Applied landscape geochemistry and environmental change in Nova Scotia, Canada

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Modern man is fast becoming a potent and transformative planetary force. In Nova Scotia data from lakes, streams, soils, bedrock, tills and plants reveals environmental change. Previous studies concerned mostly acidic precipitation, acid drainage, intracoastal pollution with recent attention given to elevated radon, mercury and arsenic levels. Using Landscape Geochemistry modern drainage catchments are considered to act as mass storage devices containing the 'geochemical genetic code' as background levels for input to GIS and other modeling applications.

Several landscape geochemical studies outline significant man-made (anthropogenic) environmental issues. Catchment lithology, chemical mobility, and dispersion and dilution of metals during transport are related to varying pH. Surface water samples from streams in Hants and Halifax counties identified many bedrock factors with the notable presence of elevated N2 ions in lowland areas when used for agriculture. Since the 1960s, construction activities at the airport and along the Bicentennial Highway have exposed highly fractured, mineralised, and pyritic units of Halifax Group slate. The 1987 runway extension created an acidic leachate runoff with a pH of 2.9, with resultant fish kills and relocation of a municipal water supply at Enfield. The 1990 amelioration by sheet-creting of the exposed runway bedrock increased pH of outlet water by 0.5 pH units. During the 17th century wooden ships brought foreign pollen as ragweed (Ambrosia spp.) and Plantago spp. This layer provides a baseline from which to estimate anthropogenic inputs. Dramatic increases in baseline metal values of Pb (automobiles), Cu (plumbing), and V (heating oil) are observed in many cores. Post-Ambrosia disturbance is noted near smelters in Ontario. At Chocolate Lake a geochemically distinct 'backhoe' horizon is produced by excavation and construction activities about 40 years ago. Elements in lake cores also act as time and spatial or ballistic markers with Ni, Cu, U, Br, As, Sb and Co useful in Ontario and Al and Zn at Soldier Lake. As a corollary to future global warming effects, lake cores record climatic change to a warm, dry maximum at ca. 3500–5500 RYBP, the xenothermal interval. The use of road salt for ice control is noted by increased halophilous diatoms. Since ca. 1750, deforestation changes are seen in tree pollen and diatoms. Prior to 1900 pH in cores is approximately 4.5 but since the 1970s increasing lake water eutrophication due to leaching of domestic waste is noted by near-neutral pH.

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