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<a href="#">About Us</a>				

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# EnviroZine

*Environment Canada's On-line Newsmagazine*

You are here: [EnviroZine Issue 53](#) > Feature 1

## Acid Rain Drops Keep Falling on my Head

As we enter 2005, it seems a bit surprising to be writing an article on acid rain issues in Canada. Wasn't this issue tackled 20 years ago?



A stillwater on the Sable River, Nova Scotia. Photo: Courtesy of Natural Resources Canada [Click to enlarge](#).

Well yes and no. Canada and the United States are both meeting targets to reduce emissions that cause acid rain but that may not be enough.

Thousands of lakes remain acidified; a large part of the salmon habitat in the Maritimes is lost; a significant proportion of eastern Canada's forests are affected; damage to buildings and monuments is documented; and the health of Canadians suffers.

### What is Acid Rain?

Acid rain is rain, snow, fog, gases and dust that is polluted by acid in the atmosphere and damages the environment. The two most common air pollutants that cause acid rain are sulphur dioxide ( $\text{SO}_2$ ) and nitrogen oxides ( $\text{NO}_x$ ).



These acid rain-causing pollutants can travel hundreds and even thousands of kilometres from the source of emission. Due to long-range transport and the destructive nature of acids, acid rain has numerous impacts on humans, their environments and the economy.

The sulphur and nitrogen oxides in acid rain can also contribute to the formation of ground-level ozone and smog – both known to cause health problems.

### Fast Facts

The two most common air pollutants that cause acid rain are sulphur dioxide ( $\text{SO}_2$ ) and nitrogen oxides ( $\text{NO}_x$ ).

In Canada and the United States, major sources of acid-causing emissions are non-ferrous mining and smelting, electric power generation, oil and gas operations and transportation.

Between 1980 and 2000, total emissions of sulphur dioxide declined by approximately 50 per cent in Canada and 40 per cent in the United States.

Acid rain is a particular problem in eastern Canada because many of the water and soil systems in this region lack natural alkalinity – such as a lime base – and therefore do not have a natural capacity to neutralize acid.

### Related Sites

[Canadian Acid Deposition Science Assessment](#)

[Acid Rain](#)

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## Canada-U.S. Emission Reductions



An Environment Canada Acid Precipitation Collector.

Long-range transport, combined with the proximity of major sources of sulphur and nitrogen oxides emissions in the United States, means that solutions to Canada's acid rain problem require emission reductions from both countries.

Significant sulphur dioxide emission reduction commitments were made by each country in the 1980s. Then in 1991, the Canada-U.S. Air Quality Agreement was signed which established sulphur dioxide emission reduction targets for 1997 (Phase I) and for 2010 (Phase II).

Efforts made by both Canada and the United States have proven successful in reducing sulphur dioxide emissions. Between 1980 and 2000, total emissions of sulphur dioxide declined by approximately 50 per cent in Canada and 40 per cent in the United States. Sulphur dioxide emissions are projected to decline by an additional 4 per cent by 2020 in Canada and 38 per cent in the United States.

While there was little decline in emissions of nitrogen oxides between 1985 and 2000 in either country, nitrogen oxides are predicted to decline approximately 17 per cent in Canada and 47 per cent in the United States by 2020.

Although it is expected that 2010 emissions targets will be achieved, research indicates that many lakes and forests will continue to sustain damage from acid rain. Current reduction targets are not sufficient to prevent damage from acid rain in eastern Canada.

## Acid Rain in Canada

The results of the [2004 Canadian Acid Deposition Science Assessment](#) confirm that although levels of acid rain have declined in eastern Canada over the last several decades, approximately 21 per cent of eastern Canada continues to receive levels of acid rain in excess of what the region can handle and 75 per cent of eastern Canada is at risk of damage. Despite widespread misconceptions that the issue is solved, new research indicates that the problem could linger for another 60 years or more.

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[Clean Air](#)

### Related EnviroZine Article

[Canada and the United States Work Together to Fight Air Pollution](#)

[What are the main causes of air pollution?](#)

Provinces that are part of the Canadian Precambrian Shield, like Ontario, Quebec, New Brunswick and Nova Scotia, are hardest hit because their water and soil systems cannot fight the damaging consequences of acid rain. In fact, more than half of Canada consists of granite areas that have little capacity to neutralize the effects of acid rain. If the water and soil systems were more alkaline – as in parts of western Canada and southern Ontario – they could neutralize acid rain naturally.

Historically, the eastern part of Canada and the United States also suffer from higher levels of industrialization. However, large increases in emissions of sulphur and nitrogen oxides from oil sands operations in northern Alberta are raising concerns that the problem of acid rain may expand west.

## Impacts of Acid Rain

Acid rain has negative impacts on lakes, rivers, soils, forests, wildlife, biodiversity, buildings, and human health.

Lakes and rivers that have been acidified cannot support the same variety of life as healthy water sources. Many aquatic species such as algae, fish, water birds and other freshwater life find acidified waters toxic. Since many lakes and streams continue to be acidified by acid rain, the biodiversity of large regions of eastern Canada is reduced. For example, researchers predict that Atlantic salmon populations in rivers of the southern upland region of Nova Scotia will become extinct if adult death rates remain high and acid rain continues.

Acid rain is removing essential nutrients, such as calcium, from soils which is negatively affecting the health and growth of trees. At current levels, it is estimated that over half-a-million cubic metres of wood is being lost from forests in Atlantic Canada each year due to loss of soil nutrients.

The corrosive impacts of acid rain can damage property, particularly older stone buildings and electrical transmission towers. For electrical towers, acid rain can reduce the life expectancy by 50 per cent and greatly increase repair frequency with an annual cost of thousands of dollars per tower.

Our health is also affected. Recent studies found links between incidence of acid rain and respiratory symptoms, impaired lung function, hospital admissions and premature death.

Canada has been successful in reducing acid-causing emissions to date. However, acid rain is still a problem. Researchers estimate that a further 75 per cent reduction in sulphur dioxide emissions will be required from Canada and the United States, beyond those agreed to for 2010, to protect the health of Canadians as well as eastern Canadian ecosystems from damage by acid rain.



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