United States and Canada. They were fruitful spawning grounds for salmon in the mid-1950s. Since 1974 they have been heavily acidic during the spring spawning season and salmon are no longer produced.

– The provincial governments of Ontario and Quebec, with federal assistance, are measuring the chemical composition of a large number of lakes to develop a model that will help scientists understand how lakes respond to acid loadings.

– Canada's Department of Fisheries and Oceans is studying the effects of acidification on a number of healthy lakes near Kenora, Ontario. At one (a nameless body of water designated as Lake 223) three metric tons of sulphuric acid have been added in the last four years, an amount equal to the acidification the lake would have received from precipitation in twenty years if it had been near Sudbury, Ontario. The pH has dropped from 6.5 to 5.6. The lake might still not be considered in critical condition at this pH level, but it has been significantly damaged nevertheless. Tiny freshwater shrimp and fathead minnows have disappeared, and the number of slimy sculpin has declined sharply. There has been an increase in embryo malformations among lake trout, and toxic heavy metals such as aluminum and zinc have been leached out of the rock by the acid and are now present in the water in increasing concentration.

– Ontario's Ministry of the Environment is studying a number of acidified lakes in the cottage country near Algonquin Park in Dorset and the impact of changes in them on recreation.

– The U.S. Environmental Protection Agency is studying the effects of acid rain on field crops. Preliminary findings show that it does not have harmful effects in the early stages and that it actually increases the yield of several crops, including corn and tomatoes. At higher concentrations, however, it can destroy plant tissues, remove nutrients from the soil, interfere with photosynthesis and affect the abilities of soybeans, peas and other legumes to fix nitrogen.

– Health and Welfare Canada and the United States Department of Health and Human Services are making separate epidemiological studies on the effects of sulphate particles on lung patients, asthmatics and schoolchildren.

The Atmospheric Environment Service of Environment Canada, the Ontario Ministry of the Environment and a number of U.S. agencies are cooperating in developing and testing mathematical models of atmospheric transport, chemical changes and fallout of acid precipitation and dust. These models are needed to predict effects on lakes and soils of increases or decreases in SO_2 of emissions in industrial areas thousands of miles away.

Official Actions and Reactions

The Canadian and United States governments recognized acid rain as a major problem in 1976.

In the United States Senator Max Baucus of Montana and Representative John Fraser of Minnesota, with the help of colleagues in Congress, persuaded the State Department to confer with Canada about a bilateral air quality agreement.

In 1978 a Bilateral Research Consultation Group was formed to coordinate the research programs in both countries on the long-range transport of air pollutants, including acid rain.

After a series of discussions, the two countries announced their intention to develop a "cooperative agreement on transboundary air quality" in July 1979.

The two countries already had a body of law and practice dealing with bilateral environmental issues, including the Great Lakes Quality Agreement (see page seven), which provided models for an air quality agreement.

In November 1979 eight hundred persons, including officials from both countries, attended an acid rain seminar in Toronto.

The same month John Fraser, then Minister of Canada's Department of the Environment, and Doug Costle, then Administrator of the U.S. Environmental Protection Agency, met in Geneva and issued a joint statement on acid rain in North America, acknowledging the extensive and irreversible damage that had already occurred.

In January 1980 there were joint consultations on Canada's concern about plans for conversion from oil to coal in U.S. industrial and utility plants. The impact of coal conversion on the environment was also discussed at the summit meeting of western leaders in Venice the following summer.

Last August, after a series of joint meetings, the two countries issued a Memorandum of Intent, announcing that an air quality agreement would be negotiated. Five specialized work groups would lay the technical foundation for the agreement, which would require the vigorous enforcement of anti-pollution standards, advance notice and consultation on activities, and cooperation in research.