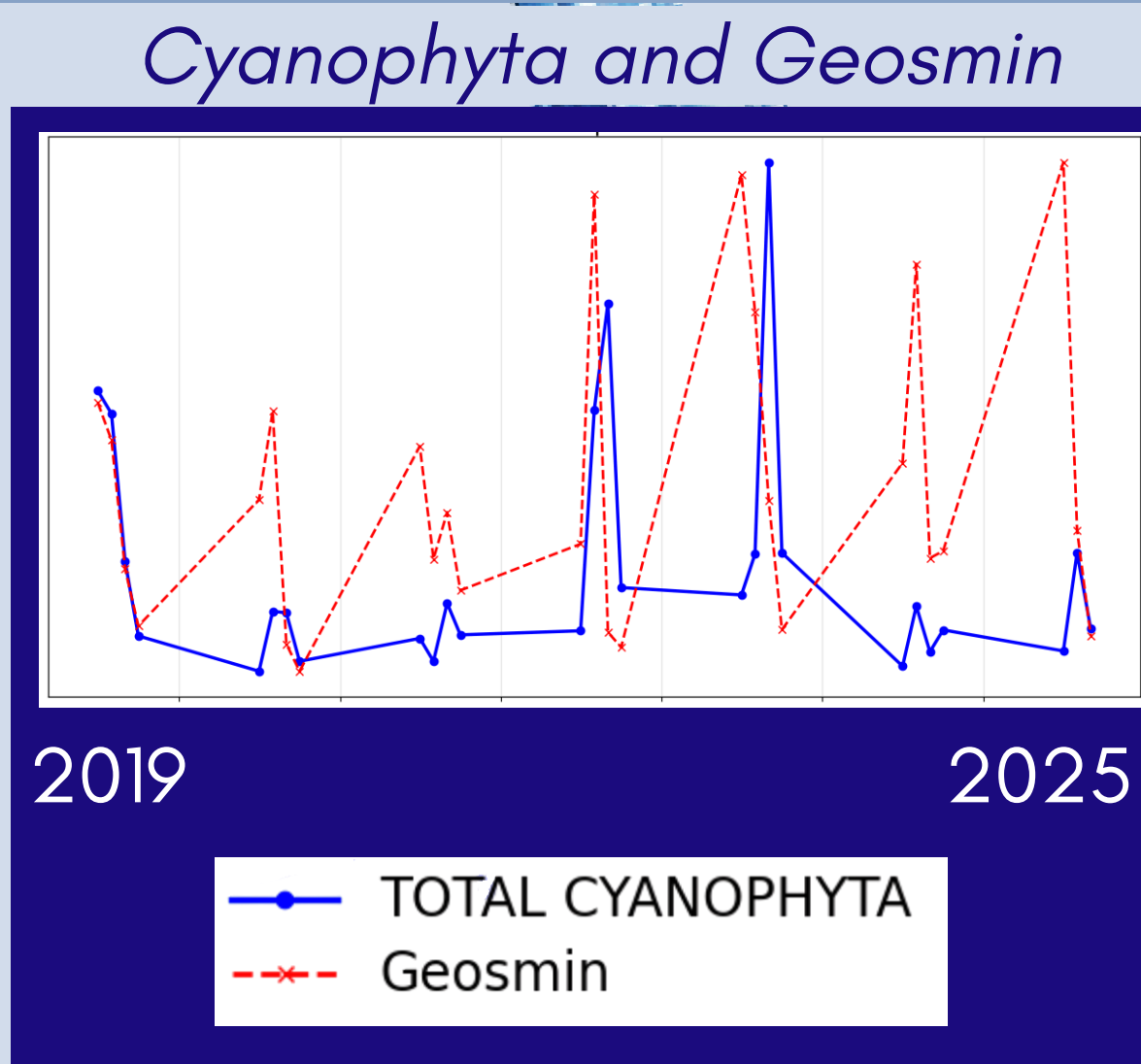
