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Can cyanobacterial blooms in nutrient-poor lakes accelerate eutrophication? Perspectives from modeling

Gloeotrichia echinulata is a large nitrogen-fixing cyanobacterium that is causing nuisance blooms in oligotrophic and mesotrophic lakes in northern New England. We hypothesize that *G. echinulata* accelerates eutrophication by alleviating nitrogen (N) and phosphorus (P) limitation. Previous work in eutrophic lakes has established that meroplanktonic *G. echinulata* translocate significant amounts of P from sediments into the water column during recruitment, though the magnitude of N additions has not been previously calculated. Using extrapolations of recruitment data for Lake Sunapee, NH, we suggest that *G. echinulata* may add as much P as a small tributary, and predict that it could become comparable to a major tributary if recruitment continues to increase.

While data collection and analysis have been part of this project for several years, mathematical modeling is a newer component. Initial forays into modeling the interactions between *G. echinulata*, in the different phases of its life cycle, and N and P show that the addition of life-cycle components and the interaction of a second nutrient change the predictions of simple, one-element models. This modeling work is key in predicting the extent to which increases in the duration and extent of *G. echinulata* blooms might impact lake water quality.