# Geological Factors Affecting Surface Water Chemistry in Southwestern Nova Scotia[1]

*D. J. Utting and T. A. Goodwin*

In southwestern Nova Scotia, some lakes have been adversely affected by acid rain, causing a reduction of pH and stress to fish habitat. The effects of this acidification have been heavily studied in terms of ecology and water chemistry, and have been extensively monitored and modelled. Previous studies have generally ignored the effects of geology, however, considering the bedrock as 'un-buffering' granites, metasediments and slates. Although bedrock geology may have a more significant control on water chemistry than previously considered, this study focuses on the role of glacial sediment cover on the buffering capacity of lakes in southwestern Nova Scotia. Southwestern Nova Scotia has been affected by numerous glacial events including the Escuminac Phase, when an ice divide located to the north over the Magdalen Shelf resulted in glacial advance to the south over the region. This phase produced tills and drumlins composed of distally derived material that may have higher calcium carbonate content than locally derived materials. Because of the region's complex history of multiple ice-flow phases, this calcium carbonate is not equally distributed. Understanding its dispersal and relationship to water chemistry is critical for modelling responses to acid rain. To establish a link between glacial sediment and lake chemistry, the authors compare a Department of Natural Resources archive of over 3000 lake sediment geochemistry samples collected in the late 1970s to water chemistry from Environment Canada's database of monitoring lakes (n=74), which has operated continuously since the 1970s. In lakes where both the sediment geochemistry and water chemistry were measured, there is a negative correlation between calcium concentrations in the sediment and the acidity of the water: lakes with higher concentrations of Ca in their sediments have less acidic water. A map of Ca concentrations from the more extensive lake sediment database reveals that lakes with enough Ca in the sediment to buffer the lake pH tend to occur within drumlin fields. This is confirmed at the scale of local catchments, where if the upper topographic elevation is above the occurrence of drumlins a corresponding low Ca concentration is observed. Conversely, in the lower elevations of the catchments, if they lie within a drumlin field, higher Ca concentrations are measured in the sediment.

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