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*An Introduction to*  
**Air Quality in  
New Brunswick**

New  Nouveau  
**Brunswick**  
Environment and  
Local Government





# An Introduction to Air Quality in New Brunswick

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## Introduction

New Brunswickers enjoy relatively clean and healthy air, compared to many other parts of the world. But rapid changes in human activities over the past century have taken their toll, in New Brunswick and around the world. Clean air is not something we can ever take for granted.

We know from research that air pollution can have an effect both on the health of our environment and on human health. In New Brunswick, the Department of the Environment and Local Government works to protect and enhance the quality of air in the outdoor environment. Indoor air quality is the responsibility of the Department of Health and Wellness, except for places of business, where it is the responsibility of the Workplace Health, Safety and Compensation Commission (employees of the federal government working in New Brunswick are covered by federal legislation). Because air travels indoors and out, from province to province, and across international borders, air pollution management can be a very complicated, multi-jurisdictional challenge.

The better we understand the issues, the more we can do to ensure good air quality for the future. As a starting point, this booklet provides an introduction to the things affecting air quality, with special emphasis on New Brunswick's experience, and suggests sources for more information on topics that may be of particular interest to you.

Here, we look at the air pollution that affects our province, and discuss the factors that can influence the quality of our air. We discuss some of the more common pollutants: what they are, where they come from, and how they can affect our environment and our health. We also explain the existing programs and legislation that help us protect air quality, keep track of how we're doing, and take appropriate action when pollution becomes a problem. Finally, we suggest some positive ways in which individual New Brunswickers can take action for cleaner air.



# The Air We Breathe

The composition of air changes almost constantly from season to season, and is strongly affected by the weather. It changes, too, because of local, regional and international factors, as well as natural events and human activities.

“Pure” air contains about 79% nitrogen, 20.9% oxygen, 0.04% carbon dioxide, with argon and trace amounts of other gases and components, some of them having an impact on the environment and human health. “Air pollution” is the general term to describe excessive amounts of unwanted, potentially harmful elements in our atmosphere.

Air pollution can cause a wide range of health effects, particularly for children, the elderly, and people with respiratory or heart problems. It can also reduce visibility, cause damage to materials, decrease crop production, harm forests, fish and wildlife, and alter the quality of our lakes, streams, and drinking water. Some air contaminants can affect buildings and other man-made structures. Air pollutants may also cause nuisance issues that affect our comfort and well-being, such as excessive dust and odours.

## What Affects Air Quality?

Air pollution comes in many different forms, and from many different sources. Nature has a hand in it: carbon dioxide, ash and smoke from forest fires, windblown dust and pollen, electrical storms, salt spray from the ocean, and even the eruption of a far-off volcano can affect the quality of air in New Brunswick.

Many pollutants are present naturally in the environment. Human activities can also increase the concentration of pollutants in the atmosphere. For example, by spreading sand on winter roads or crushing rock in a gravel pit, we increase the amount of dust in the air.

Not surprisingly, the “man-made” sources of air pollution tend to concern us more on a day-to-day basis than natural sources. For example, when humans burn tires or garbage, or use a woodstove improperly, a whole range of harmful gases are released into the atmosphere. The largest sources of man-made air pollution are the burning of fossil fuels: for transportation, to heat our buildings, to make electricity, and to operate industries.



## Long-Range Transport

Borders mean nothing when it comes to air pollution. In fact, much of New Brunswick's air pollution is transboundary in origin, coming from sources beyond our provincial borders. That's why the federal government has a significant role to play in monitoring long-range pollutants, and in establishing agreements with other jurisdictions.

Air masses can cross the heavily populated and industrialized areas of central Canada and the United States before they reach us, picking up pollutants on the way. (Think of the hazy yellow skies we sometimes experience when large forest fires burn in Ontario and Québec.)

As a rule, southern New Brunswick gets more pollution from **long-range transport** than the northern parts of the province, which tend to be influenced by cleaner air masses.

### The Jet Stream

*The Jet Stream is a zone of strong upper-level winds that carries major weather systems around the world in the general direction of west to east. The jet stream can have an effect on surface air flow and, as a result, on the distribution and removal of pollutants from the atmosphere.*

What distance air pollutants will travel depends on what they are, on where and how they are **emitted**, and on atmospheric conditions. Pollutants that stay in the lower levels of the atmosphere are

often **deposited** near their source, while others are **transported** many

hundreds of kilometres before their effects are noticed. In New Brunswick, the long-range transport effect is significant for ground-level ozone (see p.15), acid deposition (see p. 9), and fine particulates (see pg. 12).

## Local Effects

Local geographic and weather conditions have a strong influence on air quality. The funnel shape of the Bay of Fundy, for example, can channel polluted air from the southwest into the southeastern part of the province, and those cold Atlantic waters help to cool air close to the surface, which can prevent pollution from rising and mixing.

Pollutants tend to gather in low-lying areas or valleys, and New Brunswick's rolling terrain has lots of "pockets" where temperature inversions are more frequent and winds are light. Inversions occur when temperature increases with height instead of decreases, creating an invisible barrier that prevents pollutants from scattering as they would normally.

Other local New Brunswick effects include fog and wind patterns around the Bay of Fundy. When fog blankets

### Where Does Our Air Pollution Originate?

*Studies suggest that a large portion of New Brunswick's air pollution comes from sources outside the province. Some pollutants, such as ground-level ozone, are significantly transboundary in origin. Also, some areas of the province may be more affected by transboundary air pollution than others. This doesn't let us off the hook from addressing the remaining "home-grown" sources, but it's important to know when looking at the big picture.*



our communities, it reduces visibility and its moisture may react with pollutants, aggravating their effects on humans and the environment.

