



Pergamon

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EFFECTS OF *DAPHNIA* ON THE RESPONSE OF MESOTROPHIC LAKES TO EXPERIMENTAL ENRICHMENT

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ABSTRACT

We are currently involved in a whole-lake experiment designed to assess how *Daphnia* affect the response of mesotrophic lakes to increased nutrient loading. In the first year of the experiment, we wished to demonstrate that there are P loading rates which eutrophy lakes without *Daphnia* but not lakes with *Daphnia*. In order to do this, we needed to choose an appropriate level and schedule for the experimental enrichment. This paper describes how we made that choice, then evaluates whether our choice was successful. Based on the literature, a simulation model, and a mesocosm experiment, we decided that enriching at a rate of $1 \mu\text{g P L}^{-1} \text{d}^{-1}$ would create the desired contrast between lakes with and without *Daphnia*. Model simulations indicated that mean algal response to enrichment would be comparable under monthly, weekly, or continuous additions. We chose to add nutrients continuously at ambient N:P ratios. Experimental results from 1993 suggest that we achieved a nutrient loading rate consistent with our goal: chlorophyll responded less to enrichment in the lake with *Daphnia* than in the lake without *Daphnia*. The modeling, mesocosm, and whole-lake studies summarized here support the idea that *Daphnia* reduce chlorophyll at P loads $\leq 1 \mu\text{g P L}^{-1} \text{d}^{-1}$. However, cyanobacteria may escape control by all grazers at relatively low P loading rates.

KEYWORDS

Bio-manipulation; *Daphnia*; food web; mesocosm; phosphorus; phytoplankton; simulation model; whole-lake experiment; zooplankton.