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Undergraduate Thesis Abstract

Acadia University
Wolfville, Nova Scotia

Author:

Kirklyn Davidson

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Paleolimnological research at A'se'k (Boat Harbour, a former estuary in Pictou County, Nova Scotia that has been contaminated by effluent from a kraft pulp mill and other inputs over the past 50 year has focussed on understanding the spatiotemporal distribution of metals within pre- and post-disturbance sediments. The site was dammed in 1967, effectively converting it into a shallow freshwater lake (140 Ha, 4m max. depth). The lake bottom sediments within A'se'k reflect both estuarine and freshwater environments and can be broadly characterized as grey marine silt (~50% water content) that predated effluent input, which is overlain by black, organic-rich sediment (~90% water content). The contact between these two units is sharp and is present throughout the basin. To better understand the geogenic contribution of toxic metals which will inform post-remediation management decisions, the marine sediment and sediment at nearby reference sites were analysed for the spatiotemporal distribution of As, Cd, Cr, Cu, Pb, Ti, Zn, Mo, and Ni, which were identified in previous studies as representative of impact at the site. The samples were collected using a gravity corer, were analysed for metal concentrations using pXRF techniques, and distributions were modelled using QGIS.

Results indicate that As, Cr, Cu, Zn, and Pb concentrations at both A'se'k and reference sites meet or exceed interim sediment quality guidelines (ISQG's). Metal loads within the grey marine silt at A'se'k are similar to or higher than those at the reference site. At both sites, metal concentrations show little stratigraphic variability. These data likely indicate that the contaminants in the overlying organic sediment at A'se'k have not impacted the underlying sediment. This data will provide a baseline for assessment of the effectiveness of the remediation process and may be used in the determination of compliance during future remediation of the site.