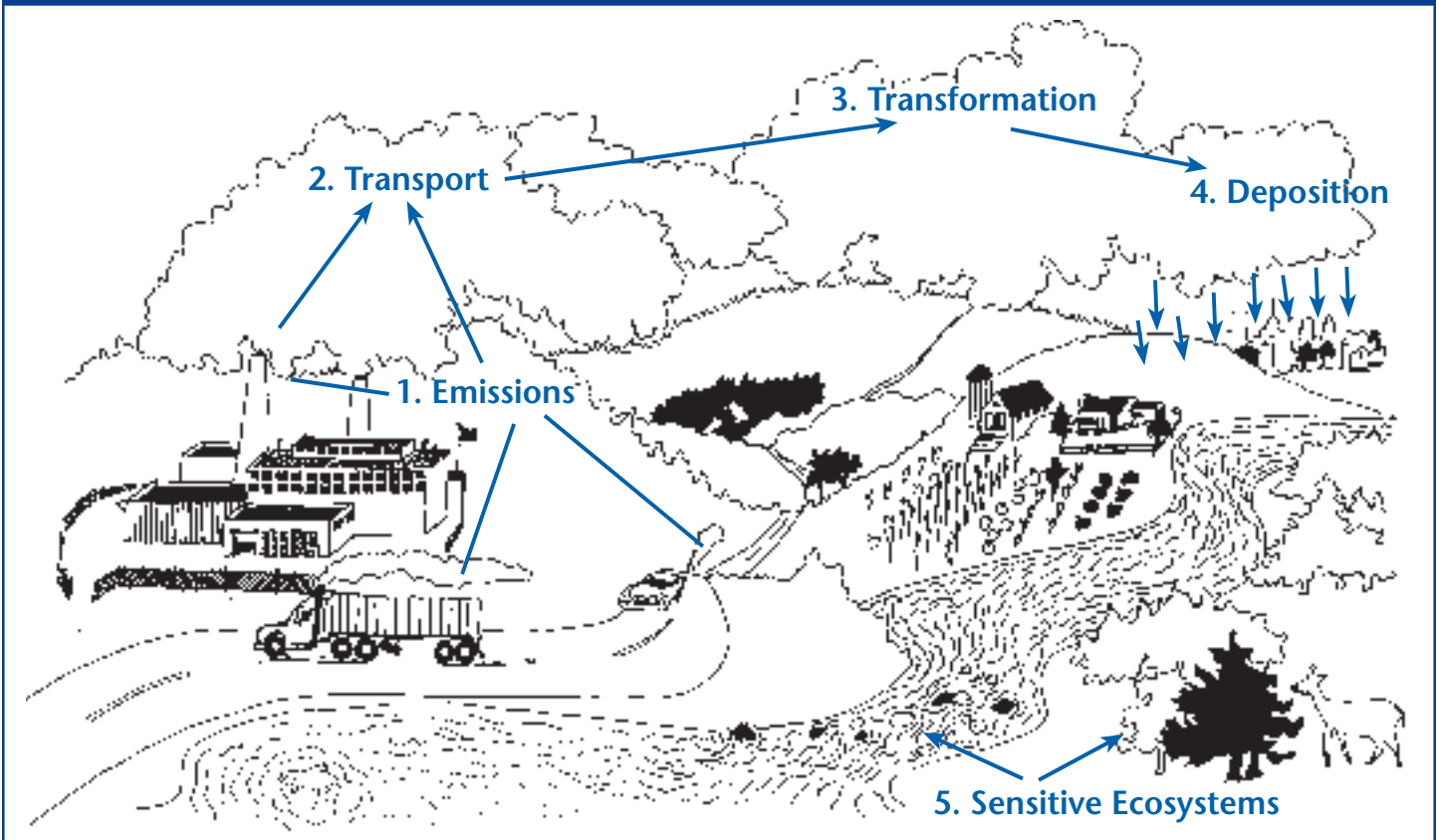
A fresh breeze may appear to “clear the air,” but it isn’t always as good as it may seem. Coastal breezes can re-circulate the same air mass, sometimes more than once. Polluted air may travel offshore and return inland over populated areas, possibly more than once, leading to episodes of reduced air quality. Wind can also stir up dust, and spread the spores and pollen released by plants, adding to the discomfort of allergy sufferers.

**Monitoring Air Quality**

When people refer to “fresh” air, we usually mean that the atmosphere around us has no smoke or pollutants that we can see, and no unpleasant taste or smell. But subjective measurements based on look, taste or smell can be misleading. The only way to know for certain what’s in the air — and what it implies for our environment and our health — is to monitor and analyze it.

That’s why the Department of the Environment and Local Government monitors a variety of pollutants at strategic locations and industrial sites throughout New Brunswick.

**An Example of the Long Range Transport Effect**





Monitoring is carried out continuously, and industries are required to take steps to cut their emissions when levels begin to approach provincial limits, known as standards and/or national guidelines.

For more information on air quality monitoring programs, call our Sciences and Reporting Branch at (506) 457-4844, or pick up a copy of our publication, "Air Quality Monitoring in New Brunswick," which is also available on the web at <http://www.gnb.ca/elg-egl/0009/0003-e.html>.

### **Pollen is the Culprit**

*That yellow "dust" you may see outside on some spring or summer mornings is probably pollen. It can sometimes be seen on the ground, on vehicles parked outside overnight, and even on the surface of lakes. The pollen is released in large amounts by coniferous trees such as spruce, fir, pine and cedar.*

### **The IQUA Program**

New Brunswick's IQUA (Index of the Quality of the Air) Program reports to the public on current air quality conditions. It uses an easy-to-understand scale that ranks air quality as *Good*, *Fair*, *Poor* or (very rarely) *Very Poor*, based on monitoring data from sites around the province.

### **Pollutant Concentrations**

*Concentrations of air pollutants are measured in tiny amounts. For example, ppm means "parts per million," and ppb means "parts per billion." One ppb is just another way of saying there is **one part** contaminant to every **billion parts** of air. Think of one drop of water in an inground swimming pool or, in terms of time, one second in 32 years.*

To make IQUA information available to as many people as possible, the New Brunswick Department of the Environment and Local Government provides recorded messages as part of Environment Canada's telephone weather forecast system. Messages are updated frequently. IQUA reports are available by telephoning the following numbers:

