

Blais JM1

New developments in using natural archives to track environmental change.

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Natural archives including lake sediments can be used to track the history of environmental change, and often provide our only glimpse of how aquatic ecosystems have responded to human perturbations before comprehensive observational data were collected. A major focus has been to use the fossilized remains of algae and other bioindicators to track ecosystem responses to changing conditions. Here I elaborate on new techniques to further resolve the environmental impacts of major environmental perturbations. Using the example of NWT gold mines, my colleagues and I are integrating the principles of ecotoxicology with lake sediment analyses to test predictions about how ecosystems should have responded to contaminant exposure based on threshold toxicity estimates from laboratory bioassays, which can then be compared against the fossil record. In the Alberta oil sands, we are employing a detailed analysis of petrogenic and pyrogenic hydrocarbons in lake sediments to assess contaminant sources to the region. We are also developing a series of organic biomarkers in lake sediments to show how lakes have responded to warming northern climates, migratory seabirds, and human occupation. These biomarkers include lignin-derived phenols to track allochthonous carbon inputs in lakes affected by warming climates and thawing permafrost, and sterol/stanol analysis that relates closely to bioenrichment of nutrients from large colonies of migratory seabirds near High Arctic ponds. I close with some promising indications that sterol/stanol analysis in dated lake sediment cores may be used by archeology to track the occupation of ancient Arctic settlements.