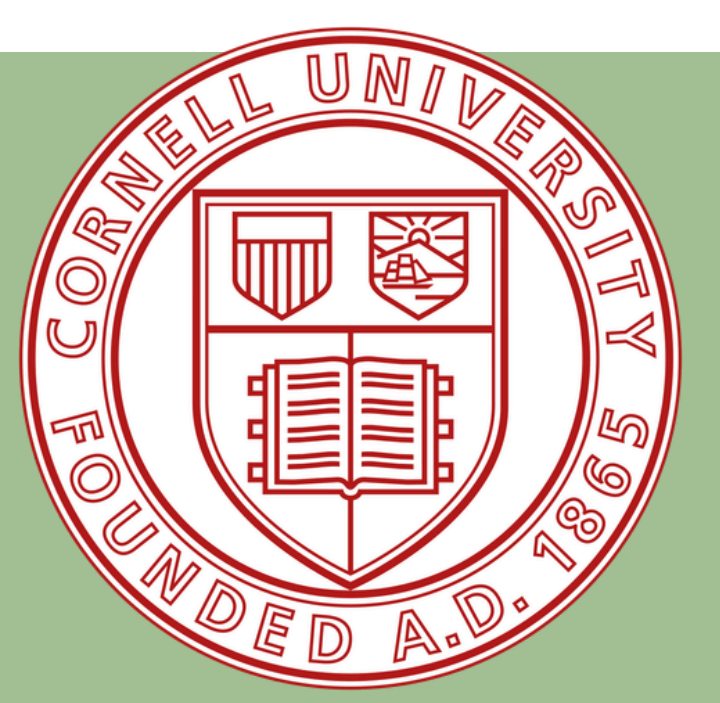




Evaluating Sources of DOC in HAB-Affected Lakes

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Harmful Algal Blooms and DOC Character

- Harmful algal blooms (HABs) typically increase the amount of linear (or aliphatic) low molecular weight dissolved organic carbon (DOC), which are typically more accessible for microbes to use as a fuel source.⁵ DOC can have complex effects on mercury methylation and demethylation rates through a variety of mechanisms.^{4,6}
- Aromatic DOC is typically more complex, with a higher molecular weight, and is a less available carbon source for microbes.
- Higher amounts of aromatic DOC can impact bacterial growth, nutrient cycling as well as inhibit the effects of toxic metals through the formation of complexes.
- More research is needed to elucidate the impact of HABs on biogeochemical cycles

How do HABs Affect DOC Character

Research Question:

How do HABs affect DOC character?

Research Hypothesis:

As HABs develop, aliphatic dissolved organic carbon will increase, corresponding to decreased SUVA at 254 nm. DOC aromaticity and complexity will be negatively correlated with algae bloom growth.

Sampling Sites

- Water samples collected twice weekly at two lakes (Dryden Lake and Long Ponds) with prior history of HAB formation.
- Samples collected from two shore points (Shore A and Shore B), system inlet and outlet; and the deepest part of the lake at both the top and bottom.
- Chlorophyll a and phycocyanin, pigments present in algal blooms, concentrations; and DO, and pH were measured in the field
- Samples analyzed for DOC concentration, mercury concentration chlorophyll a concentration and SUVA₂₅₄

Discussion

- Slight increase in DOC concentration and high SUVA₂₅₄ indicate DOC is largely from terrestrial plants in the environment
- DOC from algal blooms typically becomes less aromatic as algae enters the stationary growth phase², which could have occurred after DOC samples were collected
- For the majority of points sampled, DOC character did not change. While HAB formation was noted beginning from mid June, as determined from elevated chlorophyll a concentrations.
- More aromatic species of DOC were found at the bottom of both lakes sampled, indicating greater amounts of DOC derived from terrestrial plants as opposed to algal blooms.
- HABs did not appear to have an impact on the character of DOC in the sampled lakes.