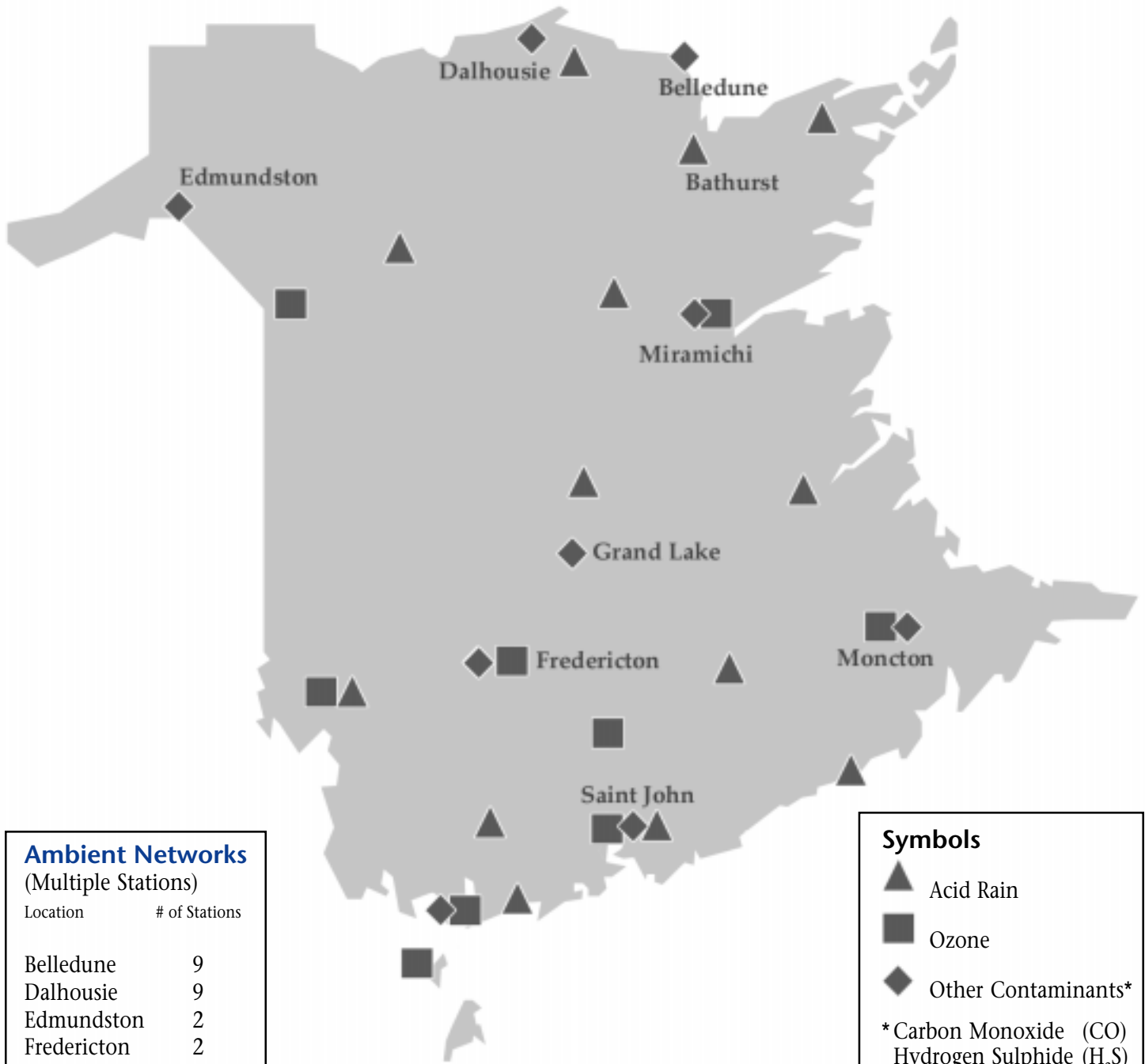
Fredericton: 506-451-6001  
 Moncton: 506-851-6610  
 Saint John: 506-636-4991  
 Bathurst: 506-548-3220  
 Miramichi: 506-773-7045  
 Acadian Peninsula: 506-726-5288  
 Edmundston: 506-739-1814

You can also access IQUA reports on the Internet via our website at [www.gnb.ca/elg-egl/0009/0003-e.html](http://www.gnb.ca/elg-egl/0009/0003-e.html).

For more detailed information about IQUA, ask for a copy of our publication, "Air Quality Monitoring in New Brunswick".



## Ambient\* Air Quality Monitoring Stations in New Brunswick



**Ambient Networks**  
(Multiple Stations)

Location	# of Stations
Belledune	9
Dalhousie	9
Edmundston	2
Fredericton	2
Grand Lake	4
Miramichi	5
Saint John	13

**Symbols**

- ▲ Acid Rain
- Ozone
- ◆ Other Contaminants\*

\* Carbon Monoxide (CO)  
 Hydrogen Sulphide (H<sub>2</sub>S)  
 Nitrogen Dioxide (NO<sub>2</sub>)  
 Sulphur Dioxide (SO<sub>2</sub>)  
 Particulate Matter (PM)

\*Ambient - Refers to the surrounding air, generally outside and surrounding a source location.





## What's in the Air

Air is made up of many different substances. Most of them are harmless or, like oxygen, even essential to sustain human life. A number of substances, however, can alter air quality when they occur in high enough concentrations. Some of these combine with water vapour to make acid rain, for example, while others may lead to changes in the global climate. Many are known to pose a threat to the environment and to human health.

Let's take a look at some of the more common air pollutants — what they are, where they come from, and the implications for the natural environment and our health.

### Some Common Air Pollutants

- Sulphur Dioxide (SO<sub>2</sub>)
- Acid Deposition
- Particulate Matter
- Hydrogen Sulphide (H<sub>2</sub>S)
- Nitrogen Oxides (NO<sub>x</sub>)
- Volatile Organic Compounds (VOCs)
- Ground-Level Ozone (O<sub>3</sub>)
- Carbon Monoxide (CO)
- Carbon Dioxide (CO<sub>2</sub>)

### Sulphur Dioxide (SO<sub>2</sub>)

#### *What is it?*

Sulphur dioxide (SO<sub>2</sub>) is a colourless gas. It has a sharp odour, like that of a struck match. At higher concentrations, many people can notice an acid taste in the air.

#### *Where does it come from?*

Sulphur dioxide is a by-product of the burning of sulphur-bearing fuels such as oil and coal. Major sources are fossil-fuel-powered generating stations, oil refineries, pulp mills, smelters, and industrial heating systems.

#### *What does it do?*

High concentrations of SO<sub>2</sub> can damage trees and agricultural crops, and corrode metals. People with respiratory conditions or chronic lung and heart diseases are the most sensitive to SO<sub>2</sub> and may experience problems. Even those without these conditions may find it irritating to the eyes and throat.

SO<sub>2</sub> combines with water vapour in the clouds to form an acid, just as nitrogen oxides (NO<sub>x</sub>) do, and contributes significantly to acid deposition. We continue to monitor and control significant sources of SO<sub>2</sub> in New Brunswick.



## Acid Deposition

### *What is it?*

Acid deposition, also referred to as acid rain, is a generic term used to describe a process in which certain pollutants combine with moisture in the air. When this happens, it can create a very dilute acid, which in turn produces acid rain, snow, fog and dust particles.

