from areas of soils and bedrock with a low potential to reduce acidity exposed to acidic deposition, show an increase in sulphate and corresponding decrease in alkalinity and pH. Areas of similar lithology and land use practices, but not receiving significant acidic deposition do not show similar losses of alkalinity.

Lakes in the Adirondack Mountain range have some of the lowest alkalinity values and are located in watersheds with a low potential to reduce acidity. They are located in the eastern U.S. in a zone receiving high acidic deposition (26-40 kg/ha.yr of sulphate in precipitation 1978-81). Historical data on fish and pH are available for 40 high elevation Adirondack lakes. In the 1930s, only 8% of these lakes had pH less than 5.0; 10% had no fish whereas in the 1970s, 48% had pH less than 5.0 and 52% had no fish. In some cases, entire fish communities consisting of brook trout, lake trout, white sucker, brown trout, and several cyprinid species apparently have been eliminated over the 40-year period. The New York Department of Environmental Conservation has concluded that at least 180 former brook trout ponds are acidic and no longer support brook trout. The relative contribution of natural and anthropogenic sources to acidification of these lakes is not known.

In New England, deposition of wet sulphate has been measured to be 17-40 kg/ha.yr. A study of 95 lakes for which there are historical pH data from the 1930s to the 1960s has indicated that 36% either had the same pH or higher while 64% now have lower pHs. For 56 lakes, a comparison of historical alkalinities to modern values indicated that 30% of the lakes had increased and 70% had decreased in alkalinity. Over the period of record, measured alkalinity values have decreased by an average of 100 μeq/L. The lakes were small to medium size oligotrophic to mesotrophic with moderately to very transparent water, low to moderate concentrations of humic solute, low alkalinity and conductance and with moderately disturbed to pristine watersheds. For four rivers in Nova Scotia data from 1980-81 showed a decrease in bicarbonate, an increase in sulphate and hydrogen ion concentrations when compared to 1954-55 data.

Short-Term pH Depressions

While the rate of change of water quality of lakes (i.e., the time required for a lake to become acidified) is one of the least well-defined aspects of the acidification process, there is evidence that current acid loadings are damaging to fish populations and other biota due to short-term pH depressions following snowmelt and storm runoff. 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 the total acidity.