The Muskoka Watershed

REPORT CARD

Background Report #5

Our Air

Muskoka
WATERSHED COUNCIL

July 2004

OUR AIR

Indicator	Are We Happy?	Are Things Improving
No incidents of poor air quality		?
Industrial and automotive emissions in a healthy range		

Why are we concerned about good air quality?

Health research has recently shown that there is no threshold below which smog will have no negative effect on human health. Respiratory problems can be caused either by smog levels or by acid aerosols.

Smog is composed mostly of ground-level ozone and fine particulate matter. Ground-level ozone results from chemical reactions between nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. Smog can make breathing more difficult – even for healthy people – and it can make us more susceptible to cardio-respiratory diseases. Even healthy young adults breathe less efficiently on days when the air is heavily polluted, especially if exercising outdoors. Particularly vulnerable to smog are people with heart or lung disease, the elderly and small children.

Human activities are responsible for the increases in ground-level ozone in recent years. About 95 per cent of nitrogen oxides from human activity come from the burning of coal, gas and oil in motor vehicles, homes, industries and power plants. VOCs are produced mainly from gasoline combustion and from the evaporation of liquid fuels and solvents.

Acid rain is composed of mainly sulfur dioxide (SO_2) although nitrogen oxides also lead to acid conditions. These chemicals react with other chemicals in the air to form tiny sulphate particles, which can lodge deep within the lungs and cause respiratory problems.

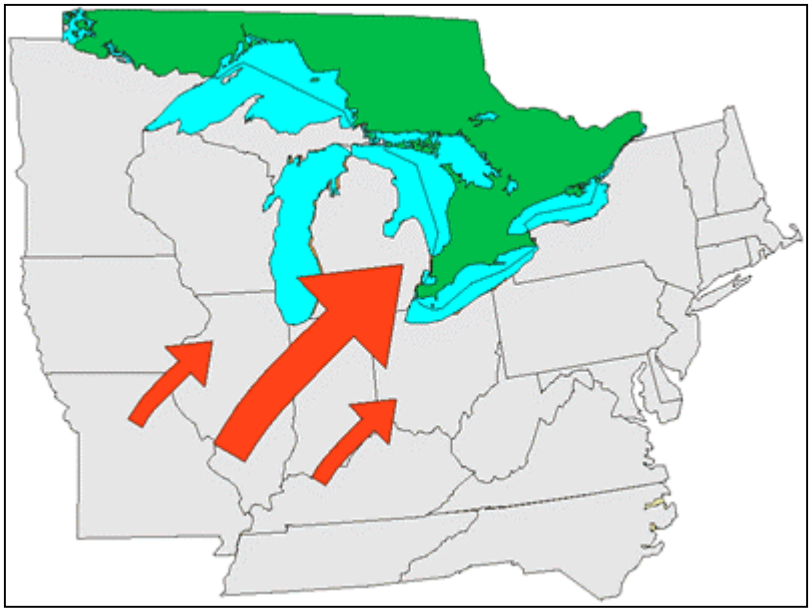
Current state

<u>Smog</u>

Smog in Ontario is usually the result of the migration of pollutants from the United States combining with unfavourable weather patterns. Ground-level ozone and fine particulate matter are key components of smog. Ground-level ozone is different from the ozone layer high above the earth that protects us from the sun's harmful UV rays. Fine particulate matter is also formed from chemical reactions in the atmosphere as well as through direct emissions. The formation and transport of both ozone and fine particulate matter is strongly dependent on meteorological conditions.

In Ontario, elevated concentrations of ozone are generally observed on hot, sunny days from May to September, between noon and early evening. On such days, the level of fine particulate matter is often elevated, but unlike ozone it can remain high throughout the day and night. Elevated levels of fine particulate matter can occur throughout the entire year, especially during stagnation periods when meteorological conditions are not conducive for the dispersion of pollutants.

Map 1
Direction of flow of Poor Quality Air



Significant amounts of ozone and fine particulate matter are carried into Ontario from the U.S. During periods of widespread elevated smog, it is estimated that more than 50 per cent of Ontario's ground-level ozone and fine particulate matter comes from the U.S. The map above shows the area from which southern Ontario air originates during days of widespread elevated smog. Historically, most episodes of elevated smog in Ontario come from emission sources in the U.S. Midwest.