### *Where does it come from?*

Oxides of sulphur like SO<sub>2</sub> and nitrogen oxides (NO<sub>x</sub>), both of which may convert in the atmosphere to sulphuric acid and nitric acid, are the main causes of acid deposition.

Other pollutants may also add to the problem.

While some New Brunswick sources, such as fossil-fuelled power generation facilities, contribute to the problem, more than half of the acid deposition we receive in our region is transported from sources in central Canada and the eastern United States.

### *What does it do?*

Acid deposition damages the foliage of trees and plants, and can reduce the yields of food crops. It makes the waters of our lakes and streams more acidic, can alter the ecosystems which support fish, forests and wildlife, and can change the quality of our drinking water.



*A typical acid rain monitor*

Acidified water tends to absorb metals such as arsenic, which occurs naturally in the soil, and mercury, which may be present in the soil and in the air. Fine acid particles may have harmful effects on humans.

The southwestern corner of New Brunswick is the most strongly affected, as it tends to lie in the direct path of major weather systems and has extremely acid-sensitive soils and watersheds. In addition, the natural buffering capacity of bedrock geology and surface water in more northern parts of the province are better able to combat the effects of acid deposition.



### **What Are We Doing About Acid Deposition?**

New Brunswick's province-wide acid deposition monitoring program includes a combination of sites that measure the impact in different areas of the province and the influence of provincial and transboundary sources of emissions. Testing acidity levels of rain, snow and surface water, and the chemical makeup of airborne particulate, are among the methods used to study this problem. Analysis of weather patterns is also essential.

The Eastern Canada Acid Rain Program has led to a 50 % reduction in sulphur dioxide emissions from local sources since 1980. The 1991 Canada/United States Air Quality Agreement, and the 1998 Acid Rain Action Plan of the Conference of New England Governors/Eastern Canadian Premiers, are examples of cooperative efforts to address transboundary sources. The Acid Rain Action Plan aims to reduce acid rain-causing emissions and to coordinate a cross-border research and monitoring program.

While much progress has been made on the acid deposition front in the past, it still remains an issue needing our attention.

For more information on acid deposition, write to: Inquiry Centre, Environment Canada  
351 St. Joseph Boulevard, Hull, Québec K1A 0H3;  
visit Environment Canada's acid rain site on the Internet at [www.ec.gc.ca/acidrain/index.html](http://www.ec.gc.ca/acidrain/index.html); or call the New Brunswick Department of the Environment and Local Government's Sciences and Reporting Branch at (506) 457-4844.

### **Hydrogen Sulphide (H<sub>2</sub>S)**

#### *What is it?*

Hydrogen sulphide (H<sub>2</sub>S) is a colourless gas that is heavier than air. One of the Total Reduced Sulphur (TRS) gases (see p. 11), it has the characteristic smell of rotten eggs.

#### *Where does it come from?*

In nature, hydrogen sulphide occurs beneath the earth's surface as an impurity in natural gas, and may also be formed during natural decomposition, such as in marshes and swamps. Industrial sources of H<sub>2</sub>S include kraft pulp mills, oil refineries, wastewater treatment facilities, livestock feedlots and fish processing plants.

#### *What does it do?*

Even at very low concentrations (less than one ppb), we're certainly aware of the presence of H<sub>2</sub>S due to its unmistakable smell. At higher concentrations it can be irritating to the eyes and mucous membranes, aggravate respiratory conditions and cause nausea, fatigue and headaches. The severity of its health effects will increase with higher concentrations and longer exposure times.

H<sub>2</sub>S is very corrosive to certain metals and dissolves in water to form an acid. It converts to sulphur dioxide (SO<sub>2</sub>) when it is burned, which contributes to acid rain.

Concentrations of H<sub>2</sub>S are monitored at several locations in New Brunswick.



## Particulate Matter

### *What is it?*

Particulate matter are airborne, invisible specks of solid or liquid matter, including dust, ash, soot,

smoke, or tiny particles of pollutants. Most are smaller than grains of pollen — small enough to be transported long distances through the air. Particulate matter can be a significant form of air pollution.

### **What is TRS? The Nose Knows!**

If you notice a distinctive “rotten egg” smell in the air outside, you are detecting the presence of a group of gases known as Total Reduced Sulphur (TRS). These sulphur-containing gases are a by-product of the kraft pulping process, which uses heat and chemicals to break down wood chips into fibres for making paper.

Reduced sulphur compounds have a low “odour threshold,” which means we can easily smell them at levels as low as one part per billion. At such low concentrations, TRS gases are well below recommended guidelines and generally more of a nuisance than a health concern.

Less TRS gas is produced in the newer kraft paper production processes, and the odours created are controlled more effectively than they once were. As well, TRS can sometimes be captured for use within the mill itself, to power furnaces or incinerators. Concentrations of TRS are monitored continuously at several locations in New Brunswick.

### *Where does it come from?*

Particulate is created by combustion processes such as woodstoves, by burning coal or refuse, and by forest fires. Industrial fuel use, construction activity, motor vehicles, road dust and agricultural operations also contribute. Natural sources include windblown pollen, dust, fine sand, ocean salt spray, and volcanoes. Other particles form in the air when gases such as sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) react together. These particles are partly responsible for the yellowish “smog” sometimes seen over large cities.

### *What does it do?*

Very small or “fine” particles, which are invisible, can enter the lungs and slow the intake of oxygen, which can put stress on the respiratory system. People with respiratory problems are most vulnerable to the effects of high concentrations.

The effects of particulate matter are often visible, especially over long periods and with large amounts of exposure. For example, soot-blackened buildings can sometimes be seen in older industrial areas.

Particulates can reduce visibility by causing haze or smog. Depending on their composition, particles may also damage vegetation and corrode metalwork and other materials.



### **Total Suspended Particulate (TSP)**

Total suspended particulate (TSP) has been a standard pollution measurement for many years. It includes natural particles, such as pollen and spores, as well as particles from vehicles or smokestacks. Particles of all sizes are included. TSP levels may be higher in rural areas during the spring “allergy season” when many plants and grasses release their pollen; in urban areas, TSP may reflect traffic volume, construction, or other dust-generating activities.

### **Fine Particulate**

Health studies over the past decade have drawn our attention to particulate air pollution, and especially to those particles small enough to be taken into the lungs when we breathe.

Fine inhalable particulates are closely linked to human respiratory and cardiovascular problems, but more research is required to determine exactly how they cause these health effects. Most jurisdictions in North America are working towards new or revised air quality standards for inhalable particulate. In Canada, a sub-group of the Canadian Council of Ministers of the Environment is also addressing the issue.

