

Elevated concentrations of toxic elements, such as aluminum, and biological effects including losses in fish populations have been reported to accompany some of these pH depressions. In most of the reported cases, clear relationships were not established between acidic deposition and observed effects. Conclusions are based on an understanding of the acidification process although mechanisms which control this process are often not completely understood.

The following summary statements are observations reported to be occurring in areas receiving acidic deposition.

Both sulphuric and nitric acid contribute to the acidity of precipitation. It appears, however, that sulphuric acid contributes more to long-term acidification of surface waters than does nitric acid. Nitric acid can contribute to pH depression of surface waters during periods of snowmelt and heavy rain runoff in some areas. Studies of lakes in eastern North America indicate that atmospheric deposition accounts for sulphate levels in some waters in excess of those expected from natural processes. Lake study areas are located in Labrador, Newfoundland, Nova Scotia, New Brunswick, the southern part of the Canadian Shield in Quebec, and in eight regions of Ontario. Primary study areas in the U.S. are found in New Hampshire and southern Maine, Adirondack Park in New York, the Boundary Waters Canoe Area of Minnesota, and numerous lakes in north-central Wisconsin.

There is evidence of long-term reductions of pH and alkalinity and other water quality changes for some low alkalinity surface waters. The rate of change of pH and alkalinity in lakes is one of the least well defined aspects of the acidification process. However, there is evidence of short-term pH depressions in some waters following high runoff from snowmelt and storm activity. Both sulphate and nitrate are associated with short-term changes in water chemistry but, in the majority of surveyed cases, sulphate appears to be the larger contributor to total acidity.

Short-term pH depressions and elevated concentrations of metals, particularly aluminum, iron, zinc, and manganese have been observed during periods of high runoff. Metal mobilization from some watersheds, first noted in streams and lakes of Scandinavia, also has been reported from such places as Hubbard Brook, the Adirondacks, and the Great Smokey Mountains of the U.S., and Sudbury, Muskoka, and Plastic Lake in Ontario, Canada. Artificial acidification of a lake in the Experimental Lakes Area of Ontario has shown mobilization of metals from lake sediments to the water column.

Sediments from lakes in Maine, Vermont, and New Hampshire suggest increased acidity in aquatic ecosystems. It has been inferred from declines in metals (zinc, copper, iron, calcium, magnesium and manganese) in the sediments that the acidity of the water increased since the late 1800s. Low pH maintains