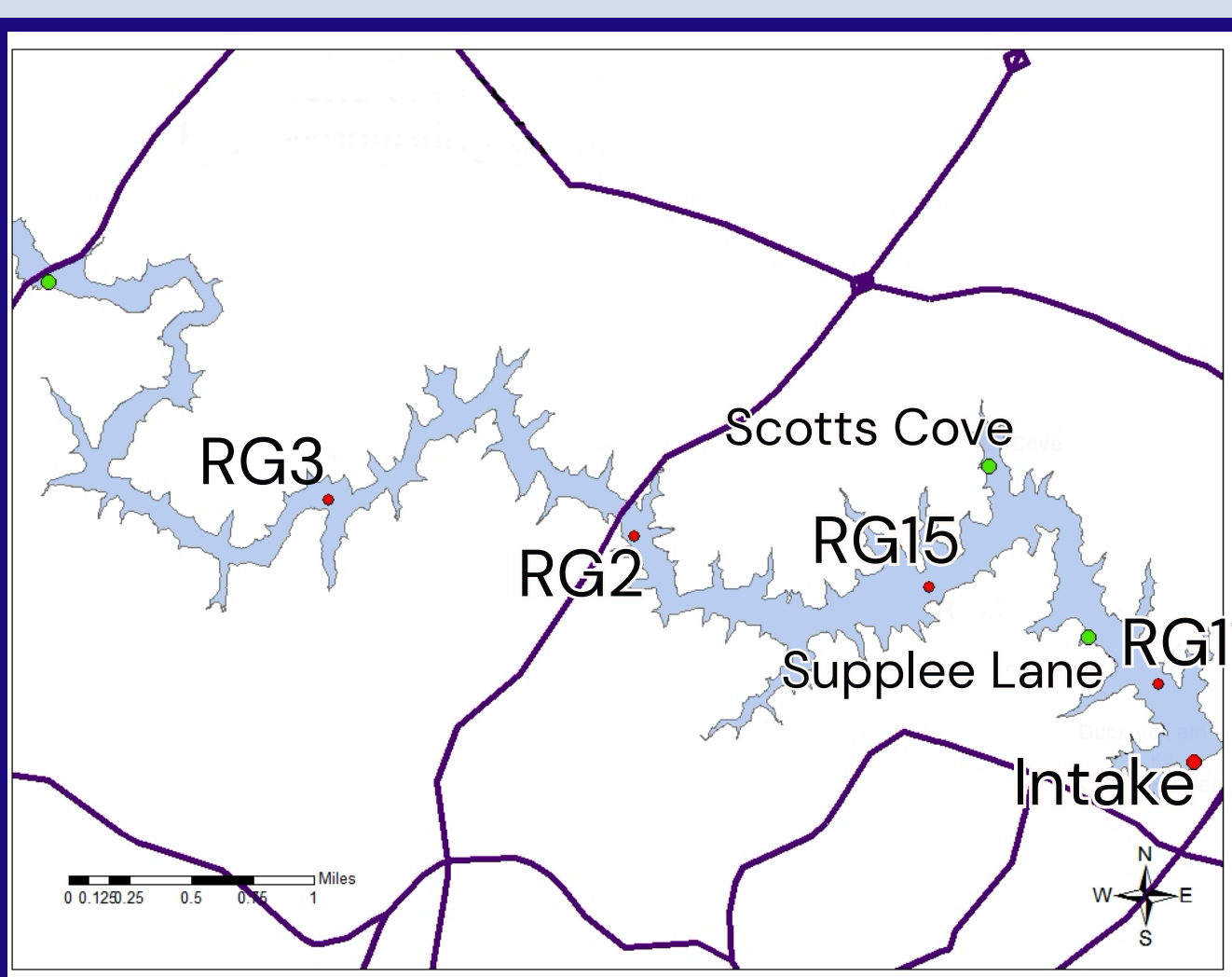