#### **PM 10**

PM10 describes particles that are 10 microns or less in diameter. A micron is only one-millionth of a metre, so a PM10 particle is invisible to the naked eye, larger than a smoke particle but smaller than the dust raised by driving on an unpaved road.

PM10 can be made up of pollen, spores, and dust from roads, quarries and tire wear, with smaller contributions from sea salt, diesel exhaust, and NO<sub>x</sub> and SO<sub>2</sub> emissions.

#### **PM2.5**

Some studies suggest that even smaller particles — those of 2.5 microns in diameter and less — warrant closer attention. PM2.5, generally referred to as inhalable particulate, is the particle size most known for reducing visibility, and includes smoke particles. Chemically, PM 2.5 is usually much higher in sulphates, nitrates, carbon and heavy metals than PM10.

The most common source of PM2.5 is fossil fuel combustion, including vehicle exhaust and industrial emissions, with very minor contributions coming from road or quarry dust and sea salt.



## **Acid Aerosols**

Acid aerosols are fine particles containing high levels of sulphur-related compounds, normally created as a result of human activity. As air masses move across the heavily industrialized parts of the continent, they may pick up acid aerosols and carry them into the southern Maritimes. Like other transboundary pollution, acid aerosol episodes are influenced by weather conditions and the amount of emissions upwind, as well as by local emissions.

The New Brunswick Department of the Environment and Local Government cooperated with federal scientists from 1992 to 1994 in a detailed study known as the Canadian Acid Aerosol Measurement Program (CAAMP). Monitoring took place at both urban and rural sites in the Saint John area, and, for comparison, at locations across eastern Canada. The findings of CAAMP will increase our understanding of the effect of fine particles in the air.

## **Nitrogen Oxides (NO<sub>x</sub>)**

*What are they?*

Nitrogen oxides are a group of gases produced when nitrogen and oxygen combine, typically when fuels are burned at high temperatures and pressures. Nitrogen oxides — which include nitrogen dioxide (NO<sub>2</sub>), nitric oxide (NO), nitrous oxide (N<sub>2</sub>O), and other nitrogen-oxygen compounds — are collectively referred to as NO<sub>x</sub>.

*Where do they come from?*

A major source of NO<sub>x</sub> in New Brunswick is the combustion of fossil fuels by motor vehicles and power generating stations. Other sources include kraft and paper mills, wood burning, waste incineration, oil refining and gas production, and any combustion process.

*What do they do?*

NO<sub>x</sub> can irritate the lungs and lower our resistance to respiratory infections. It can damage vegetation, including food crops. NO<sub>x</sub> can also damage a wide range of materials; for example, it corrodes metals, causes fading of fabrics, and degrades rubber.

NO<sub>x</sub> is a major factor in the formation of acid deposition (or acid rain). Also, when combined with Volatile Organic Compounds (VOCs) in sunlight, NO<sub>x</sub> contributes to the formation of ground-level ozone and smog (see ground-level ozone, p. 14 and 15).

In general, New Brunswick's emissions of NO<sub>x</sub> are ranked as moderate to low. Air masses that travel through central Canada and the northeastern United States before reaching New Brunswick can also bring NO<sub>x</sub> with them.

## **Volatile Organic Compounds (VOCs)**

*What are they?*

VOCs are a group of carbon-containing substances. Some of these compounds take the form of gases; those that are liquids — such as gasoline — will readily evaporate, hence the term “volatile.”



Thousands of different VOCs exist in the air, many of which occur naturally. Only some VOCs have an important impact on air quality, because they are toxic, because they are concentrated, or because they can react in the air to form other substances.

