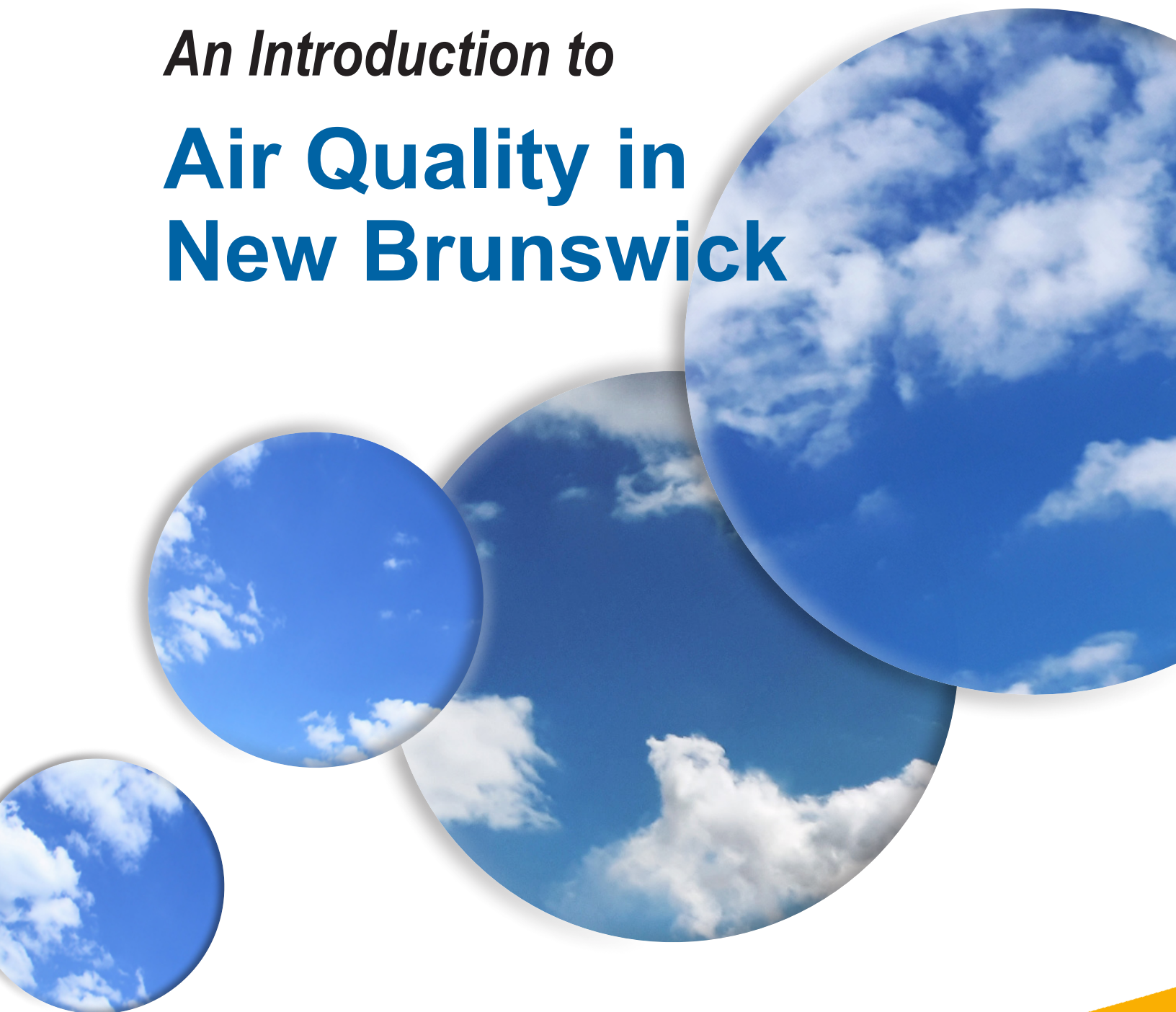


An Introduction to
**Air Quality in
New Brunswick**



An Introduction to Air Quality in New Brunswick

Department of Environment and Local Government

2022

Contact the
Department of the Environment
and Local Government for more
information:

(506) 460-6602
elg/egl-info@gnb.ca

ISBN 978-1-4605-3080-1



Contents

Introduction.....	2
The Air We Breathe.....	3
What Affects Air Quality?.....	3
Long-Range Transport.....	4
Local Effects.....	4
Monitoring Air Quality.....	5
New Brunswick's Air Quality Monitoring Network.....	6
What's in the Air.....	7
Common Air Pollutants.....	7
Particulate Matter.....	7
Particulate Matter Sub-Types.....	8
Ground-Level Ozone (O ₃).....	9
Sulphur Dioxide (SO ₂).....	10
Nitrogen Oxides (NO _x).....	10
Hydrogen Sulfide (H ₂ S).....	12
Volatile Organic Compounds (VOCs).....	13
Carbon Monoxide (CO).....	13
Greenhouse Gases and Climate Change.....	14
The Effects of Climate Change.....	14
Key Greenhouse Gases.....	15
Carbon Dioxide (CO ₂).....	15
Methane (CH ₄).....	15
Nitrous Oxide (N ₂ O).....	16
Taking Action on Climate Change.....	17
Working Together on Air Quality.....	18
What Improves Air Quality?.....	18
Legislation.....	18
Federal, Provincial, and Territorial Cooperation.....	18
Pollution Prevention and Control.....	19
Compliance and Enforcement.....	20
Environmental Education.....	20
Community Engagement.....	20
What Can Individuals Do?.....	21



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 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, except for places of business, where it is the responsibility of the WorksafeNB (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, and trace amounts of other gases and components. “Air pollution” is the general term to describe unwanted, potentially harmful substances that can also occur in our air.

Air pollution can cause a wide range of environmental and health impacts. It is particularly problematic for children, the elderly, and people with respiratory or heart problems. It can also reduce visibility (haze), 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 infrastructure. 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: 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 pollution from human sources tend to concern us more on a day-to-day basis than natural sources. For example, when people burn tires or garbage, or use a woodstove improperly, a whole range of harmful gases are released into the atmosphere. The largest source of this type of air pollution is the burning of fuel: 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 kilometers before their effects are noticed. In New Brunswick, the long-range transport effect is significant for

ground-level ozone, acid deposition, and fine particulates.

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

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.



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. 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 Environment and Local Government monitors a variety of pollutants at strategic locations and industrial sites throughout New Brunswick.

Monitoring is carried out continuously, and

for the most part, is automated. Industries are required to take steps to cut their emissions when levels begin to approach provincial limits.

Air quality monitoring data is available via New Brunswick’s Air Quality Data Portal (www.elgegl.gnb.ca/AirNB). The data on the portal is updated hourly, and up to three years of prior data can be accessed.

The Department of Environment and Local Government also analyzes all monitoring results and publishes yearly summary statistics via its Annual Air Quality Monitoring Results reports.

The data from New Brunswick’s air quality monitoring stations is also shared with the federal government so that it can be reported through the Air Quality Health Index (AQHI) program. The AQHI program reports to the public on current air quality conditions, and provides daily forecasts based on complex modelling. The AQHI is reported as a number from 1 to 10. The higher the number, the poorer the air quality, and the greater the need to take precautions.

Local AQHI values, forecasts, and associated guidance can be accessed via the federal weather website:

www.weather.gc.ca

Pollen

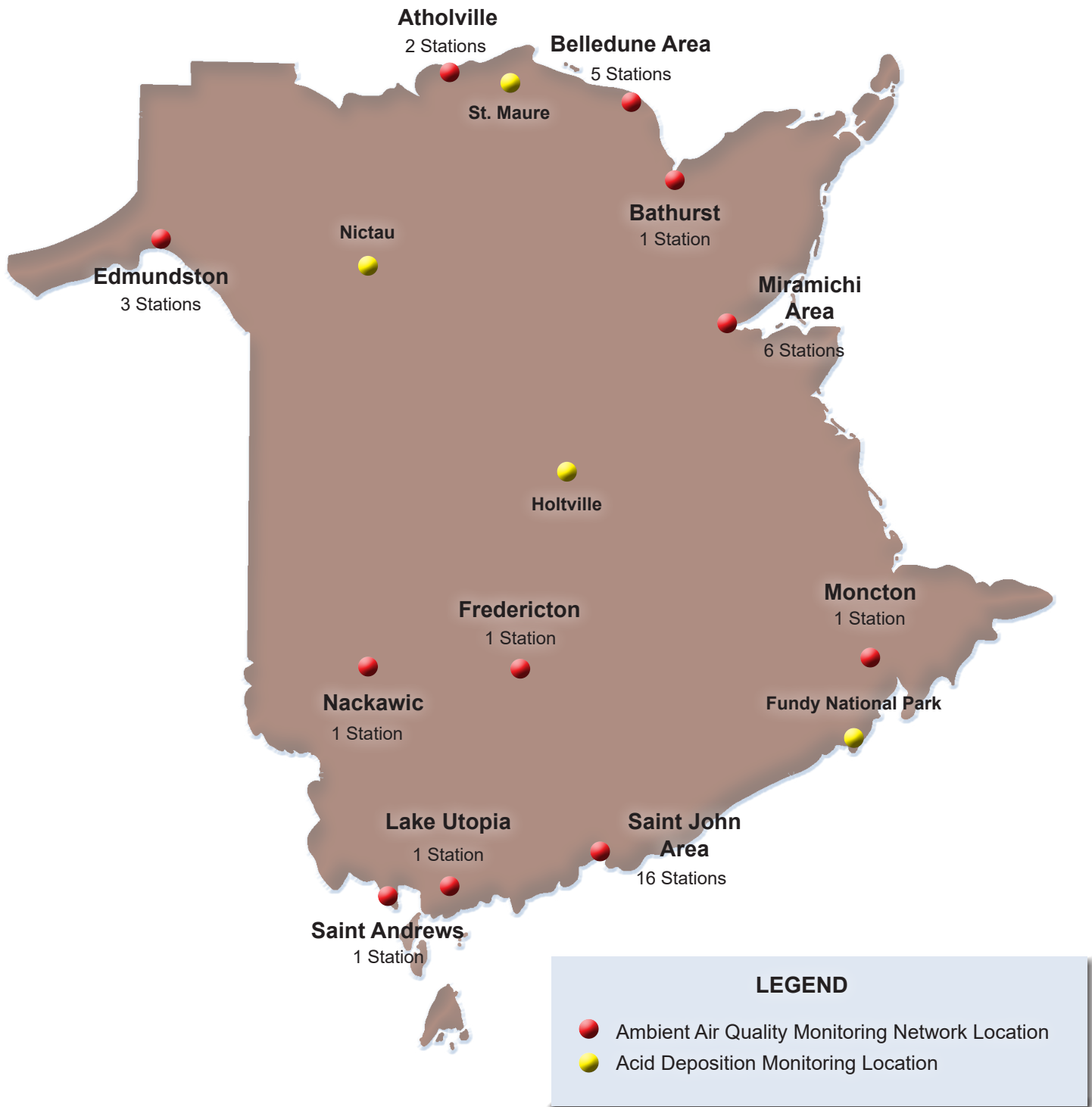
That yellow “dust” you may see outside on some spring or summer mornings is probably pollen. It can sometimes be seen on the ground, on vehicles parked outside overnight, and even on the surface of lakes. The pollen is released in large amounts by coniferous trees such as spruce, fir, pine, and cedar.

Measurement Units

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 a large swimming pool or, in terms of time, one second in 32 years.



New Brunswick's Air Quality Monitoring Network





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. 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.

Common Air Pollutants

Particulate Matter

What is it?

The term "particulate matter" refers to airborne 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.

Some Common Air Pollutants

Particulate Matter
Ground-Level Ozone (O₃)
Sulphur Dioxide (SO₂)
Nitrogen Oxides (NO_x)
Hydrogen Sulphide (H₂S)
Volatile Organic Compounds (VOCs)
Carbon Monoxide (CO)

Where does it come from?

Particulate is created by combustion processes such as the burning of residential fuel wood, gasoline, fuel oil, and coal. Industrial fuel use, construction activity, motor vehicles, road dust and agricultural operations all contribute. Natural sources include windblown pollen, dust, fine sand, ocean salt spray, and volcanoes. Other particles form in the air when certain gaseous pollutants 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.