Problem Definition

WSSC Water faces growing challenges from **climate change**, **land use shifts**, and **emerging contaminants** that strain source water quality. WSSC Water has increased focus on water monitoring over the past five years to help safeguard the community's water supply. However, **limited analytical resources** have left **key quality trends unclear**. This project analyzes source water data from the Rocky Gorge reservoir on the lower Patuxent.

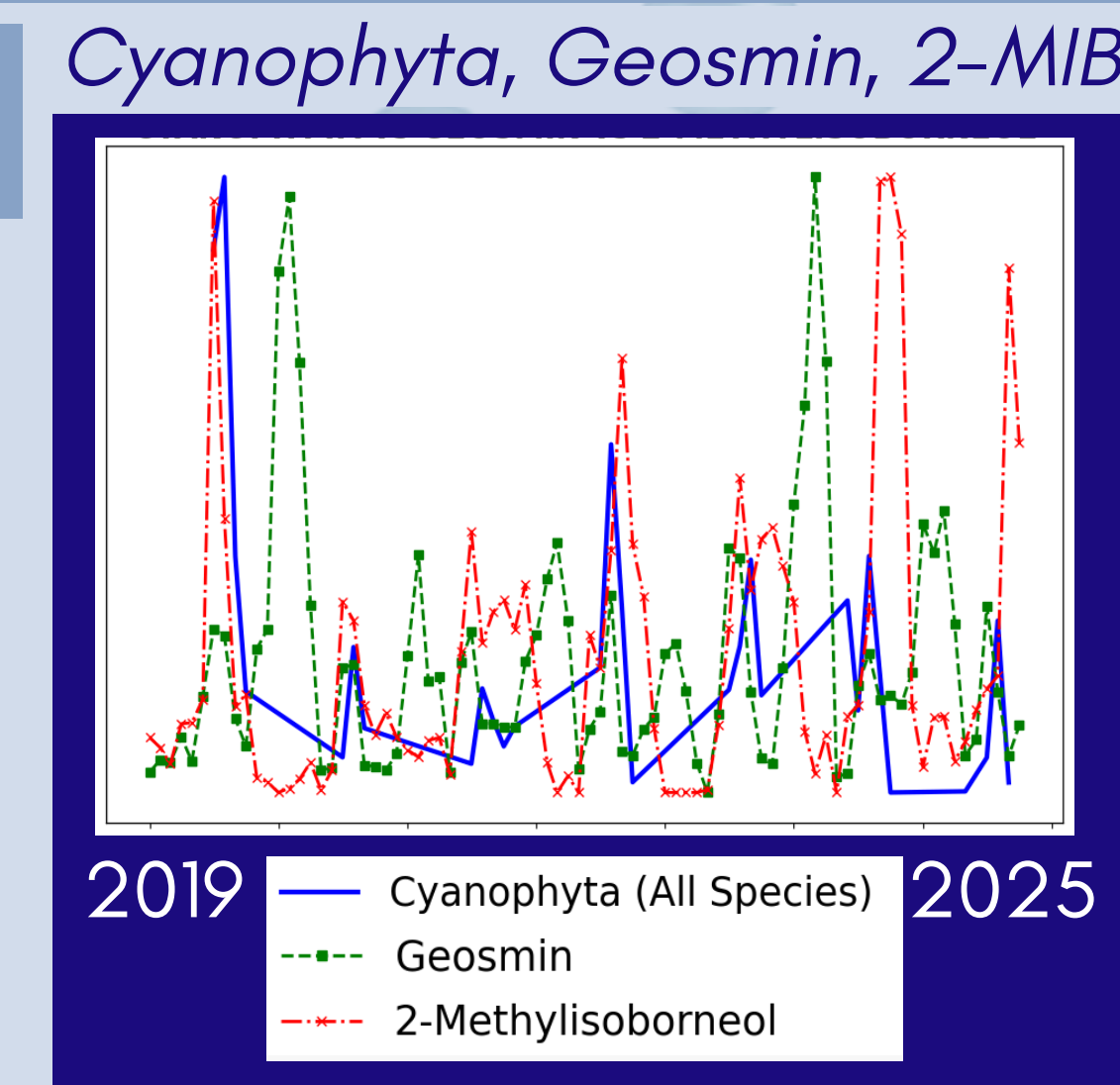
Project Goals

Improve understanding of trends in raw water quality over 6 years, **recommend improvements to methods of water quality monitoring and innovative water treatment technologies and reservoir improvements** that are **sustainable and economical**, to be **implemented by 2040**



