Remote assessment of instantaneous changes in water chemistry after liming in a Nova Scotia catchment

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Southwestern Nova Scotia (SWNS) has some of the most acidic freshwaters in North America due to its location downwind of major emission sources and due to resistant geology with little acid buffering capacity. Because of the poor buffering and regionally high runoff, hydrological events such as snowmelt and rain storms are frequent and can cause sudden changes in water chemistry which can have devastating effects on freshwater biota due to increases in acidity and 13 metals. Here we take advantage of recent advances in equipment to monitor water chemistry in an experimental catchment, and explore the response to catchment liming.

Catchment liming is thought to be the best strategy for mitigating long-term effects of acid deposition in sensitive areas. We limed a segment of the dynamic source zone at a rate of 5 t/ha in a 50 ha catchment in SWNS to examine interactions between application of lime with the geological and climatological conditions of this region. In order to assess changes of episode frequency caused by liming, we established two mobile environmental monitoring platforms in the catchment: a control site located immediately above the limed area, and a treatment site 320 m below the limed area. We monitored pH, DO, water temperature, conductivity, stage height, air temperature, wind speed and direction as well as precipitation every 15 minutes with the data being accessed in real-time. The high frequency measurements were supplemented by chemical analysis of bi-weekly to monthly grab-samples at the site. pH values before treatment were as low as 4.9 and Ca^{2+} as low as 0.7 $mg \bullet L^{-1}$ demonstrating the need for liming treatment. In this work, we show real-time outputs of pre- and post-treatment stream chemistry and present the short-term effects of liming on this acid sensitive ecosystem.