Particulate matter can also have aesthetic impacts. 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.



Particulate Matter Sub-Types

Total Suspended Particulate (TSP)

All sizes of particles are represented in total suspended particulate (TSP). It includes natural particles, such as pollen and spores, as well as particles from vehicles or smokestacks. 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.

TSP was a standard pollution measurement for many years, but is becoming less important as monitoring efforts shift toward smaller particle sizes, which are of greater concern for human health.

Coarse or "Respirable" Particulate (PM₁₀)

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.

PM₁₀ can be made up of smaller pollen, spores, and dust from roads, quarries, and tire wear, with smaller contributions from sea salt and vehicle exhaust.

Fine Particulate (PM_{2.5})

Fine particulates (PM_{2.5}) are 2.5 microns in diameter **or less**. The most common source of PM_{2.5} is organic fuel combustion (wood, oil, natural gas, coal, etc), including vehicle exhaust, home heating, and industrial emissions. Other typical sources of particulate (e.g. road dust) contribute relatively little.

Many studies over the past decade have confirmed that these smallest of particles are the most important with respect to human health.

PM_{2.5} is closely linked to human respiratory and cardiovascular disease.



Ground-Level Ozone (O₃)

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 in the air. It forms when certain other pollutants in the atmosphere react together in the presence of strong sunlight. Electrical storms also produce some ozone.

Most of our ozone pollution is carried here (through long-range transport) by air masses originating in heavily populated regions in the northeastern United States and central Canada.

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.

Good and Bad Ozone

High in the stratosphere, far above the earth's surface, the natural ozone layer protects us from the Sun's 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, ground-level 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 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 on the protocol with strict regulations under the *Clean Air Act*.



Sulphur Dioxide (SO₂)

What is it?

Sulphur dioxide (SO₂) 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 electrical generating stations, oil refineries, pulp mills, smelters, and industrial heating systems.

What does it do?

High concentrations of SO₂ can damage trees and agricultural crops, and corrode metals. People with respiratory conditions or chronic lung and heart diseases are the most sensitive to SO₂ and may experience problems. Even those without these conditions may find it irritating to the eyes and throat.

SO₂ combines with water vapour in the clouds to form an acid and contributes significantly to acid deposition (e.g. "acid rain").

Nitrogen Oxides (NO_x)

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 (NO₂), nitric oxide (NO), nitrous oxide (N₂O), and other nitrogen-oxygen compounds - are collectively referred to as NO_x.

Where do they come from?

A major source of NO_x 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_x can irritate the lungs and lower our resistance to respiratory infections. It can damage vegetation, including food crops. NO_x can also damage a wide range of materials; for example, it corrodes metals, causes fading of fabrics, and degrades rubber.

NO_x is a major factor in the formation of acid deposition (similar to SO₂). Also, when combined with Volatile Organic Compounds (VOCs) in sunlight, NO_x contributes to the formation of ground-level ozone and smog.



Related Issue: Acid Aerosols and Acid Deposition (Acid Rain)

Sulphur dioxide and nitrogen oxides can 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.

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.

Acidified water tends to absorb harmful 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.

Historically, the southwestern corner of New Brunswick has been 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.

While New Brunswick emission sources contribute to the problem, much of the acid deposition we receive in our region is transported from sources in central Canada and the eastern United States.

Acid Rain Monitoring

New Brunswick has operated an acid rain monitoring program since the 1980's. This monitoring has confirmed that emissions reductions over the years have greatly reduced the amount of acid deposition that we receive.



A typical acid rain sampler



Hydrogen Sulfide (H_2S)

What is it?

Hydrogen sulphide (H_2S) is a colourless gas that is heavier than air. It is a "reduced sulphur" gas, with a 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_2S 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_2S 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 increase with higher concentrations and longer exposure times. H_2S is very corrosive to certain metals and dissolves in water to form an acid. It converts to sulphur dioxide (SO_2) when it is burned, which contributes to acid rain.

What's that Awful Smell? Reduced Sulphur Gases

If you notice a distinctive "rotten egg" smell in the air outside, you are detecting the presence of a group of air pollutants known as reduced sulphur gases. In New Brunswick we monitor and report on these gases in aggregate as "Total Reduced Sulphur" (TRS).