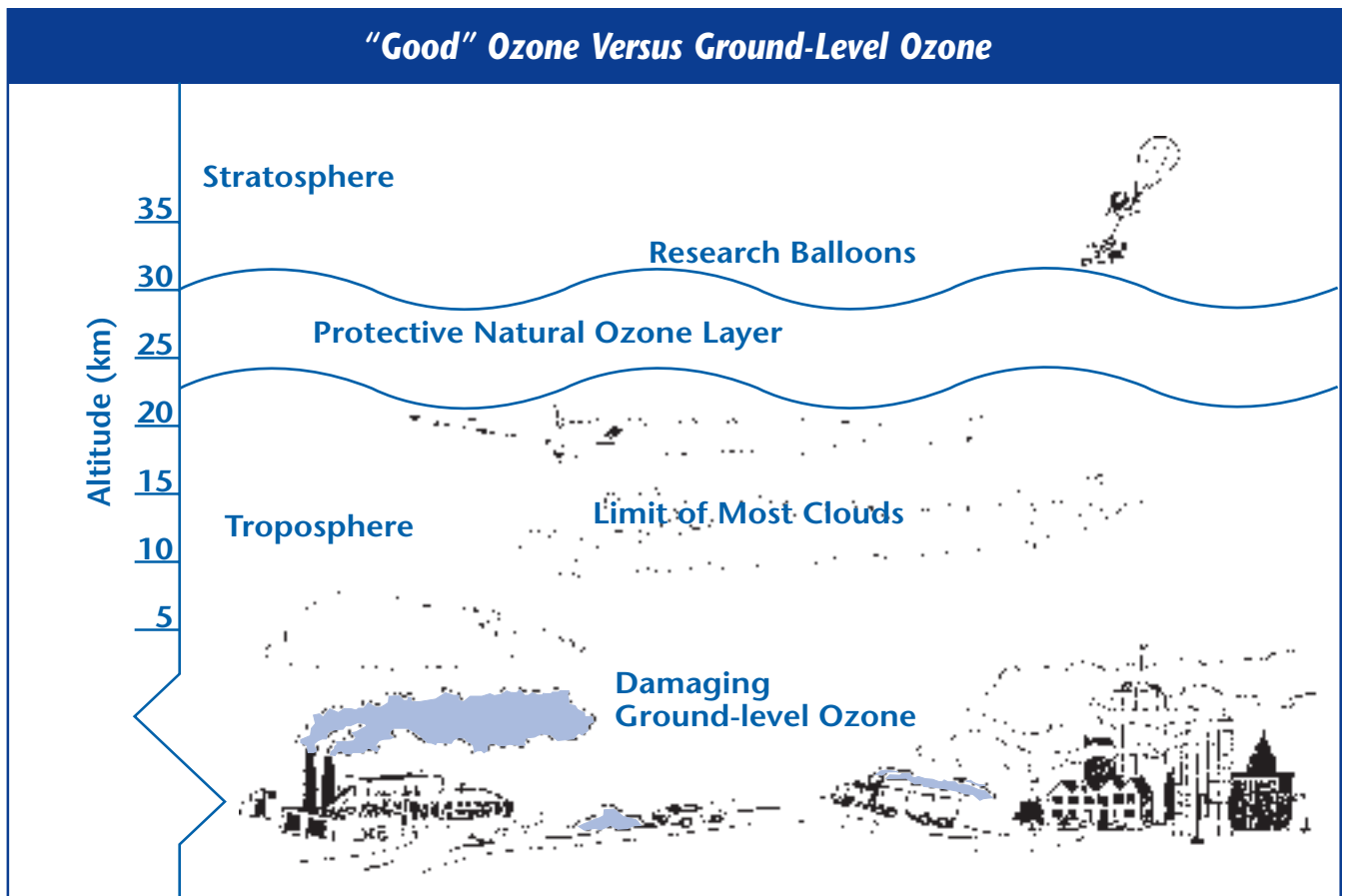
*Where do they come from?*

The production and burning of fossil fuels is a major source. Man-made VOCs come from a variety of industrial processes, and from the evaporation of liquid solvents and fuels such as gasoline, paint thinner, rubbing alcohol, and barbecue starter or lighter fluid. Oil-based paint also emits VOCs.

*What do they do?*

Volatile Organic Compounds, reacting with other substances such as NO<sub>x</sub> in the presence of heat and strong sunshine, contribute to the formation of ground-level ozone and smog. Some VOCs are also toxic in their own right, such as benzene.

New Brunswick is represented on the Canadian Council of Ministers of the Environment (CCME). A key CCME initiative is the NO<sub>x</sub>/VOC Management Plan aimed at resolving ground-level ozone problems in Canada. Work on Canada-Wide Standards for ozone will also support this.





## Ground-Level Ozone (O<sub>3</sub>)

### *What is it?*

Ozone is an invisible and odourless gas. It is often found at relatively high concentrations during hot, hazy summer weather. In such conditions, ground-level ozone may build up day by day into a white or yellowish haze called smog. Fine particles in the air give smog its colour.

### *Where does it come from?*

Unlike most other air pollutants, ozone is not directly emitted but is formed as a result of a chemical reaction. It forms when VOCs and NO<sub>x</sub> in the atmosphere react in the presence of strong sunlight. Electrical storms also produce some ozone.

Most of our ozone pollution is carried here by air masses originating in heavily populated regions in the northeastern United States and central Canada. Although the number of smog episodes varies with seasonal weather conditions, New Brunswick's "smog season" usually runs from May to October. The southern parts of the province are most strongly affected.

### *What does it do?*

Ground-level ozone can irritate the lungs and make breathing difficult. Ground-level ozone can also cause damage to sensitive crops such as potatoes and tomatoes, cause damage to forests and other vegetation, weaken rubber tires, and attack metals and painted surfaces.

For more information about ground-level ozone, VOCs, NO<sub>x</sub> and smog, see the New Brunswick Department of the Environment and Local Government publication, "Information About Smog in New Brunswick," available on the Internet at <http://www.gnb.ca/elg-egl/0009/0003-e.html>, or by calling (506) 453-3700 or any of our regional offices. Environment Canada's "Green Lane" at <http://www.ec.gc.ca> also has information about smog.

## Smog Advisories

From May to October, the New Brunswick Departments of the Environment and Local Government, and Health and Wellness, along with Environment Canada, provide daily smog forecasts and issue Smog Advisories when air quality is expected to be poor due to high concentrations of ground-level ozone. The advisories enable individuals to make informed decisions about their health and activities.

Smog Advisories provide information about the effects of ground-level ozone on the environment and human health, and suggest measures everyone can take to improve the situation.

Smog Advisories are heard during regular radio weather broadcasts, or may be accessed through Environment Canada's recorded weather information telephone lines:

Fredericton: 506-451-6001

Moncton: 506-851-6610

Saint John: 506-636-4991

Bathurst: 506-548-3220

Miramichi: 506-773-7045

Acadian Peninsula: 506-726-5288

Edmundston: 506-739-1814

Information on the New Brunswick Smog Forecast is also available on the Internet at <http://www.atl.ec.gc.ca/weather/ozone.html>.





## Good and Bad Ozone

High in the stratosphere, far above the earth's surface, the natural ozone layer protects us from harmful ultraviolet rays. Studies have revealed that the release of certain Ozone Depleting Substances (ODS) has caused the ozone layer to thin, and steps have been taken to restrict the release of these substances to protect the ozone layer. Unlike the natural ozone layer, however, groundlevel ozone is the result of a chemical reaction that takes place in the lower atmosphere — just above the earth's surface — and is harmful to human health.

### *Why is ozone depletion a problem?*

As our natural ozone “sunscreen” is depleted, more harmful radiation can reach the earth, leading to various health impacts. Many trees and plants are affected too, including those important to our food supply. Even plants in the ocean are thought to be harmed, possibly threatening marine ecosystems as well as food fisheries.

### *What are we doing about it?*

On the international scene, the Montreal Protocol (1987) was a landmark agreement to reduce and ultimately eliminate ODS. It marked the beginning of serious attention on the part of governments to the issue.

In New Brunswick, we have followed through with the Ozone Depleting Substances Regulation under the *Clean Air Act*. The Regulation prohibits the release of ODS into the air, bans non-essential uses of these substances, and requires that labels be attached to products containing ODS. As well, people who work with ODS must be trained and provincially certified to handle them.

For more information, see the New Brunswick Department of the Environment and Local Government publication, “Understanding the Law: An Overview of New Brunswick's Ozone Depleting Substances Regulation.”

## Carbon Monoxide (CO)

### *What is it?*

Carbon monoxide (CO) is a colourless, odourless and tasteless gas.

### *Where does it come from?*

CO is produced by the incomplete burning of carbon-containing materials such as coal, oil, gasoline, wood, or natural gas. Forest fires, industrial activity, and home heating systems also contribute significantly.



Motor vehicles are also a major source of carbon monoxide. High levels of CO are found on city streets with heavy traffic and in confined spaces like parking garages.

*What does it do?*

CO primarily affects the body's cardiovascular and nervous systems. Symptoms may include dizziness, headaches, and fatigue. Very high exposure to CO has been linked with impairment of vision, work capacity, learning ability, manual dexterity and performance of complex tasks.

