the acid rain partnership
PROGRESS REPORT 2003

Symposium addresses health impacts from Air Pollution

Air pollution is causing major public health problems according to health researchers, environmental and public health officials, as well as air quality specialists who attended the two-day "Symposium on Air Pollution and Public Health." Hosted by the Government of Quebec in Montreal in late May 2002, more than 150 people participated in the Symposium, which provided an opportunity to share information and exchange ideas on the impact of air quality on human health. Citing numerous studies, speakers demonstrated the connection between exposure to air pollution (from burning fossil fuels for energy production and transportation) and asthma in children and premature pulmonary and respiratory deaths. The evidence is accumulating and the Symposium has created a forum for researchers, policy makers and regulators to share information.

The Symposium linked the public health research community to the environmental and regulatory community for the first time. The weight of the evidence is growing according to many of the researchers in attendance. "Air pollution can and does harm people," according to Richard Valentinetti, Director of the Air Pollution Control Division, Agency of Natural Resources in Vermont. Participants acknowledged that one of the biggest challenges facing decision makers is setting policies for the New England and Eastern Canada airshed shared by 23 million people. Participants agreed that protecting public health guides the future as more scientific evidence is shared with the public linking air pollution and public health.

Impact of cars and trucks

How we measure and assess the impacts of mobile sources (gasoline- and diesel-powered cars and trucks) on public health was one of the topics addressed. According to Michael Brauer, Ph.D. at the University of British Columbia, Vancouver, British Columbia, there is a growing body of evidence linking urban areas and the prevalence of asthma in children. Dr. Brauer's presentation focused on exposure assessment techniques including proximity to major roads, traffic intensity on the nearest road and on the use of geographic modeling to capture the affected populations. This body of evidence shows that the higher the traffic rates, the higher the asthma rates.

David Suzuki gave the keynote speech at the Air Pollution and Public Health Symposium, May 23, 2002, Montreal, Quebec. He stated, "What we do to the air, we do to ourselves…we are the air we breathe."

One study of school-aged girls found a relationship between the number of trucks and the number of reports of wheezing. The higher the number of trucks in the area, the more cases of wheezing had been reported.

Impact of wood burning

Winter residential wood burning in cities like Montreal is one of the largest sources of fine particulates and volatile organic compounds in the air around us. It is a known trigger for asthma in adults and children. In addition, many of the individual chemicals produced by wood combustion, such as polycyclic aromatic hydrocarbons (PAHs), formaldehyde and dioxins and furans are known carcinogens. To better characterize the effects of air pollution from wood burning, Yvette Bonvalot, Ph.D. from the Department of Public Health of Montreal-Centre, undertook a study in which outdoor and indoor levels of chemicals were monitored as well as indicator substances in urine from local residents. In areas of heavy use of wood burning, levels of contaminants such as formaldehyde in indoor air were significantly higher. Dr. Bonvalot concluded that local air pollution impacts caused by wood burning are significant and need special consideration when air quality management strategies are developed.

Air monitoring - improving science

More air monitoring data is needed if policymakers want even better science, according to Michael Jerrett, Ph.D., from the Institute of Environment and Health at McMaster University of Hamilton, Ontario. Dr. Jerrett's work focuses on the relationship between air pollution and health in the U.S. and Canada. His findings show that one of the biggest challenges facing public health researchers is measuring actual exposure to air pollution given the availability of monitoring data.

Consistent health-based standards needed

Data linking air pollution and public health consequences is consistent between U.S., Canada and Europe. What is not consistent are the health-based standards, i.e. how much exposure to any one pollutant is too much and how can the measurement tools used to collect pollution data be made consistent between countries. Establishing consistent measurement tools as well as communication mechanisms continues to be a priority for scientists as well as for environmental and public health officials.

The Symposium concluded with ideas for future work on air pollution and public health, including gaining access to more pollution data inventories and continuing with public health research to connect the exposures to air pollution and health effects. According to many participants, there is a great need to harmonize regulations on both sides of the border. In addition, suggestions were made to encourage local problem-solving such as installing control devices on diesel-fueled school buses or improved education on wood burning and its impact.

The Symposium was endorsed in August 2001, when the Conference of New England Governors and Eastern Canadian Premiers adopted a resolution to proceed with a conference that would explore the effects of air pollution on public health. For presentations and a transcript of the Symposium, go to ***www.menv.gouv.qc.ca/Symposium/index_en.htm.***

The U.S. connection between coal and acid rain

Current reliance on coal to generate electricity is a big factor in the formation of acid rain. In the 1970s, during the U.S. energy crisis, many U.S. utility companies switched from oil to coal or natural gas. Given the current favorable economic climate for coal (in the United States), many old coal-fired plants are still operational without the pollution control devices that help reduce air pollution. Why? Although the 1977 U.S. Clean Air Act Amendments restricted pollution from smokestacks, it included an exemption for aging power plants. Pollution controls were seen as too costly and because many older plants were to be retired an exemption was granted.

