HOW TO TRAIN YOUR DIATOM: INDUCING A DIATOM BLOOM TO DISPLACE HARMFUL ALGAL BLOOMS

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Anthropogenic influences have resulted in a dramatic increase in the frequency, intensity, and duration of harmful algal blooms (HABs). These blooms are the result of additional nutrient loads to lakes and river, sourced from wastewater treatment plants and agricultural landscapes. As the availability of silica (Si) decreases, relative to nitrogen (N) and phosphorus (P), diatom communities shift to species with a lower silica demand. Imbalances between N, P, and Si facilitate HABs as diatoms become unable to outcompete their non-siliceous counterparts. However, it has been theorized that the addition of Si can promote diatom growth over harmful and nuisance non-siliceous algal taxa.

Wastewater treatment plants are a major source of N and P to environmental waters. Within a plant, influent phosphate and ammonia concentrations are often greater than 5 and 50 mg/L, respectively. Lagoon treatment plants often experience short diatom blooms in the early spring before rapidly transitioning to non-siliceous algae. As a result, blooms are temporally compressed, facilitating observations.

Our project is designed to induce a diatom bloom in a wastewater system that is primed for non-siliceous algal growth. We plan to add biologically available Si to wasterwater lagoons in order to gain insight on how to combat the occurrence of HABs. We analyzed shifts in nutrient availability and transitions in algal communities during-and-after a spring diatom bloom. We observed a decline in dissolved Si concentrations in the water column as the algal community transitioned from diatom to green algae to cyanobacteria dominance. We then introduced biologically available silica to the lagoons, monitored nutrient availability, and characterized shifts within the algal communities. Ultimately, we intend to apply these results as a method to spike natural systems or wastewater effluent with silica in order to preferentially induce diatom blooms.