CO interferes with the blood's ability to carry oxygen to vital organs and tissues. As a result, carbon monoxide can affect any living thing that needs oxygen to survive. Vulnerable birds and other wildlife can become ill or die from CO exposure at levels that may be safe for humans. However, even relatively low concentrations of CO may affect children and other susceptible individuals, such as people with heart disease. Most healthy adults will be affected only at higher concentrations.

New Brunswick's few cities and small population mean that CO is not normally a problem in our outdoor environment. Monitored levels seldom approach any of the existing air quality standards.

### ***A Note About Mercury***

Mercury is a substance that has always been present in New Brunswick's bedrock and soil. Because mercury occurs naturally in the environment, everyone is exposed to very low levels. Natural concentrations are increased, however, when mercury-containing emissions are released to the air by some activities, such as the burning of fossil fuels, mining and smelting, and waste incineration, and then fall to earth. Mercury-containing emissions can come from local sources and from sources in the other provinces and the United States, through long-range transport (see p. 4). When mercury undergoes a natural chemical process which converts it to a more harmful form, called methylmercury, it becomes capable of being absorbed by living organisms. It accumulates over time in living things and can become a hazard to humans and wildlife. We continue to work on an Action Plan through the Conference of New England Governors/Eastern Canadian Premiers to monitor and assess the mercury situation in New Brunswick, and we are active participants in the development of Canada-Wide Standards for mercury. Additional information is available by contacting the Department of the Environment and Local Government.



## Carbon Dioxide (CO<sub>2</sub>)

### *What is it?*

Carbon dioxide (CO<sub>2</sub>) is a colourless, odourless gas that occurs both naturally and from human activities. CO<sub>2</sub> is sometimes used to fight fires because it is heavier than air and will displace or push away the oxygen that feeds the flames.

### *Where does it come from?*

Carbon dioxide is produced when we burn fossil fuels in our vehicles, power plants, factories and heating systems — including gas, kerosene, woodburning stoves, and heaters. CO<sub>2</sub> is also produced naturally when living things breathe and by the decay of organic matter.

Forest fires are a major natural source of CO<sub>2</sub> — and have a double impact. In nature, trees and plants take in carbon dioxide and produce oxygen. When we lose trees to fire or to deforestation through human activity, the balance between CO<sub>2</sub> uptake and release is altered.

### *What does it do?*

It is considered to be the most significant of the greenhouse gases which many scientists believe are linked to global warming (see p. 19). Not much is known about how the carbon cycle works, including how CO<sub>2</sub> moves, and how much is in any one ecosystem. It is for this reason that CO<sub>2</sub> is generally not regarded as a “traditional” pollutant. It is, however, being monitored globally so that scientists can learn more about its movements and trends.



### **Warm Engines Mean Less Pollution**

Better emission controls on automobiles, such as catalytic converters, have reduced CO levels steadily during the past two decades. Converters don't work until a critical temperature is reached, however, so try to minimize the number of short trips you take in your car, or combine several errands into one trip. If you plug your car engine in during the winter, you will enable it to run cleaner more quickly. Plug the engine in for an hour before you need to use the car, or put it on a timer. You will use less electricity this way.



## Global Warming

The terms “global warming,” “greenhouse effect” and “greenhouse gases” all describe natural and normal processes and substances.

- Global warming and global cooling refer to the natural warming and cooling trends that the Earth has experienced throughout its history. The factors that affect the extent and duration of these trends may be influenced by pollutants. “Global warming,” however, has become popularized in the media to describe the negative effect of human influence on our climate.
- The term “greenhouse effect” describes the role the atmosphere plays in trapping the sun’s heat near the Earth’s surface and in keeping our planet warm and habitable. Most of the “greenhouse gases,” which include water vapour, carbon dioxide, methane, nitrous oxide, ozone and halocarbons, occur naturally in the atmosphere in relatively small amounts. Their heat-trapping ability helps the Earth’s surface to remain at a temperature that is suitable for life. A problem occurs when natural concentrations of greenhouse gases are increased by humans burning fossil fuels and clearing forests, which intensifies the greenhouse effect. This is known as the enhanced greenhouse effect and is expected to increase temperatures globally by about 0.1 degree Celsius per decade.

### *Why is it a problem?*

An average change of a few degrees Celsius over a century may not sound like much, but it can make a big difference.

Global warming, as it has come to be known, has the potential for serious effects on the environment. Weather patterns could change, warmer temperatures could cause flooding in coastal areas and droughts further inland, and storms could become more frequent and more severe. Years ago, global warming was not a common area of scientific study. Today, much effort is focussed on learning more about this phenomenon.

### *What are we doing about it?*

Many industrialized nations are limiting greenhouse gas emissions. Canada has signed on to a number of important international agreements, including the 1992 United Nations Framework Convention on Climate Change. This agreement has resulted in international efforts to restrict greenhouse gases in the atmosphere to levels that will stabilize global climate change.

Canada has also signed the 1997 Kyoto Protocol, which will become international law if enough countries ratify it over the coming years. Canada’s commitment to the Kyoto Protocol is to reduce greenhouse gas emissions to six percent below 1990 levels by the period 2008 to 2012.

For more information on Canada’s national and international action on global warming, contact the Climate Change Secretariat, 55 Murray Street, Suite 600, Ottawa, Ontario K1N 5M3; visit the Secretariat’s national climate change website at <http://www.climatechange.gc.ca> or visit Environment Canada’s Green Lane at <http://www.ec.gc.ca>.



## Working Together

Protecting our air quality is quite a challenge. The good news is that there are things we can do as a society and as individuals that will improve air quality.

### What Improves Air Quality?

#### Legislation

It is legislation which gives the New Brunswick Department of the Environment and Local Government the mandate and legal authority to protect the environment. The *Clean Air Act* provides the principal framework for local and provincial efforts to protect air quality. It provides opportunities for the public to take part when air quality decisions are made, and it allows for action against polluters when the environment or human health may be at risk.

The *Act* also calls for specific air quality objectives to guide the Department in its application of the legislation. These are put forward by the Ministers of the Environment and Local Government and Health and Wellness for review and comment by citizens and stakeholder groups.

#### Standards and Agreements

Standards and agreements help us control the amount and type of pollutants released, here in New Brunswick and around the world. The federal government plays a role in monitoring and research on a national level, as well as in setting

### Clean Air- Get Involved!

Want to know more about air quality in New Brunswick?

Want to participate in reviewing the approvals for key sources of air pollution in the province?