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



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.

Where do they come from?

The production and burning of fossil fuels is a major source. VOCs are also emitted 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 and lacquers also emit VOCs.

What do they do?

Volatile Organic Compounds, reacting with other substances such as NO_x 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.

Carbon Monoxide (CO)

What is it?

Carbon monoxide (CO) is a colourless, odourless, and flavourless 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. Motor vehicles can be a major source of carbon monoxide. Higher levels of

CO are found on city streets with heavy traffic and in confined spaces like parking garages. Forest fires, industrial activity, and home heating systems also contribute significantly.

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. Recent improvements in the efficiency of automobile engines and other fuel burning devices also helps to lower ambient CO levels in our communities (increased efficiency typically results in the more complete burning of fuel, and hence less CO production).

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.



Greenhouse Gases and Climate Change

Greenhouse gases (of greatest concern being carbon dioxide, methane, and nitrous oxide) are gasses that trap some of the infrared heat energy that is radiated from the Earth's surface, keeping it in the atmosphere. This heat trapping changes the balance between energy received from the Sun and radiated from Earth. This, in turn, causes changes to air, land, and sea temperatures, which impacts weather patterns at global and regional scales. That is, it changes the climate.

The Effects of the Changing Climate

Climate change is already occurring, bringing multiple changes in different regions – which will all increase with further global warming. These include changes to wetness and dryness, to winds, snow and ice, coastal areas, and oceans.

New Brunswick is already experiencing the impacts of climate change, and it will get worse:

It Will be Warmer: the average temperature has and will continue to increase, leading to more extreme heat events and associated public health impacts, such as heat stress.

It Will be Wetter: The water cycle is intensifying. This brings more extreme precipitation and associated risk of flooding, which damages homes, properties, and roads.

It Will be Stormier: Expect more extreme weather such as high winds and

ice storms. This will lead to more power outages and damage to homes, power lines, and other essential infrastructure.

The Sea Level Will Rise: A one metre increase in sea level is forecast by 2100. This will contribute to more severe coastal flooding and coastal erosion, which will mean the loss of natural areas such as dunes, beaches, and wetlands.

The Ocean Will Change: Changes include warming waters, more frequent marine heat-waves, ocean acidification, and reduced oxygen causing impacts to marine resources, ecosystems and biodiversity.

Humans are to Blame

Irrefutable evidence confirms that greenhouse gas release from human activities are the primary cause of the global warming we are experiencing today. Many of the changes observed in the climate are unprecedented in thousands, if not hundreds of thousands of years.

The latest United Nations (UN) Intergovernmental Panel on Climate Change (IPCC) [report](#) shows that emissions of greenhouse gases from human activities are responsible for increasing the average global temperature by approximately 1.1°C since 1850-1900, and finds that over the next 20 years, this increase is expected to reach or exceed 1.5°C.



Key Greenhouse Gases

Carbon Dioxide (CO₂)

What is it?

Carbon dioxide (CO₂) is a colourless, odourless gas that occurs both naturally and from human activities. It is the most important greenhouse gas because it accounts for the greatest portion of the warming associated with human activities.

Where does it come from?

Carbon dioxide is produced when we burn fossil fuels in our vehicles, power plants, factories, and heating systems. Fossil fuels include, but are not limited to: coal, heating oil, natural gas, and propane. CO₂ is also produced naturally when living things respire and by the decay of organic matter. Forest fires are a major natural source of CO₂ — 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 CO₂ uptake and release is altered.

Carbon dioxide is naturally present in the atmosphere as part of the Earth's carbon cycle (the natural circulation of carbon among the atmosphere, oceans, soil, plants, and animals). However, human activities are altering the carbon cycle—both by adding more CO₂ to the atmosphere, and by influencing the ability of natural sinks, like forests and soils, to remove and store CO₂ away.

Carbon dioxide in the atmosphere is now reaching levels 50 per cent higher than

when humanity first began large-scale use of fossil fuels.

What does it do?

Carbon dioxide is the most significant of the greenhouse gases emitted through human activities. It accounts for about 78 per cent of global greenhouse gas emissions from human activities in the 20 major economies.

