

AN INVESTIGATION OF  
STREAM CHEMISTRY VARIABILITY OF WATERSHEDS IN  
CENTRAL ST. LAWRENCE COUNTY, NEW YORK

by

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## ABSTRACT

Geochemical study of five watersheds from the central portion of rural St. Lawrence County shows impact from acidification, mining, agriculture, and variable geologic materials. The largest impact is the location of the watershed with relation to the Adirondack Highlands (acidic crystalline basement rocks) and Lowlands (large proportions of marble). The Star Lake (Little River) watershed is located within a historical acidified portion of Adirondack Park and most tributaries display low pH (~6.74), high Al (up to 472ppb), and low Ca concentrations (down to 1.23ppm). Those watersheds near the site of the former Benson Mines (open pit magnetite-martite mines) are enriched in iron, manganese, and nitrate at levels up to 4,362ppb, 1230ppb, and 45.16ppm, respectively. Plumb Brook has a limited geology, consisting mostly of various granitic gneisses (~55%) and glacial deposits, the lowest TDS (0.038g/L), and geochemical characteristics between those of highly acidified southern drainage basins and those buffered by carbonate to the north. The Harrison Creek drainage basin is in the Adirondack Lowlands and underlain large areas of marble which makes up around 22% of the watershed bedrock. Its characteristics include basic pH values, high total dissolved solids, low DO values, large Ca/Al ratios, and anionic indicators of agricultural use (~19% of the drainage basin). The Cold Brook watershed, also with the Adirondack Highlands is less acidified and is largely fed by ground water. It had the lowest summer temperatures (~13.4°C), highest DO values (up to 10.02ppm), and low TDS (~0.065g/L), and the most consistent chemistry between sampling events. Lastly, the Little River Canton watershed is furthest north of those studied and shares many of the same characteristics as Harrison Creek, except with higher correlations between major

relationships. In general, the characteristics of all the basins are in accord with their ANC capacity determined from representative rock, glacial, and soil samples, with average values between sampling events around 2.30meq/L. The June 11<sup>th</sup> sampling event occurred during a time of high flow and stream chemistry was generally in disequilibrium. The July 24<sup>th</sup> sampling took place under lower discharge conditions, had higher TDS, and showed greater influence of base flow conditions and chemical equilibrium between various ionic species. Individual subbasins were found to vary considerably often reflecting unique local conditions (proximity to mine tailings), variability in bedrock lithologies, one-time events (fertilizer application), or proximity to roads or developed areas.