Want to add your comments to the review of New Brunswick's air quality objectives?

New Brunswick's Clean Air Act provides opportunities for public involvement. We welcome your participation.

#### To find out more:

[www.gnb.ca/elg-egl/0009/0003-e.html](http://www.gnb.ca/elg-egl/0009/0003-e.html)

#### Department of the Environment regional offices:

Bathurst area	Tel: 547-2092
Saint John area	Tel: 658-2558
Miramichi area	Tel: 778-6032
Fredericton area	Tel: 444-5149
Moncton area	Tel: 856-2374
Grand Falls area	Tel: 473-7744

### Care for the Air!





national standards for key pollutants. National and international regulatory bodies cooperate to research, monitor and set standards for both emissions and ambient air quality.

Each province is charged with the responsibility of making sure that the standards agreed to on a national level are put into place and enforced. While New Brunswick can't directly control emissions in other jurisdictions, we can support the national and international agreements that will ultimately be good for air quality here at home, and limit the pollution that comes from our own sources. We currently have standards in place for the following major pollutants: carbon monoxide, hydrogen sulphide, nitrogen dioxide, sulphur dioxide, and Total Suspended Particulates. New Brunswick is currently participating in the development of Canada-Wide Standards for PM 2.5 and ozone. Similar standards for other substances such as benzene are also being developed.

### ***Pollution Prevention and Control***

The overall goal is to prevent the release of contaminants into the air. How can we do this?

Department of the Environment and Local Government inspectors and engineers work with approval holders to find solutions or develop plans for reducing air emissions. It is sometimes possible to reduce emissions by installing scrubbers or

other often complex and expensive pollution control devices or by switching to a higher-grade fuel, for example. We also have a province-wide system of air quality monitors that test the air for various substances, which helps us to make responsible decisions and avoid situations where potentially harmful pollutants could be released to the environment. For more information on our air quality monitoring activities, pick up a copy of "Air Quality Monitoring in New Brunswick," or visit our Web site at <http://www.gnb.ca/elg-egl/0009/0003-e.html>.

The counterpart to prevention is pollution control. Industries and other sources of emissions must apply for an Approval to Operate, which limits the amount and type of pollutants released, and sets out standards and methods for monitoring and reporting. A wide range of terms and conditions can be attached to an Approval, depending on the nature of the facility and the sensitivity of the area in which it is located. It is against the law to violate an Approval. Larger sources may be required to operate air quality monitors in their stack(s) or in the surrounding area as a condition of their Approval.

Finally, as individuals we all have a responsibility to ensure that our activities and lifestyles do not have a negative impact on the environment. The combined efforts of individuals have the collective benefit of improving the environment.



## **Compliance and Enforcement**

The Department of the Environment and Local Government's primary concern is to protect the environment and promote compliance with the law. Our Compliance and Enforcement Policy represents an approach, which applies to individuals and companies, that encourages officials to seek compliance from polluters first, and resort to enforcement when other avenues have been unsuccessful. We make regular scheduled and unscheduled visits to sources of emissions. We also respond to information received from the public and other government agencies. When an inspection reveals that a violation has taken place, we have a range of administrative options available to achieve compliance, such as warnings, fines, Ministerial Orders, and injunctions, or we may resort to a formal investigation and prosecution. Our response will vary according to the suspected violation.

## **Environmental Education**

A little information goes a long way toward protecting the environment! As we learn more about the environment and the impact of human activities on it, we change our behaviour to lessen the effect. The Department of the Environment and Local Government provides a range of information to the public on issues as varied as pesticide management, composting, and, of course, air quality, and often collaborates with other groups and agencies to support their efforts at public education.

## **Environmental Activism**

Yes, human activities contribute to air pollution, but we are also part of the solution. Local issues tend to come to light first as neighbours band together to bring their concerns to public attention — sometimes sounding an early warning of wider problems, or leading to new directions for research. Small actions can lead to big changes.

Community and environmental groups have always played a valuable role in air quality management by acting as watchdogs and educators. They help us to understand the impact of human activities and to set new priorities for our society. In raising their concerns, these groups can become a significant agent of change by helping to shape the legislation or programs that protect our environment.

## **What Can Individuals Do?**

- Stay informed. The resources suggested in this booklet can help you to learn more about air quality in general, and about those aspects that are of particular importance to New Brunswick residents.
- *The Clean Air Act* offers new opportunities for individuals to become actively involved. Take part in the Class I Air Quality Approvals review process, or in the setting of New Brunswick's air quality objectives as they are brought forward.



- Power generation can be a significant source of air pollution, so it's important to use electricity wisely. Reduce energy use at home through improved insulation and weather-proofing. Choose energy-efficient appliances whenever possible.
- Keep your vehicle in good working order to improve energy efficiency and reduce emissions. Reduce the number of unnecessary trips, and consider using public transportation or organizing a car pool. If a Smog Advisory has been issued for your area, try to avoid any non-essential uses of gas-powered equipment, such as lawnmowers or recreational vehicles.
- Prevent the accidental release of Ozone Depleting Substances by having refrigerators, freezers and air conditioners serviced regularly by certified technicians. Each year, have your car's air conditioning system tested for leaks, and run it weekly in winter to prevent leaks in spring. Choose ozone-friendly equipment where possible, and make sure that any ODS are safely recovered from old appliances before disposal.
- To prevent leakage or evaporation, store gasoline, solvents, paints and other products containing VOCs in proper containers. Buy only as much as you know you can use up quickly. Dispose of the empty containers safely, as directed by the label instructions.
- Help nature clean the air by planting a tree or replacing thin lawn grass with leafy shrubs and groundcovers. As we go about our business, the trees and plants go about theirs — taking in carbon dioxide and putting oxygen into the air. Studies link a decline in trees and vegetation to a buildup of carbon dioxide, contributing to global warming.
- Operate your woodstove at peak efficiency by burning properly seasoned wood that's cut to fit the firebox. Add a stove-type insert to an open fireplace, or replace an older woodstove with an energy efficient, Environmental Protection Agency (EPA)-certified unit. Contact your local chapter of the New Brunswick Lung Association for more information.
- Contact a Department of the Environment and Local Government office for more information:
- **on Monitoring Programs:** Sciences and Reporting Branch, (506) 457-4844;
- **on Air Quality Approvals:** Approvals Branch, (506) 444-4599; and
- **for general information about air quality, or for more information about public comment opportunities under the *Clean Air Act*:** Educational Services Branch, (506) 453-3700.