

Studies of lakes in eastern North America have provided evidence that atmospheric deposition accounts for sulphate levels in excess of those expected from natural processes. In the absence of effects from mine drainage and industrial waste water, the symptoms of acidification (e.g., pH depressions of surface waters and loss of fish populations), have been observed only in lakes and rivers where the accompanying elevated concentrations of surface water sulphate (and nitrate in some cases) indicate atmospheric deposition of these ions. Land use changes, such as fires, logging, and housing developments have taken place in many areas with sensitive (low alkalinity) surface waters, but the symptoms of acidification have not been observed unless there is an accompanying increase in surface water sulphate concentrations. Nitrate concentrations also increase in some areas, especially during snowmelt.

In eastern Canada, the surface waters which have elevated excess sulphate occur in areas which have high atmospheric deposition of sulphate. All of the surface waters sampled in northeastern North America that have experienced loss of alkalinity also have elevated excess sulphate concentrations. In areas with less acidic deposition, loss of alkalinity in surface waters has not been observed. In Quebec, sulphate concentrations in surface waters decrease towards the east and north in parallel with deposition patterns. Sulphate concentrations are equal to or greater than the bicarbonate concentration in lakes in the southwest part of the Province. This indicates that the surface water chemistry has been altered by atmospheric sulphur deposition.

Observed Historical Changes

Sediments from lakes in Maine, Vermont, and New Hampshire indicate increased atmospheric acidic deposition has affected terrestrial and aquatic ecosystems as measured by changes in metal concentrations and diatom populations. It has been inferred from the sediment record that the rate of acidification of aquatic ecosystems has increased since the late 1800s as measured by declines in metals (zinc, copper, iron, calcium, magnesium and manganese) in the sediments. Conditions of low pH maintain metals in the water column, where they can be flushed out of the system before being deposited in the sediments. Diatom data are less complete, but they also indicate a statistically significant pH decline since the early 1900s.

In this report numerous historical chemistry records have been examined for waters not influenced by local urban or industrial discharges. Reviews have been conducted for 2 rivers in Newfoundland and 6 in Nova Scotia; 7 lakes in Nova Scotia and 3 in New Brunswick; 40 lakes in Adirondack Park, New York; 250 lakes in New England; 2 streams in New Jersey Pine Barrens; and 275 lakes in Wisconsin. Historical records which are available