Methane (CH₄)

What is it?

Methane is a colourless, odorless, and highly flammable gas. It is composed of carbon and hydrogen and is a primary component of natural gas.

Where does it come from?

Methane is found everywhere in nature and the human environment. It is constantly formed, mostly during anaerobic decomposition processes with the help of microorganisms. Methane is produced both in natural environments, such as wetlands or humid forests, and oceans, as well as human environments, such as from agriculture, landfills, and in unintentional leaks from natural gas plants. Humans have a significant influence on the methane cycle: about 60 per cent of methane in the atmosphere is released by human activity.

Since the industrial revolution, methane concentrations in the atmosphere have more than doubled.

What does it do?

While carbon dioxide is more abundant and longer-lived, methane is a far more effective at trapping heat while it lasts.



Nitrous Oxide (N₂O)

What is it?

Nitrous oxide (N₂O), commonly known as laughing gas, nitrous, or nos, at room temperature, it is a colourless, non-flammable gas, with a slight metallic scent and taste. At elevated temperatures, nitrous oxide is a powerful oxidizer similar to oxygen.

Where does it come from?

N₂O has significant medical uses, especially in surgery and dentistry, for its anaesthetic and pain reducing effects. It is also used as an oxidizer in rocket fuel, and in motor racing to increase the power output of engines.

Although there are many sources of N₂O, the largest contributor is agriculture, where it is produced through the breakdown of nitrogen-rich fertilizers by bacteria in the soil.

The atmospheric concentration of N₂O is increasing at a rate of about 1 part per billion (ppb) annually. Global accounting of N₂O sources and sinks indicates that about 40 per cent of N₂O emissions originate from human activity and shows

that emissions growth has chiefly come from agricultural and industrial growth.

What does it do?

It is the third most important long-lived greenhouse gas and is steadily increasing in the atmosphere. Although the magnitude of the emissions is less, the potency of the gas is much stronger. It substantially

contributes to global warming.

In addition to its global warming impact, N₂O is also an ozone depleting substance with an impact comparable to that of chlorofluorocarbons (CFCs).

Comparing Impacts

Each of the key greenhouse gases has a different impact on global warming. Their potency depends on how long they remain in the atmosphere once emitted (before broken down or reabsorbed), and their physical capacity for trapping heat.

Greenhouse Gas	Lifetime in the Atmosphere	Global Warming Potential* (Over 100 Years)
Carbon Dioxide	50 - 200 Years	1X
Methane	12 Years	25X
Nitrous Oxide	114 Years	298X

*As compared to carbon dioxide.



Taking Action on Climate Change

Some of the changes already set in motion, such as continued sea level rise, are irreversible over hundreds to thousands of years. However, strong and sustained reductions in greenhouse gas emissions, reaching at least net zero emissions by 2050, would limit many other harmful impacts. Immediate, rapid and large-scale reductions in greenhouse gas emissions are necessary to limit warming to close to 1.5°C or even 2°C, while this is still attainable.

Most industrialized nations are now 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* (UNFCCC). This agreement has resulted in international efforts to reduce greenhouse gases to levels that will stabilize global climate change.

In 2016, Canada became a signatory to the *Paris Agreement*, a legally binding international treaty on climate change. Under that agreement, Canada established its Nationally Determined Contribution (NDC) commitment to reduce its greenhouse gas emissions by 30 per cent below levels in 2005. The 2016 *Pan-Canadian Framework on Clean Growth and Climate Change* (PCF) was Canada's first-ever national climate plan that was developed with provinces and territories, and in consultation with Indigenous peoples. It was an important first step for Canada towards achieving its *Paris Agreement* target. Likewise,

in 2016, New Brunswick also released a new Climate Change Action Plan, *Transitioning to a Low-Carbon Economy*, which included a commitment to reduce its annual greenhouse gas emissions to 10.7 megatonnes, or about 47 per cent below 2005 levels, by 2030.

In December of 2020, the Government of Canada introduced *A Healthy Environment and a Healthy Economy – Canada's Strengthened Climate Plan* in response to a deeper NDC commitment of achieving 40 to 45 per cent reductions in emissions by 2030. The plan builds on the efforts that are currently underway through the PCF to cut more pollution, to create more sustainable jobs, and to support a healthier economy and environment. Also, as part of the plan, the Government of Canada committed to develop Canada's first National Adaptation Strategy.

