
Geospatial analysis of mercury in stream and lake sediments across Canada

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The Geological Survey of Canada's (GSC) sediment historical surveys provide data for total mercury concentrations (THg) and other elements of stream and lake sediments across Canada. This study developed a GIS-based framework for investigating these data by wet-area coverage per basin above each sampling location, using digital elevation models (DEMs). Average THg were found to be higher on upland than lowland terrains (p-value <0.0001), with the highest values from areas affected by high geo-genic sources, metal exploration sites, and mining activities. Lakes had higher THg than streams. Lake and stream THg were correlated with AES-modelled atmospheric mercury deposition (p-value <0.0001; $R^2 = 0.74$), except for alpine and arctic locations where sediment THg was relatively low. The THg data within Selwyn basin in Yukon Territory, the area north-east of the Great Bear Lake in North West Territory, Nova Scotia, and in northern New Brunswick were further investigated using multiple regression analysis, and were found to be positively related to total Cd, Cu, Zn, and Ag and loss of ignition, and negatively related to the wet-area coverage per basin (overall model $R^2 = 0.65$). The importance of the wet-area coverage per basin became strongly accentuated when grouping the stream sampling locations by \log_{10} THg classes from low to high, and by determining the mean wet-area coverage per basin for each by logTHg class ($R^2 = 0.76$ and 0.90 , respectively).