The Ministry of the Environment operates an extensive network of air quality sites across the province. There are currently 37 air quality index (AQI) monitoring sites across the province, of which seven are located in rural areas. This includes a site at the Dorset Environmental Science Centre and a new monitoring site in Parry Sound, which began reporting in 2000 and 2001, respectively. Given the short reporting time for both sites in Muskoka, base line data only can be established at this time. It is recommended that this indicator continue to be monitored to track changes over time.

TABLE 1
Summary of Smog Advisories (2001 to 2003)

Region	2001		2002		2003	
	Adv.	Days	Adv.	Days	Adv.	Days
ALGONQUIN	5	12	3	5	2	4
BARRIE-HURONIA	7	17	8	14	4	11
HALIBURTON - DORSET	7	14	6	12	4	10
NORTH BAY-NIPISSING	4	10	1	3	1	4
PARRY SOUND-MUSKOKA	7	17	6	12	4	10
ONTARIO	**7**	**23**	**10**	**27**	**7**	**19**

Acid Deposition

SO_2 is a colourless gas that smells like burnt matches and is found in the emissions of many industrial uses. SO_2 can be oxidized to form acid aerosols and is a precursor to sulphate (SO_4), which is one of the main components of respirable particles in the atmosphere. SO_2 is the chemical compound monitored at the emission source; however, in Muskoka it is the SO_4 form of the chemical that is present and monitored.

Approximately 69 per cent of the SO_2 emitted in Ontario in 2000 came from smelters and utilities, especially from electrical generation. Other industrial sources include iron and steel mills, petroleum refineries, and pulp and paper mills. Small sources include residential, commercial and industrial space heating.

Health effects caused by exposure to high levels of SO_2 include breathing problems, respiratory illness, changes in the lung's defences, and worsening respiratory and cardiovascular disease. People with asthma or chronic lung or heart disease are the most sensitive to SO_2. It also damages trees and crops. SO_2, along with nitrogen oxides, are the main precursors of acid rain. This contributes to the acidification of lakes and streams, accelerated corrosion of buildings and reduced visibility. It also causes formation of microscopic acid aerosols, which have serious health implications and contributes to climate change.

Figure 1 illustrates an estimate of the historic sulphate deposition for the period 1850 – 1997. Although sulphate levels are being reduced, levels are still elevated above pre-European settlement era.