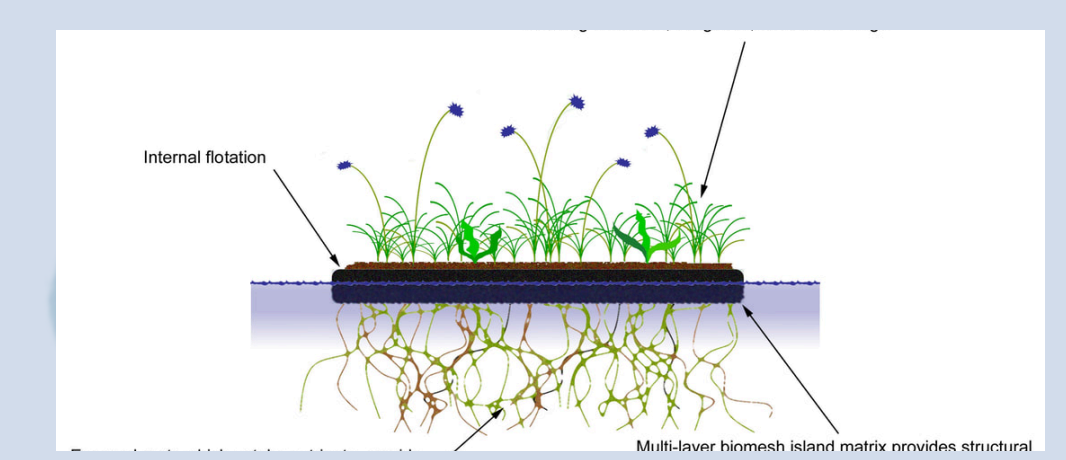
System Overview

While graphing specific algae phylums, **Cyanophyta** had the **highest co-occurrence with geosmin and 2-methylisoborneol (2-MIB)** concentrations. Excess nutrient loads support growth of diverse algal species and create conditions for the rapid growth of harmful algal blooms (HABs).