Future Work

- Analysis of data taken in late summer and early autumn to analyze DOC character at peak HAB formation and as HABs decline
- Genomic analysis of sediment to identify microbial communities
- Analysis of redox conditions in the environment

Temporally Intensive Specific Ultra-Violet Absorbance at 254 nm

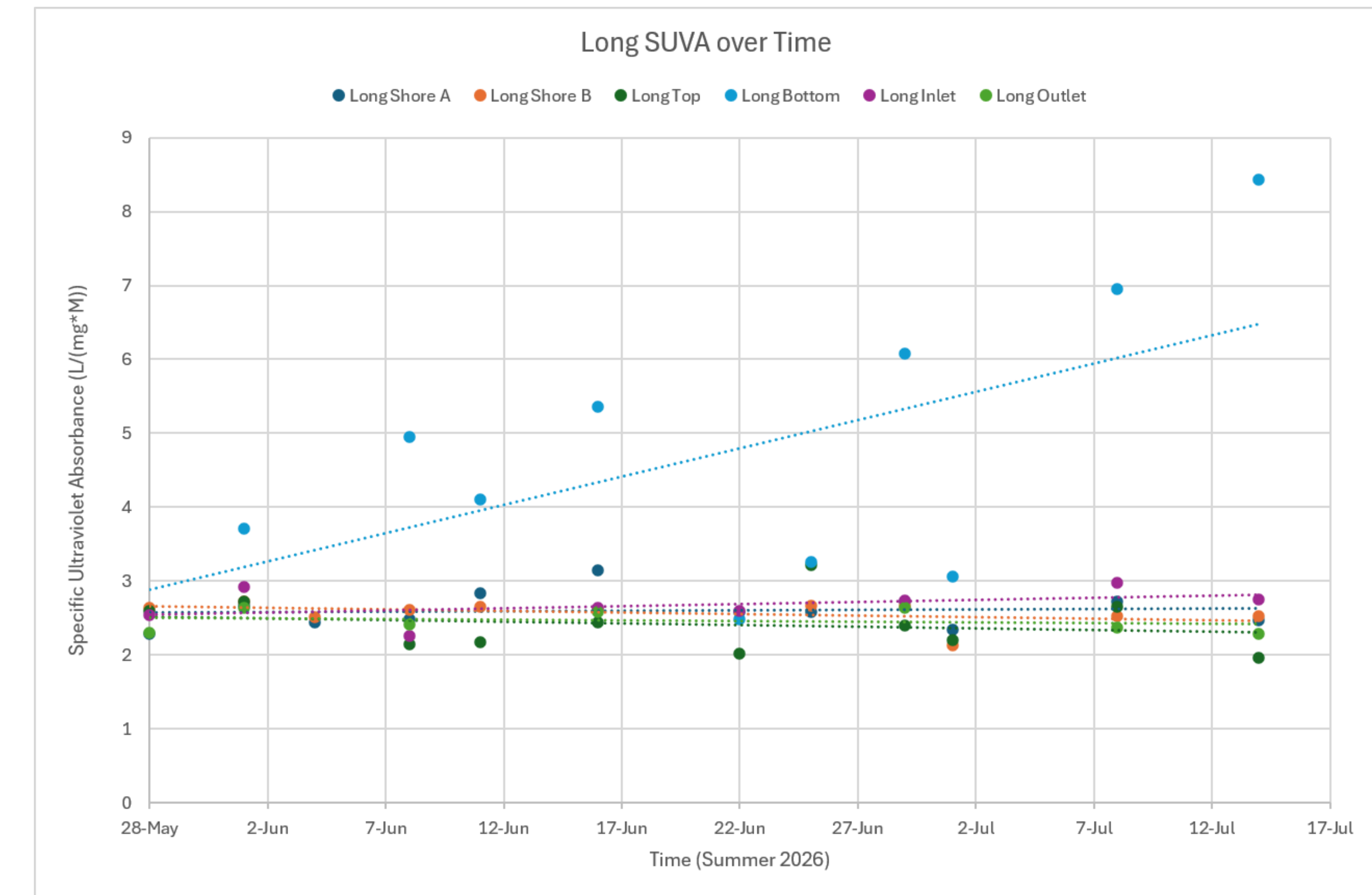
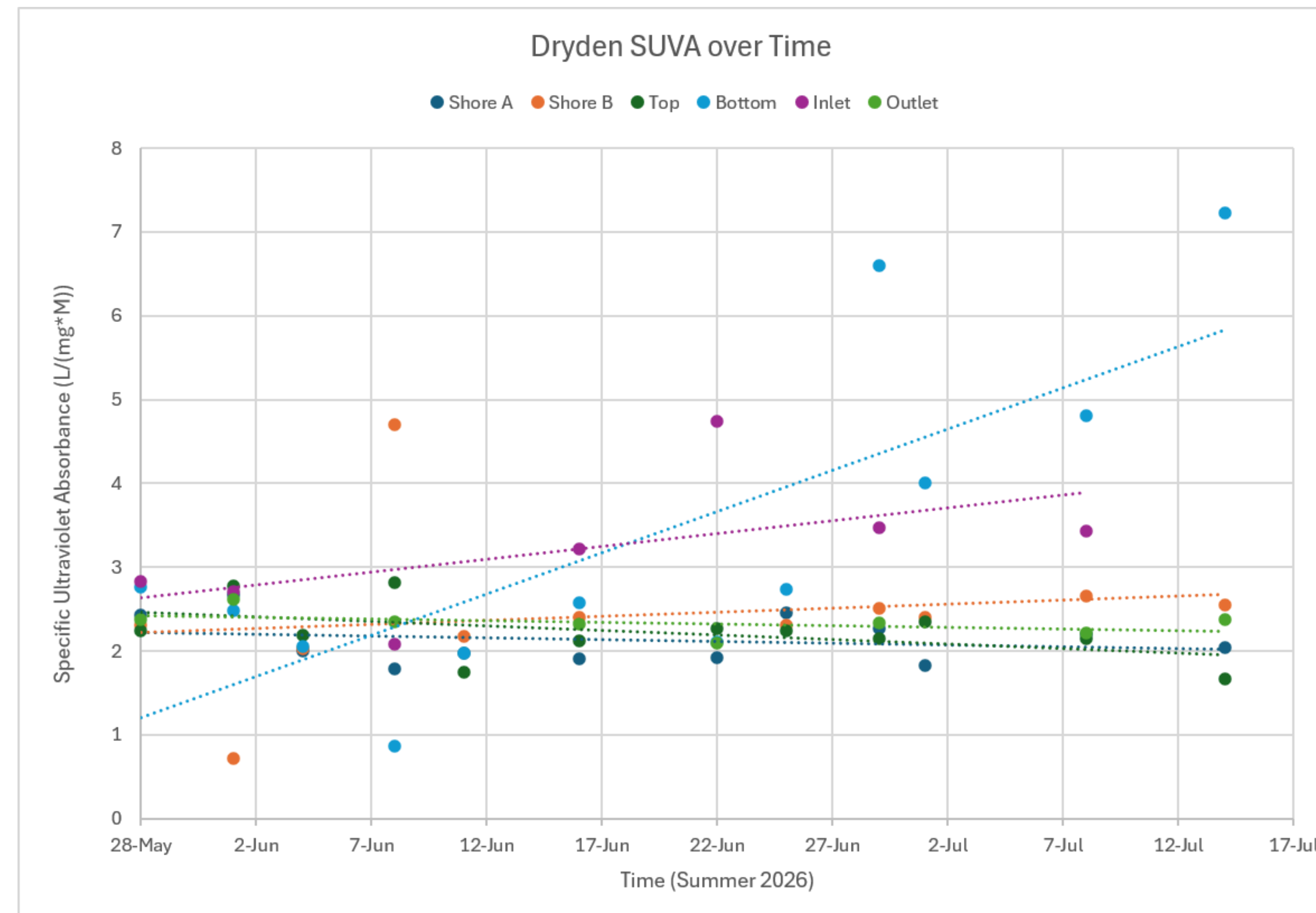


