Liming to Accelerate the Recovery of Acidified Ecosystems: A Case Study in the Adirondack Mountains of New York

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The Adirondack region of New York State is sensitive to acidic deposition, and widespread effects on aquatic and terrestrial ecosystems in this region have been demonstrated. As of the mid-1980s, about 25% of Adirondack lakes had become too acidic (ANC<0 meq/L, pH<5.0) to support a healthy fish community, and brook trout were believed to have been extirpated from many lakes. Since that time, precipitation acidity has decreased greatly as the Clean Air Act and its amendments were implemented and emissions of SO_2 and other acid precursors declined. Precipitation pH at Huntington Wildlife Station, for example, has increased from about 4.3 in the mid-1980s to 5.0 in 2011, an 80% decline in acidity. As a result of decreased acid deposition, lakes in the Adirondacks have begun to recover; widespread decreases in SO_4^{2-} and Al concentrations along with increases in pH and ANC have been reported. Notably, some lakes with ANC values near or below zero have now improved to above zero indicating conditions more favorable for a diverse aquatic biological community. Declines in lake acidity thus far have been less than those of atmospheric deposition, and limited biological data suggest a slow recovery to a pre-acidification community, hindered in part by the slow pace of soil recovery from base cation loss. We are studying the effects of stream and watershed liming in several tributaries to Honnedaga Lake in the southwestern Adirondacks as a means of accelerating aquatic and terrestrial ecosystem recovery. This lake was acidified to summer pH values <5.2 in the 1960s through the 1980s, but recent values have risen to about 5.5, a threshold accompanied by decreases in Al concentrations. The lake and its tributaries contain a heritage strain of brook trout whose numbers were greatly diminished as acidification progressed. While the population density of these trout has increased in recent years in parallel with improvements in water quality, numbers remain low due to the sluggish recovery. Liming is being studied as a method for improving brook trout recruitment in key lake tributaries with an aim of providing guidance for future liming activities that may improve fisheries management in the Adirondack region. Unintended consequences of liming such as potential increases in Hg bioaccumulation are also being studied in this ecosystem. Recent results from this study will be discussed.

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