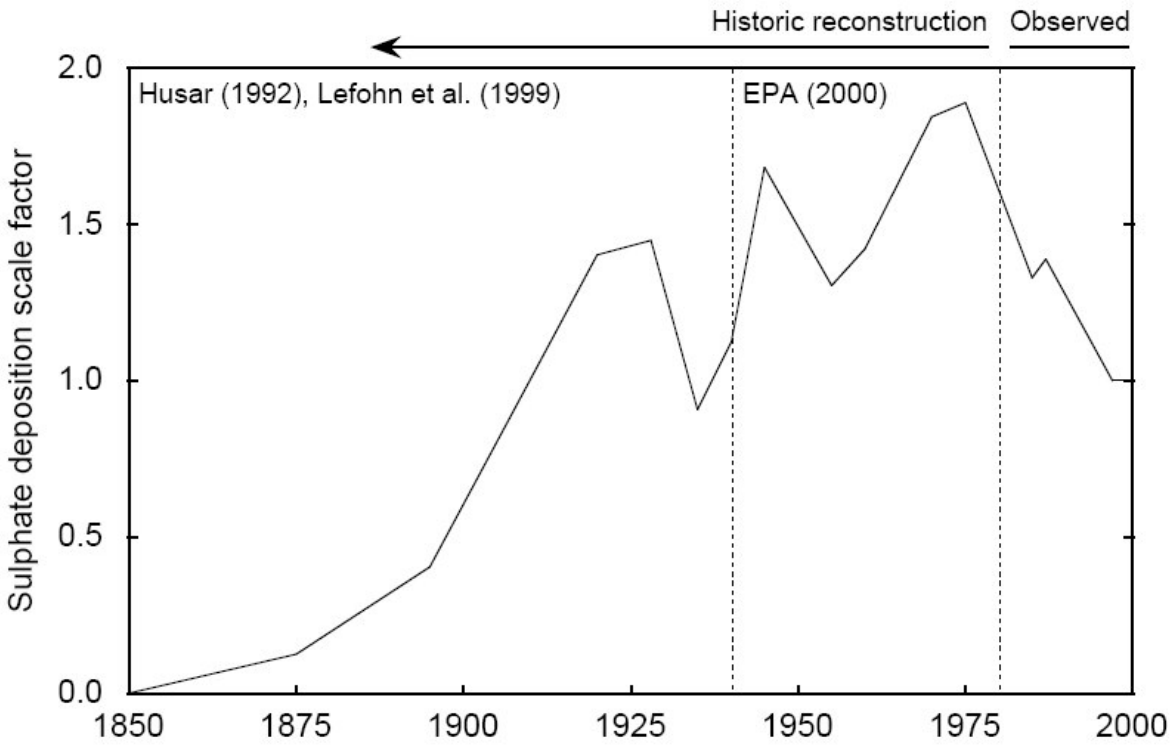


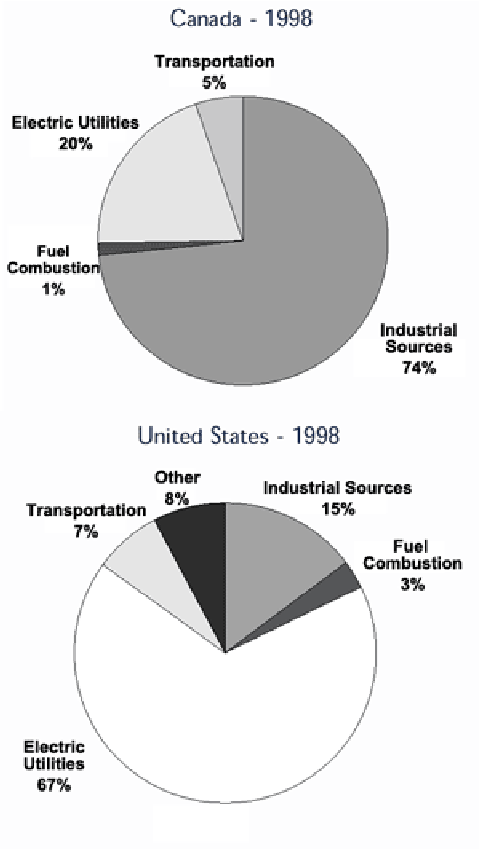
FIGURE 1: Estimate of Historic Sulphate Deposition

What are the stresses?

Sulphur Dioxide: Sulphur dioxide (SO_2) is generally a byproduct of industrial processes and burning of fossil fuels. Ore smelting, coal-fired power generators, and natural gas processing are the main contributors. In 1998, for instance, U.S. SO_2 emissions were measured at 17.7 million tonnes – more than six times greater than Canada's 2.7 million total tonnes. The sources of SO_2 emissions from the two countries are quite different. While 74% of Canada's emissions come directly from industrial sources, 67% of the U.S.'s emissions are from electric utilities.

Canada cannot win the fight against acid rain or other industrial air emissions on its own. Only reducing emissions in both Canada and the U.S. will improve our air quality. More than half of the sulphur deposition in eastern Canada originates from emissions in the United States. Areas such as Muskoka receive about three-quarters of their acid deposition from the United States. In 1995, the estimated trans-boundary flow of sulphur dioxide from the United States to Canada was between 3.5 and 4.2 millions of tonnes per year.

SO_2 Emissions from Canada and the United States in 1998



Nitrogen Oxides: The main source of NO_X emissions is the combustion of fuels in motor vehicles, residential and commercial furnaces, industrial and electrical-utility boilers and engines, and other equipment. In 1998, Canada's largest contributor of NO_X was the transportation sector, which accounted for approximately 53% of all emissions. Overall, NO_X emissions amounted to 2.1 million tonnes in 1998. By comparison, U.S. NO_X emissions for 1998 amounted to 23.7 million tonnes – 11 times more than Canada's.

The influence of trans-boundary flows of air pollutants from the United States into Canada is significant. Overall, about 24% of the regional-scale ozone episodes that are experienced in the United States occur simultaneously in Ontario. An analysis of ozone concentrations at four sites in extreme southwestern Ontario taking wind factors into account provides an estimate that 50 to 60% of the ozone at these locations is of U.S. origin (Multi-stakeholder NO_X/VOC Science Program 1997b).