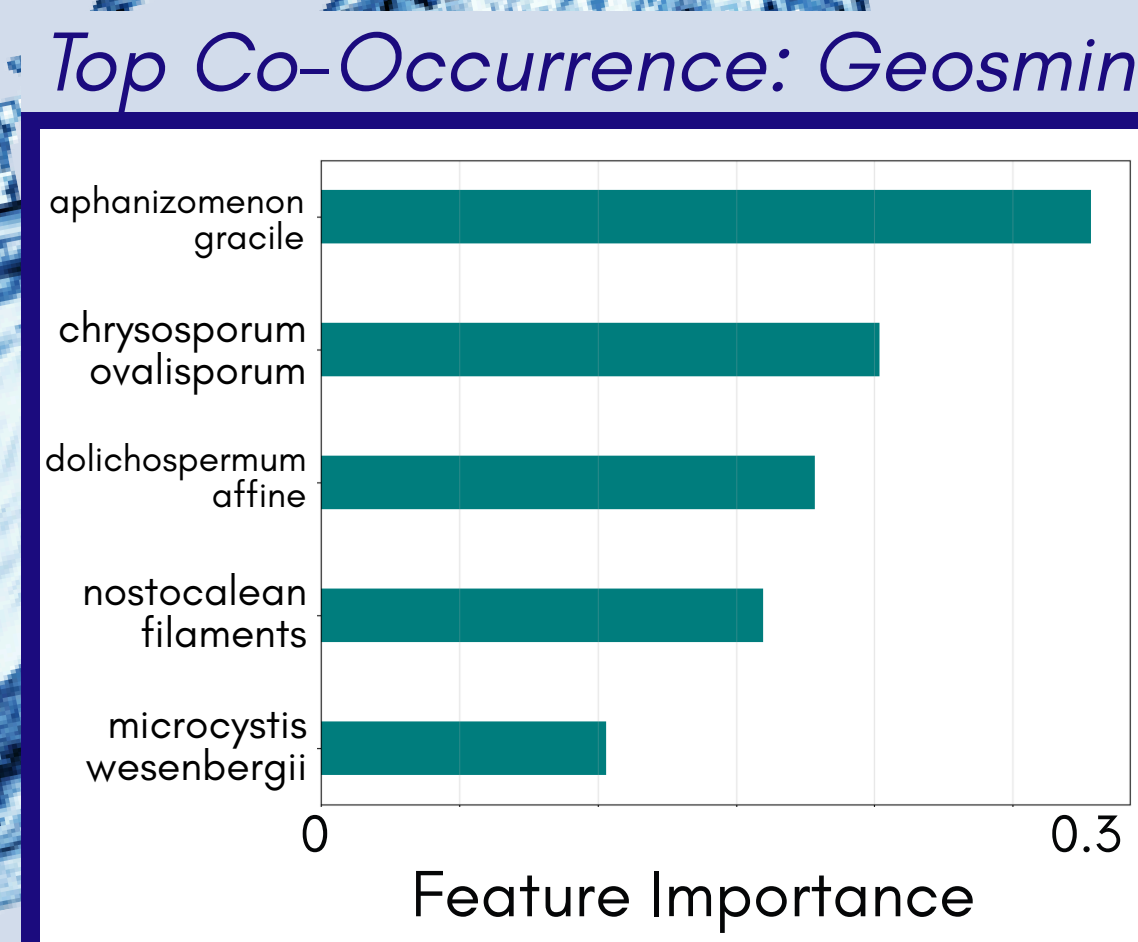


Recommendations

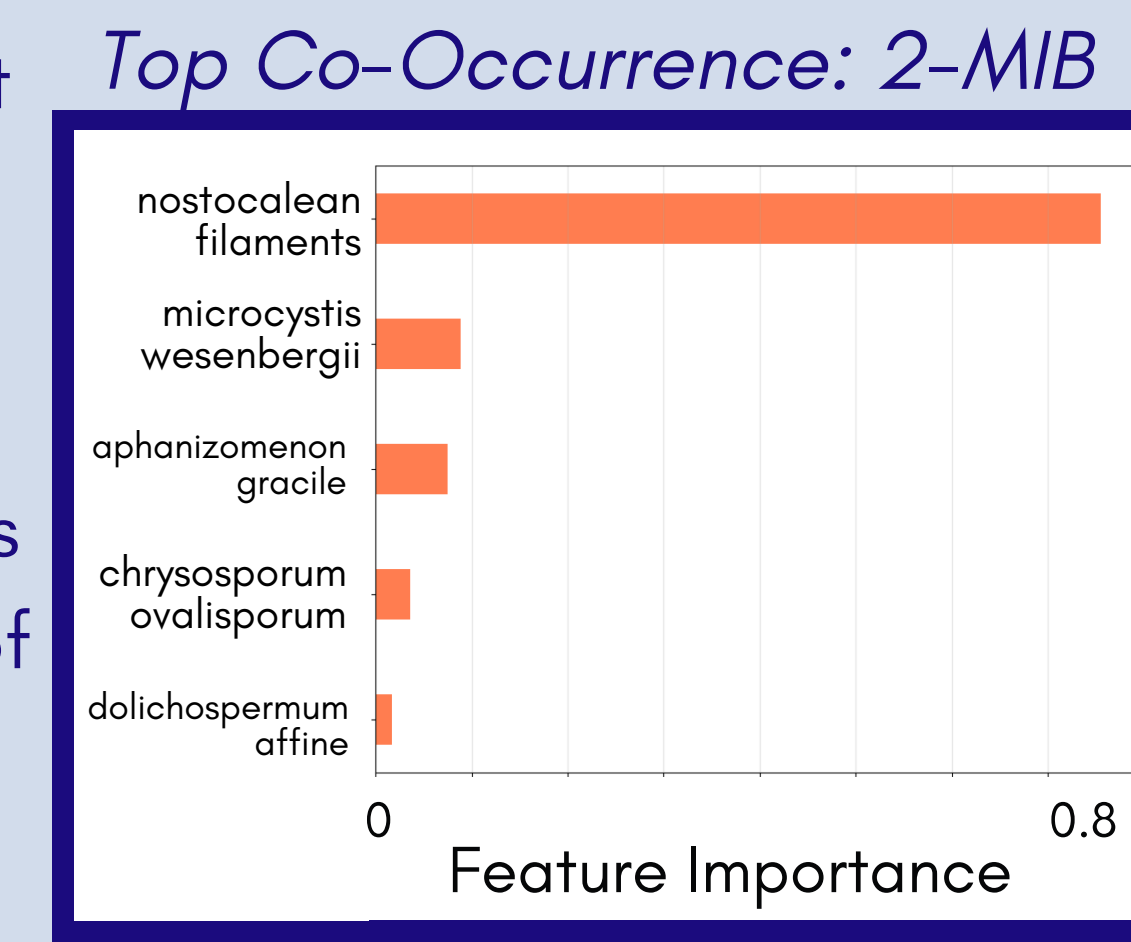
- Enhance Monitoring of Key Parameters**
Increase frequency of monitoring of phycocyanin; algae; the top Cyanophyta species co-occurring with geosmin & 2-MIB; and the top Chlorophyta species co-occurring with toxin-producing Cyanophyta.
- Enhance Monitoring of Iron**
Many Cyanophyta species, including some of those in question utilize iron for growth.
- Floating Island Treatment Wetlands**
Deter nutrients like nitrogen and phosphorus away from Algal species growth to plant growth



Analysis and General Correlations for Geosmin and 2-MIB



Of the top 15 cyanophyta species graphed against geosmin or 2-MIB, the **top 5** co-occurring species were selected for further analysis.



Subsequently, the **top 5 highly co-occurring species** were **the same** between geosmin and 2-MIB. Each of these algae types has their own environmental parameters monitored by WSSC Water.

These parameters were further analyzed as **parameters of concern**. Key trends indicated **these parameters mimicked, in numerous ways, heightened co-occurrence with geosmin and 2-MIB production**.

