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Can lake sediments and peats provide a reliable record of Cr mining activities? Insight from two sites in a pre- and post-Cr mining context.

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Accurately dated lake sediment cores are valuable natural archives for assessing the temporal evolution of metal(loid) concentrations in the environment. They can be used to establish baseline concentrations before natural resource extraction, study the effect of past climatic variations on metal(loid) mobility, and evaluate the extent of long-range atmospheric transport. Lake sediments can be effective in recording atmospheric and watershed-related deposition of metal(loid)s. However, metal(loid) profiles can also be altered by sedimentary processes, including bioturbation and diagenetic remobilization. To better constrain metal(loid) accumulation records, [1] and [2] recommend studying colocalized peat and lake sediment archives. To help guide environmental decisions in the critical mineral-rich Ring of Fire region in northern Ontario, Canada, we evaluated lake sediment and peat archives at two analog sites as a record of chromium mining activity, specifically aiming to assess the fidelity of environmental metal(loid) archives for pre- and post-chromium mining activities. Samples were obtained adjacent to a remote, unmined chromium deposit in northern Quebec (James Bay region) and near several small-scale chromium deposits in eastern Quebec that were mined until the end of *WWII*. The study compares two nearby environmental archives (lake sediment and peat) to evaluate metal(loid) remobilization and establish a reliable chronological record of trace element loading. At both sites, the metal(loid) trends observed in the different natural archives are compared to their respective age models to differentiate the effects of historical metal(loid) loading from post-depositional remobilization. Lead isotopes and mineralogical data at both sites will be presented to refine the understanding of the sources of metal(loid)s.

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[2] Pelletier, N., Chételat, J., Palmer, M.J., Vermaire, J.C., 2021. Sci. Total Environ. 775, 145521.