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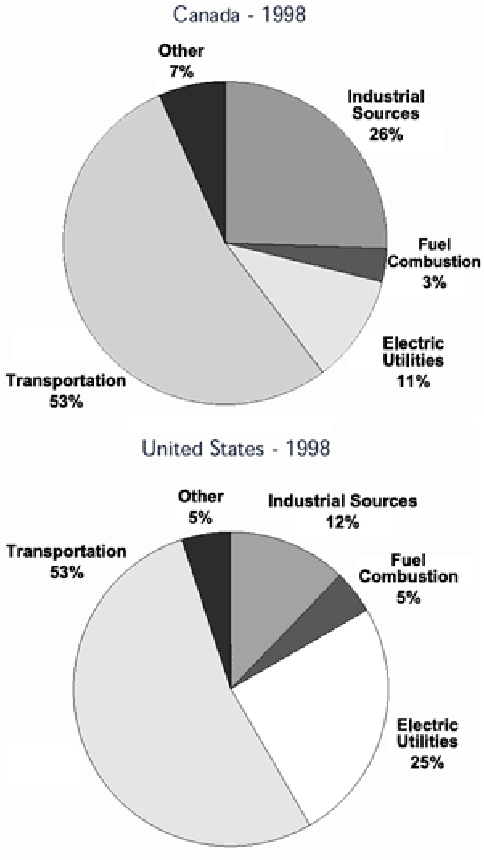

What action can be taken?

Sulphur dioxide, nitrogen oxides and Volatile Organic Compounds are the main pollutants that cause air pollution. These pollutants are emitted largely by the combustion of fossil fuels by industry and power generation. The number one action in reducing emissions that lead to poor air quality is to continue to lobby senior levels of governments to enact more restrictive emission controls for industry and power generation companies and to work with their American counterparts to achieve reduced emissions in the United States.

There are local sources of pollution that can contribute to the severity of smog events. Ontarians can take personal actions – such as driving better-tuned cars or driving less, car-pooling, avoiding the use of gas-powered lawn mowers, or lowering the use of air conditioning during the summertime – to lessen the impact of smog during a smog alert. All of these "spare the air" actions will help, especially for vulnerable persons who suffer from breathing difficulties or other health concerns. The following are some more specific suggestions that you, as an individual, can do:

In the home:

- Reduce your use of electricity by reducing your hot water
    - Run the dishwasher only with a full load.
    - Run the washing machine with a full load.

    - If using an automatic dishwasher, let the dishes air dry.
    - Turn off the hot water tank when going away for extended periods of time.
    - Install additional insulation on the hot water tank and pipes.

- Reduce your use of electricity
    - Hang dry some-or all-of the laundry.
    - Buy energy-efficient appliances.
    - Avoid the use of air conditioners altogether.
    - Turn out the lights in empty rooms and when away from home.
    - Consider installing compact fluorescent bulbs instead of high-wattage incandescent bulbs.

- Reduce your energy consumption in heating your home
    - Insulate and draft-proof your basement.
    - Weather-strip doors and windows.
    - Turn down the heat at night and when away from home.
    - If you have a forced-air furnace, change or clean its filters at least once a year.

In the yard:

- Reduce energy consumption by eliminating high maintenance yards
    - Consider changing to a low-maintenance landscape to reduce lawn mower use.
    - If you have a pool, keep a cover over it when you are not using it to heat by solar.

While shopping:

- Reduce the energy used to produce the products you use
    - Look for products bearing the EcoLogo symbol. They minimize the use of environmentally hazardous substances and maximize energy efficiency and the use of recycled materials.
    - Buy locally produced or grown items from local stores and businesses. They don't require the transportation energy of imported products.

Transportation:

- Reduce transportation emissions
    - Walk, ride your bike or take a bus to work.
    - Share a ride with a friend or co-worker.
    - Have your engine tuned at least once every six months.
    - Check your car tire pressure regularly.
    - Use alternative fuels, such as ethanol, propane or natural gas.
    - Avoid unnecessary idling.
    - In the winter, warm your car's engine with a block heater for two to three hours prior to driving, rather than plugging in the battery overnight.
    - Reduce the number of trips you make in your car.
    - Drive at moderate speeds.
    - Take the train or bus on long trips.

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