Harmful Algal Blooms (HABs) Analysis

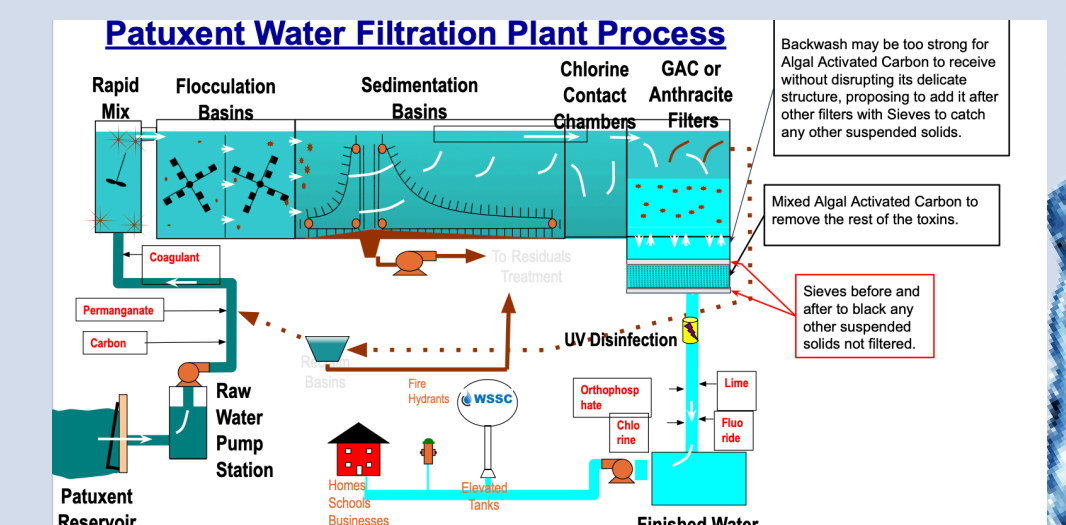
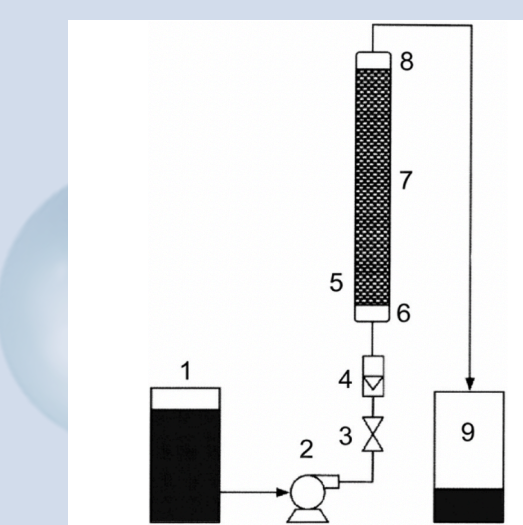
3 genera of Cyanophyta (Aphanizomenon, Microcystis, and Cylindrospermopsis Raciborskii) are of great co-occurrence with microcystins, anatoxins, and cylindrospermopsins.

Phosphorus, Nitrogen, and temperature have key co-occurrences with toxin-producing Cyanophyta

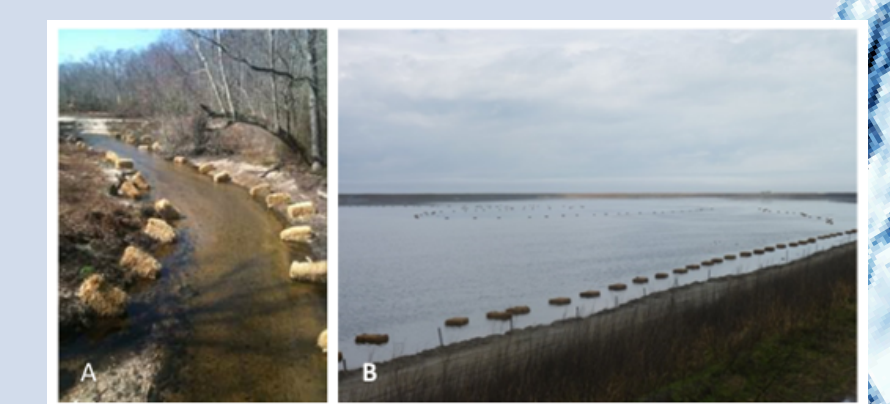
Low Nitrogen:Phosphorus ratios were a major recurrence for the specific HABs investigated (System Overview).

Cyanophyta perform **nitrogen fixation** during Aug-Oct when **nutrients have been used and not replenished**.

Algal Activated Carbon Treatment
Removes HAB toxins, Geosmin, 2-MIB, and tannins from Barley, and is more efficient than GAC



Barley Straw
Bundles decompose, releasing chemicals that inhibit algal growth



Communication Plan
Plan for communication using town halls, website announcements, emails, surveys, printed notifications and newspapers was developed and distributed to WSSC Water

