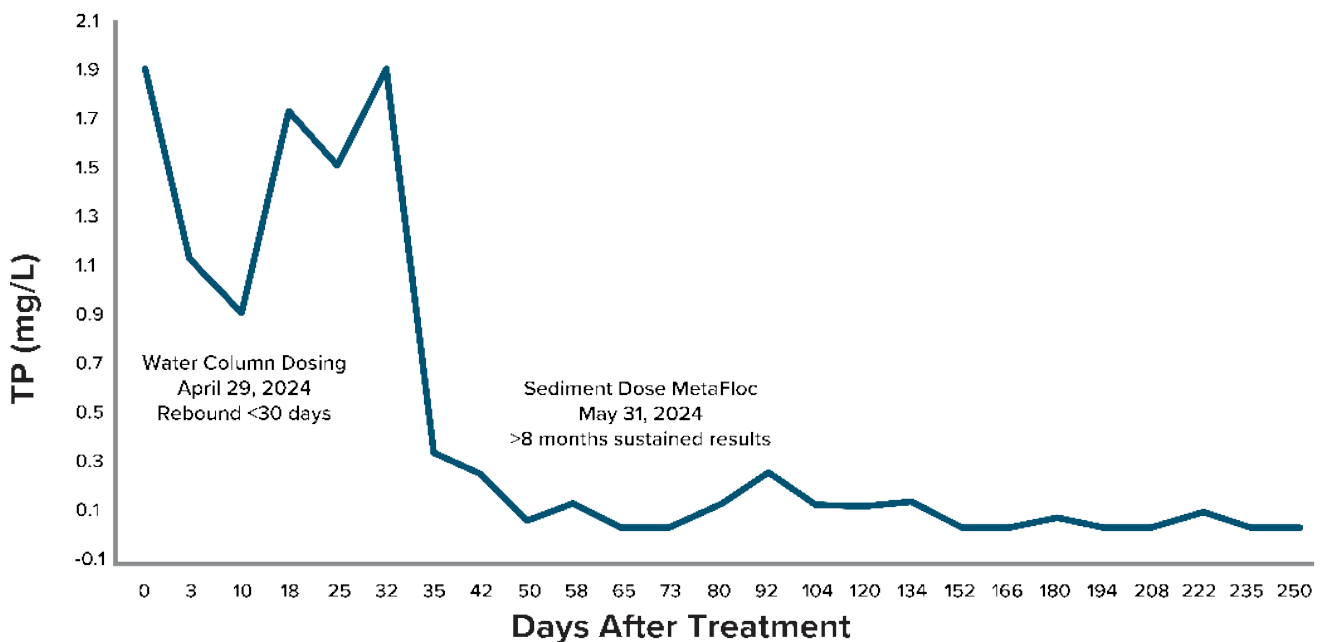


FIGURE 3. WATER COLUMN TOTAL PHOSPHORUS READINGS AT MEMORIAL PARK

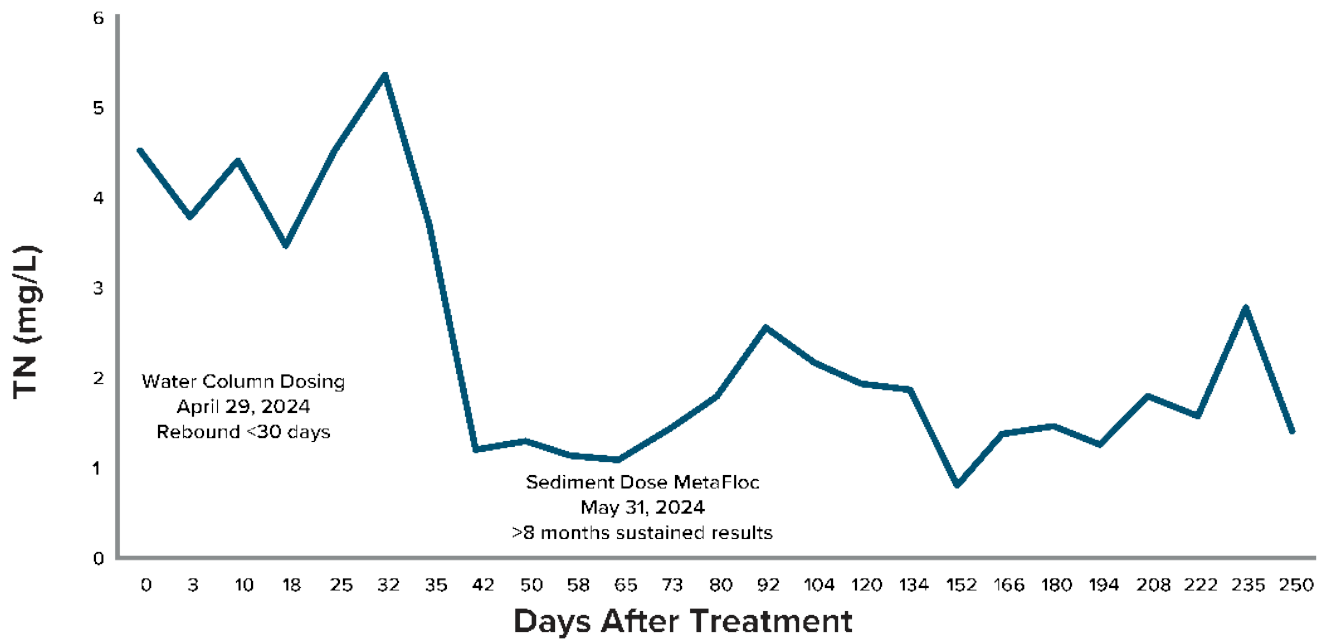


FIGURE 4. WATER COLUMN TOTAL NITROGEN READINGS AT MEMORIAL PARK

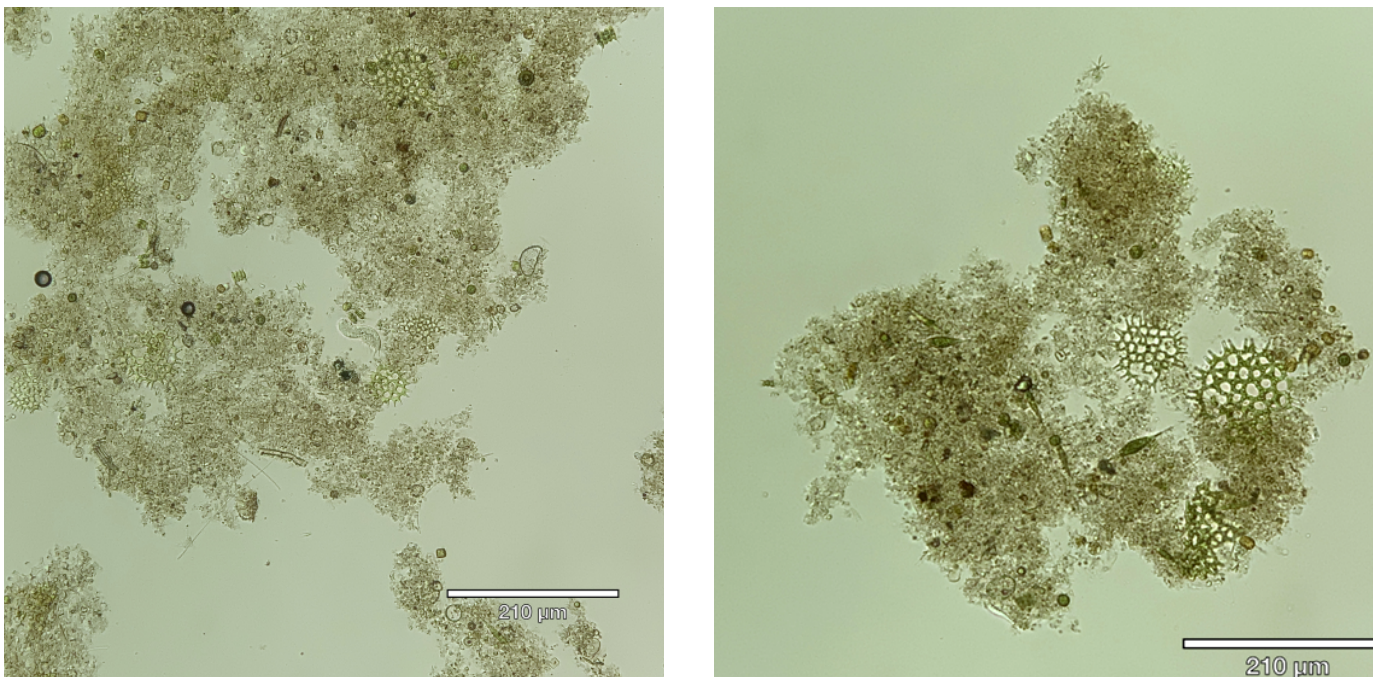


FIGURE 5. POST-RESTORATION BACTERIA FLOC AND GREEN ALGAE

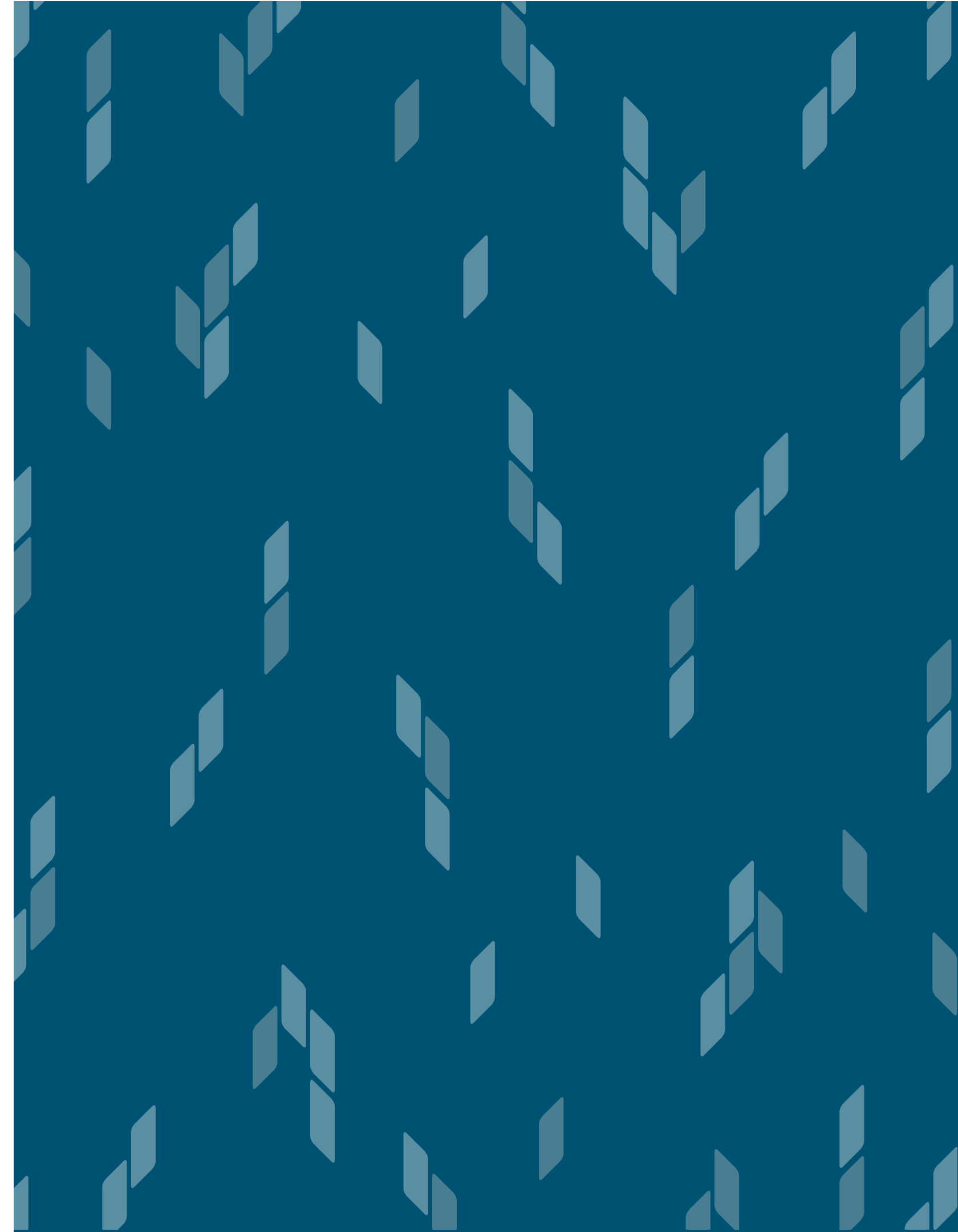
Discussion:

The “shock and lock” treatment approach of lysing cells with algaecides to release nutrients before applying nutrient binders has been successfully used on many other lakes with the same type and relative abundance of algae as Memorial Park Lake. The lack of results on Memorial Park Lake from algaecide resistance demonstrates the importance of biological products in lake management and the limitations of traditional algaecides without them.

Biological products can significantly improve water quality and reverse eutrophication, offering a more sustainable chemical-free lake management approach. Memorial Park Lake demonstrated this, where focusing on nutrient management provided long-lasting water quality benefits. No more algaecides were needed to maintain lake conditions. After sediment dosing of MetaFloc and MuckBiotics, the drastic improvements in water quality revealed that sediment nutrients were the primary nutrient load driving algae blooms in Memorial Park. It's important to note that continued water column dosing of MetaFloc would eventually achieve the same results, but it would have taken ~5 treatments.



FIGURE 6. MEMORIAL PARK LAKE AFTER TREATMENT, JUNE 3, 2024.



Study crafted and completed by:

Natural Lake Biosciences

