EXPLORING SILICA LIMITATION OF DIATOMS WITH A NUTRIENT DIFFUSING EXPERIMENT IN A HEADWATER STREAM IN INDIANA

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Harmful algal blooms are an increasing hazard for streams and lakes in Indiana. The Si limitation of diatoms in freshwater has been theorized to facilitate the growth of cyanobacteria and other non-siliceous algal groups, yet the timing and magnitude of this limitation is not well studied, particularly in streams. My research seeks to characterize the relationship between essential nutrients (nitrogen [N], phosphorus [P], and silica [Si]) and algal community composition in order to better understand the stoichiometric nutrient demands of diatoms in streams of Indiana.

In order to assess nutrient limitation, including the potential for dissolved silica limitation of diatoms, I am using nutrient diffusing substrata (NDS) enriched with different combinations of N, P, and Si. Nitrate, phosphate, and silicate salts are added to an agar medium and then diffuse through a porous glass disk once the NDS are placed in a stream. Algae are able to colonize the glass disks and reflect the enriched nutrient availability relative to the control and natural substrate. The study stream is located in Monroe County, Indiana and drains a predominantly forested watershed.

Incubating nutrient diffusing substrata in natural waters is a well-established method used in stream ecology to identify nutrient limitation and co-limitation. I am using multiple treatments of variable N:P:Si to identify the types of diatoms that grow under enriched nutrient availability. Treatments will include additions of Si, P, N, N and Si, P and Si, and all three nutrients. The response variables include total algal biomass (as chlorophyll-a) and species-level assessment of diatom community structure. This study aims to identify the diatom species that can act as proxies for stream nutrient concentrations which facilitate siliceous algal growth over nuisance and harmful non-siliceous algae.

The effects of the treatments relative to the control will be analyzed using one-way analysis of variance (ANOVA) with pairwise comparisons. Multivariate techniques may be used to explore the diatom community data. Characterizing shifts in the diatom community composition can offer insight into the variations in nutrient demands of different diatom groups as well as assessment for the potential for dissolved Si limitation of diatoms.