Figure 1: Time series showing SUVA at 254 nm at Dryden and Long Lake over a six week period. Linear trendlines were analyzed for the six locations sampled at each lake. No significant relationship was found between SUVA₂₅₄ over time for all sample points, with the exception of samples taken at Dryden Lake's bottom with $r = 0.5839$ and $p < 0.05$. SUVA₂₅₄ readings were stable for samples taken elsewhere, indicating relatively little change in aromatic character as HABs formed.

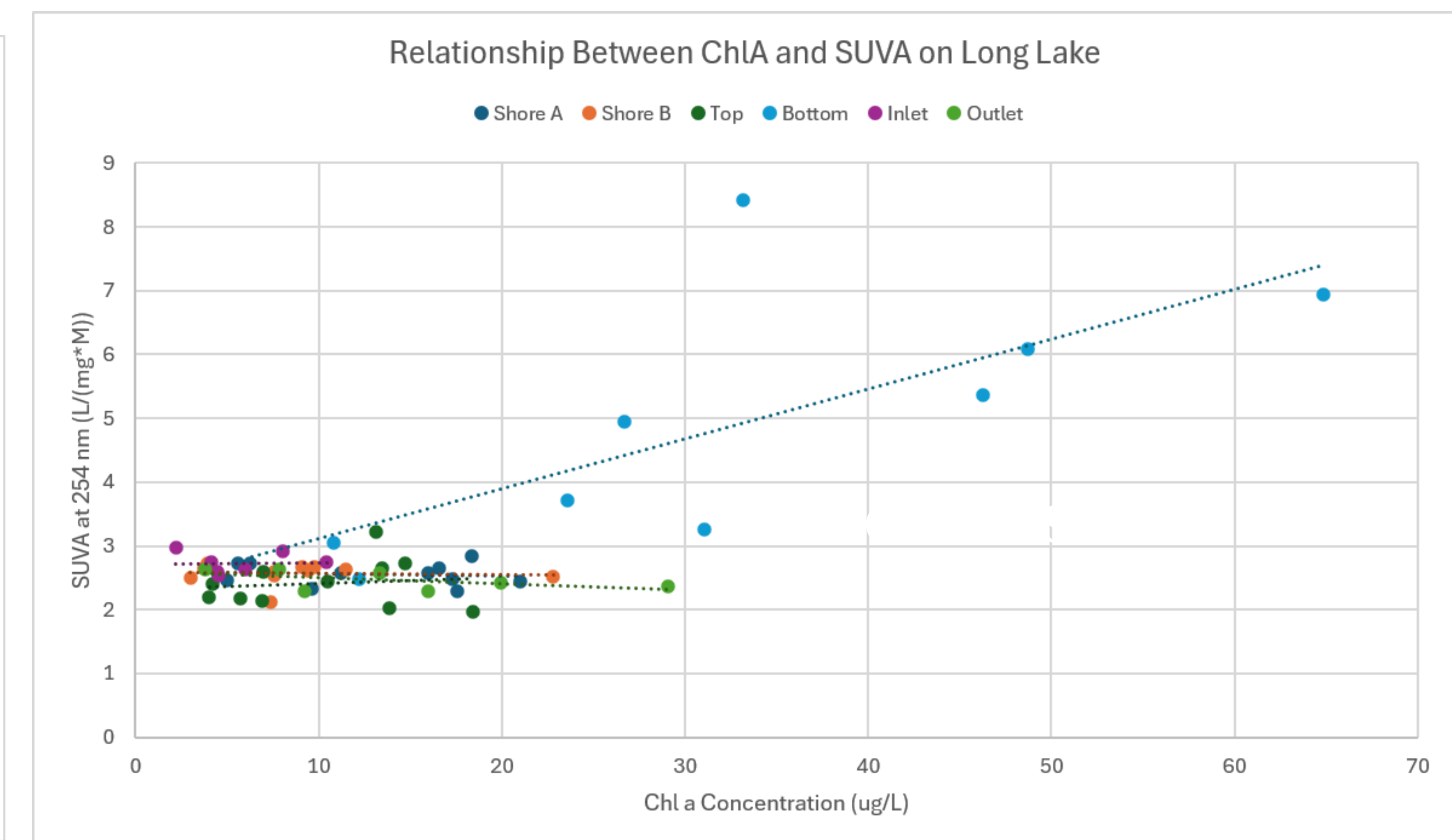
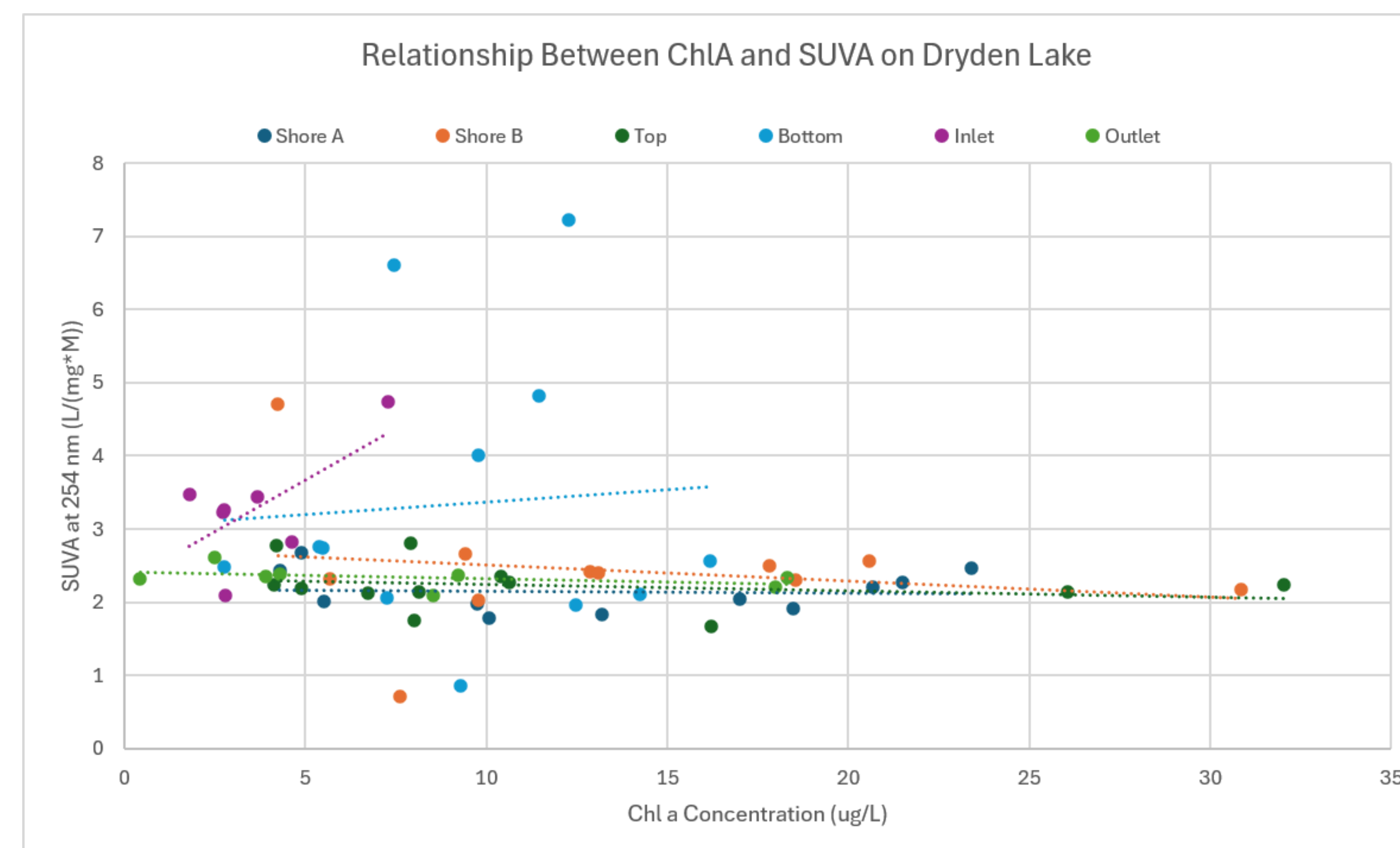


Figure 2: Relationship between chlorophyll a concentration and SUVA₂₅₄. Altogether, chlorophyll a concentrations did increase over the time samples were taken, indicating greater algal growth over time. However, this did not relate to a significant change in DOC aromaticity.

Acknowledgements

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