



## Recent changes in production in oligotrophic Uinta Mountain lakes, Utah, identified using paleolimnology

E. J. Hundey, K. A. Moser, F. J. Longstaffe, N. Michelutti and R. Hladyniuk

Limnol. Oceanogr., 59(6), 2014, 1987-2001 | DOI: 10.4319/lo.2014.59.6.1987

**ABSTRACT:** We use multiple proxies from lake sediment records of six remote alpine lakes in the Uinta Mountains, Utah, to investigate primary production and potential drivers of changes in trophic status over the last two centuries. Chlorophyll *a*, chlorophyll *a* flux, and percentage of organic matter (determined by loss on ignition) increase beginning in the mid-20th century in five of the six alpine study lakes, indicating increasing production. These changes tend to coincide with decreasing sedimentary  $\delta^{15}\text{N}$  and increasing abundance of the nitrophilous diatom *Asterionella formosa*. An earlier, more subtle change in diatom community composition and  $\delta^{15}\text{N}$  indicates that human activities prior to 1950 had measurable effects on these lake ecosystems, although no corresponding increase in primary production was observed at this time. Multiple factors can lead to increased primary production at alpine sites, but the evidence presented shows that enhanced atmospheric deposition of nitrogen and phosphorus explain the recent, more prominent increase in production. Although previous research has suggested that alpine lakes are nitrogen limited, our results suggest nutrient limitation varies spatially and temporally, and is complex in these oligotrophic systems. This and other factors, such as catchment characteristics, will affect the sensitivity of a lake to atmospheric deposition – fertilizing effects. The changes observed show that remote lakes are vulnerable to long-distance transport of nutrients, and that the risk of eutrophication could be intensified by increased nutrient inputs from expanding mining, fossil fuel combustion, and agriculture and by rapid warming predicted for the southwest.

### Article Links

[Download Full-text PDF](#)

[Return to Table of Contents](#)

### Please Note

Articles in L&O appear in PDF format. Open access articles may be freely downloaded by anyone. Other articles are available for download to subscribers only, or may be purchased for \$10 per article. All L&O articles are moved into Open Access after three years.