Likewise, New Brunswick is renewing its Climate Change Action Plan, to strengthen actions to reduce greenhouse gas emissions as well as increase our adaptation and resiliency to the changing climate. For more information on New Brunswick's action on climate change, including past Climate Change Action Plans and Progress Reports, visit the Department of Environment and Local Government's website at:

www2.gnb.ca/content/gnb/en/departments/elg.html

For more information on Canada's national and international action on Climate Change, visit the Government of Canada's website at:

www.canada.ca/en.html



Working Together on Air Quality

Protecting our air quality and climate are major challenges. The good news is that there are things we can do as a society and as individuals that will help.

What Improves Air Quality?

Legislation

It is legislation that gives the New Brunswick Department of 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 developed by the Ministers of Environment and Local Government and Health with input from citizens and stakeholder groups.

We currently have regulated objectives in place for the following major pollutants: carbon monoxide, hydrogen sulphide, nitrogen dioxide, sulphur dioxide, and Total Suspended Particulates.

The federal government also plays a significant role through monitoring and research on a national level, as well as in setting national standards for key pollutants and industries. The federal government also participates on international bodies that research, monitor, and set guidelines for both emissions and long-range transport of pollutants that impact ambient air quality.

Federal, Provincial, and Territorial Cooperation

Within Canada, the federal government, and all provinces and territories cooperatively manage air quality through participation in the Canadian Council of Ministers of Environment (CCME).

The CCME provides an organizational framework that allows the participating jurisdictions to identify key air quality issues and jointly develop guidance on how they should be addressed.

The CCME has developed an Air Quality Management System (AQMS), which is currently being implemented across Canada. The AQMS is multi-faceted, but its key drivers for air quality improvement are the Canadian Ambient Air Quality Standards (CAAQS). CAAQS are now in place for fine particulate matter (PM_{2.5}), ground level ozone, nitrogen dioxide, and sulphur dioxide.

For more information about the CCME, please visit:

www.ccme.ca



Pollution Prevention and Control

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

In New Brunswick, industries and other large sources of emissions must apply for an Approval to Operate, which include conditions to limit the amount and type of pollutants released, and set 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.

Through the Approval to Operate Department of Environment and Local Government inspectors and engineers work with approval holders industry to find solutions or develop plans for reducing air emissions. It is sometimes possible to

reduce emissions by installing scrubbers or other pollution control devices, or by switching to a higher-grade fuel, for example. Larger emitters may be required to operate air quality monitors in their stack(s) or in the surrounding area as a condition of their Approval.

Clean Air - Get Involved!

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

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

To find out more, please visit our website:

www2.gnb.ca/content/gnb/en/departments/elg.html

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, please see our most recent annual air quality monitoring results report, or visit

our Air Quality Data Portal:

www.elgegl.gnb.ca/AirNB

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 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, tickets, 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 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.

Community Engagement

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.

Air Quality Incidents

Do you have concerns about your local air quality or the emissions from a facility? Please contact the nearest Department of Environment and Local Government regional office:

Bathurst area

Tel: 547-2092

Email: elg.egl-region1@gnb.ca

Miramichi area

Tel: 778-6032

Email: elg.egl-region2@gnb.ca

Moncton area

Tel: 856-2374

Email: elg.egl-region3@gnb.ca

Saint John area

Tel: 658-2558

Email: elg.egl-region4@gnb.ca

Fredericton area

Tel: 444-5149

Email: elg.egl-region5@gnb.ca

Grand Falls area

Tel: 473-7744

Email: elg.egl-region6@gnb.ca



Community and environmental groups have always played a valuable role in air quality management by acting as advocates 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 significant agents for 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 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.

Choose a **low or zero-emissions vehicle**. 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. Try to avoid any unnecessary uses of gas-powered equipment, such as lawn mowers or leaf blowers.

Prevent the accidental release of Ozone Depleting Substances (and replacement 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 refrigerants are safely recovered from old appliances before disposal.

To **prevent VOC 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.

If you have a woodstove, operate it 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.