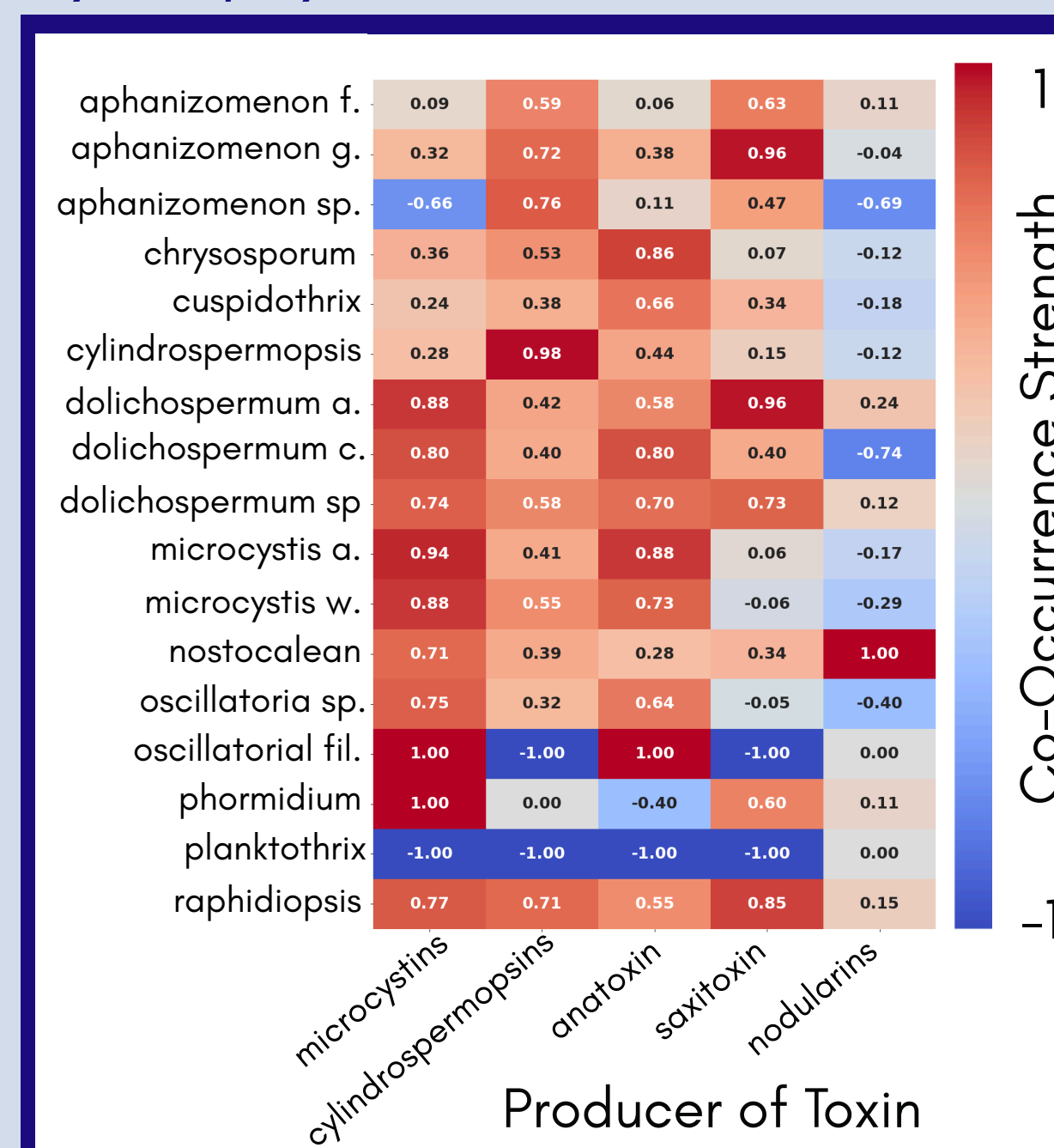
Impact Statement

This project provides the basis for the proactive protection of WSSC Water constituents' drinking water from the Patuxent Reservoir, by reinforcing drinking water quality, ensuring public health, and engaging in consistent communication with the public

Location

This figure shows the Rocky Gorge Reservoir and the measuring locations for the WSSC data analyzed in this project.

Cyanophyta and Toxin Producers



System Overview: Cyanophyta, Total Phosphorus, Nitrate

