

# Lakes: The Mirrors of the Earth

BALANCING ECOSYSTEM INTEGRITY AND HUMAN WELLBEING

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Lakes: The Mirrors of the Earth

BALANCING ECOSYSTEM INTEGRITY AND HUMAN WELLBEING

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## **RECENT CHANGES IN PLANKTONIC DIATOMS IN ALPINE LAKES: ENVIRONMENTAL DRIVERS AND RELEVANCE FOR ECOSYSTEM QUALITY ASSESSMENT**

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Nutrient (i.e. phosphorus) enrichment of alpine lakes is accompanied not only by increasing phytoplankton biomass, but also by substantial changes in algal species composition, in which planktonic diatoms play a key role. Increase in small centric *Cyclotella* species is commonly observed in oligotrophic lakes moving toward mesotrophic status, while changes from meso-to eutrophic conditions is often characterized by increasing Fragilariaceae (e.g. *Asterionella formosa*, *Fragilaria crotonensis*). There is increasing evidence that recovering lakes in the northern hemisphere are not returning to their original ecological status, as dense Fragilariaceae populations are maintained, or abruptly developed, despite the decreasing lake phosphorus level. Superimposed environmental changes are supposed to create lake conditions never experienced before, which are responsible for further species reorganization and the hysteresis of lake trophic evolution. This phenomenon has been more extensively investigated in mountain lakes of N-America, where it has often been ascribed as related to atmospheric driven nitrogen enrichment. Lake warming is, on the other hand, considered to sustain increases in small *Cyclotella* species. Here we analyze data on recent diatom changes from palaeo- and neolimnological investigations of a set of small to large mesotrophic lakes in the Alps in order to: a) explore the complexity of the environmental control over diatom development; b) try to discriminate effects of overlapping nutrients and climate changes; c) outline the relevance of nitrogen as ecological driver in Alpine lakes and the necessity to consider it for lake ecological assessment and managing purposes.

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