DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

10-1 Turning Raw Water Data Into Action

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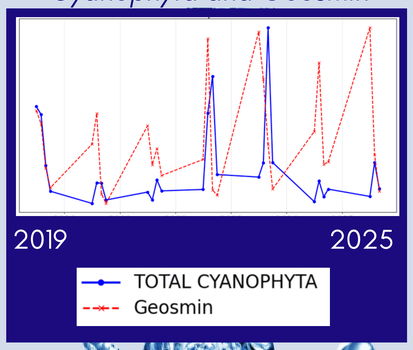
Problem Definition

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**

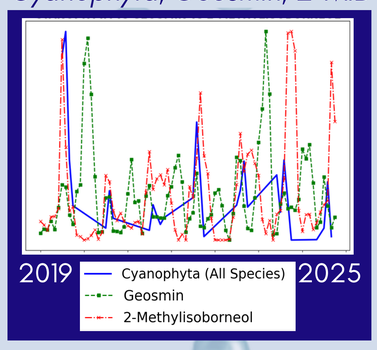
Cyanophyta and Geosmin



System Overview

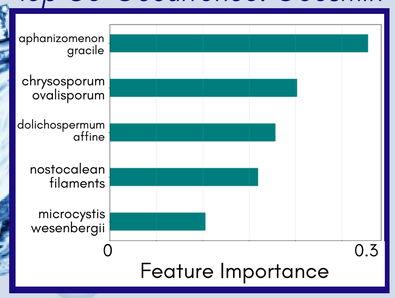
While graphing specific algae phylums, **Cyanophyta** had the **highest co-occurrence with** geosmin and 2-methylisoborneol (2-MIB) concentrations. Excess nutrient loads support growth of diverse algal species and create conditions for the rapid growth of harmful algal blooms (HABs).

Cyanophyta, Geosmin, 2-MIB



Analysis and General Correlations for Geosmin and 2-MIB

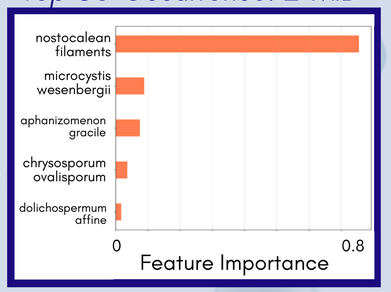
Top Co-Occurrence: Geosmin



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.

Top Co-Occurrence: 2-MIB



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

Harmful Algal Blooms (HABs) Analysis

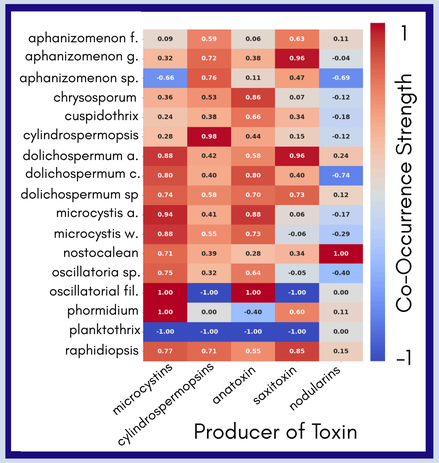
3 genera of Cyanophyta (Aphanizomenon, Microcystis, and Cylindrospermum Raciborskii) are of great co-occurrence with microcystins, anatoxins, and cylindrospermopsins.

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

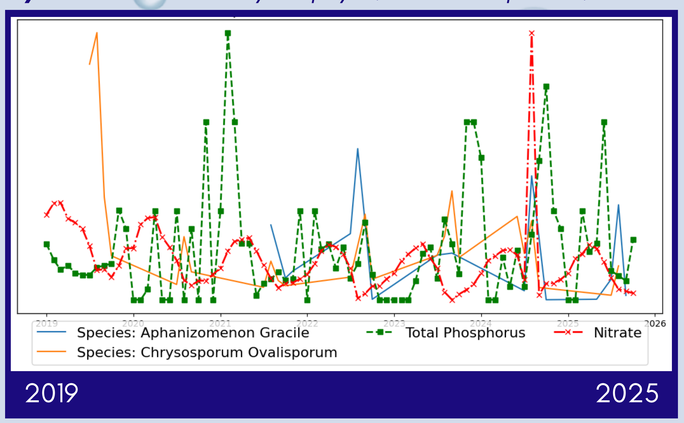
Low Nitrogen:Phosphorus ratios were a major recurrence for the specific HABs investigated (System Overview).

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

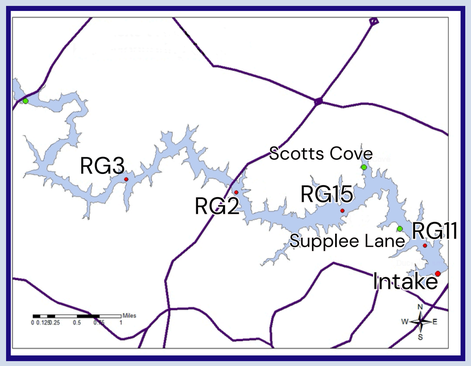
Cyanophyta and Toxin Producers



System Overview: *Cyanophyta, Total Phosphorus, Nitrate*



Location



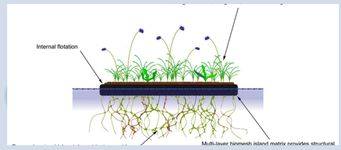
This figure shows the Rocky Gorge Reservoir and the measuring locations for the WSSC data analyzed in this project.

Recommendations

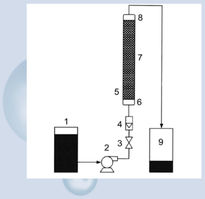
Enhance Monitoring of Key Parameters
Increase frequency of monitoring of phycocyanin; algae; the top Cyanophyta species co-occuring with geosmin & 2-MIB; and the top Chlorophyta species co-occurring with toxin-producing Cyanophyta.

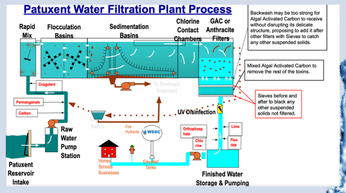
Enhance Monitoring of Iron
Many Cyanophyta species, including some of those in question utilize iron for growth.

Floating Island Treatment Wetlands
Deter nutrients like nitrogen and phosphorus away from Algal species growth to plant growth



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