Today, more than 25 years later, many of the oldest power plants exempted in 1977 are still operational and generating more electricity than ever. Between 1990 and 1999 coal-fired power plants in the U.S. increased emissions from 18 million tons of sulfur dioxide and nitrogen oxides to 21 million tons. Acid rain in the New England and Eastern Canada region is directly tied to plants located in Kentucky, Ohio, Illinois, W. Virginia, Michigan and Ontario.

More than 50 percent of U.S. electricity generation comes from coal-fired facilities. In Canada, slightly less than 20 percent comes from coal-fired facilities due to the greater availability and use of nuclear- and hydro-electricity. The role of these aging power plants can not be ignored when addressing the sources of acid rain in Eastern Canada and New England.

The connection between vehicles and air pollution

Let's face it, our culture is dominated by our dependence upon cars. We need cars for almost everything—getting to work or school, grocery shopping, picking up dry-cleaning, seeing the doctor, meeting friends at the park. We jump in the car and go. It is not a luxury; it is a way of life.

The emissions from burning gasoline in our vehicles contribute to public health problems and the formation of acid rain. While technologies have worked to reduce the negative impact of tailpipe emissions that are making the air unhealthy, more needs to be done. Each year, more miles are driven in bigger cars and trucks. As consumers, we need to balance our desire for bigger cars and trucks, with how much air pollution we are generating.

Did you know that there are simple vehicle maintenance strategies that greatly improve fuel mileage and reduce air pollution from our cars and trucks? For more ideas on minimizing the impact of cars or trucks on air quality, check out *"What have we learned and what can we all do?"* on page 4.

What is acid rain?

Acid rain is produced by the burning of fossil fuels. It is formed when emissions of sulfur dioxide and nitrogen oxide react in the atmosphere with water, oxygen, and oxidants to form acidic compounds. These compounds then fall to the ground in both wet and dry form (e.g. rain, snow, dust particles, or cloud mist).

Acid rain acidifies lakes and streams and contributes to damage of trees at high elevations. Hundreds of lakes in northeast North America have become too acidic to support sensitive fish species. In addition, acid rain accelerates the deterioration of paints and buildings.

Electric power plants account for most sulfur dioxide and (some) nitrogen oxide emissions. Cars, trucks, and other vehicles also are major sources of nitrogen oxides.
credit: Clean Air Trust

The energy connection and acid rain

What can we all do about it?

Energy - we can't live without it. Energy in the form of electricity powers our computers, refrigerators/freezers, air conditioners, light bulbs, microwaves, DVD players and even our cell phones. We burn fossil fuels to heat our homes and power our cars and trucks. But do we really know how electricity is made, where it comes from and how that can affect our health?

Let's take a closer look. Electricity is produced using an energy source to turn turbines that move electrons through power lines to our homes and businesses. Depending upon where you live, electricity is "fueled" a number of ways—with coal or oil (fossil fuels), natural gas, nuclear, wood, hydroelectric dams, and occasionally the sun (photo-voltaics) or even wind power.

While burning fossil fuels for energy production causes air pollution, coal-fired power plants are particularly significant contributors to acid rain. The smokestacks from these power plants (in our region and in mid-western U.S. and Ontario) reach high into the atmosphere emitting the primary pre-cursors to acid rain: sulfur dioxide and nitrogen oxides.

The pollutants are transported by prevailing weather patterns from west to east and can cause damage far from their sources. Those emissions eventually return to earth as acid rain (deposition), polluting our forests, soils, lakes, streams and estuaries as well as causing many health problems and environmental effects. These pollutants come directly from electricity production.

So what can be done? Energy-

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Environmental damage from air pollution and acid rain goes beyond national borders

In June 1997, the Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP) recognized that acidic deposition is "a joint concern for which a regional approach on research and strategic action is required" and that "state and provincial monitoring efforts and analysis remain a high priority within their respective programs." They directed the Committee on the Environment to study and present specific policy recommendations and by June 1998, an Acid Rain Action Plan was approved by the governors and premiers.

Working cooperatively, representatives from all NEG/ECP jurisdictions are engaged in numerous activities to implement the actions and recommendations in the Acid Rain Action Plan. These include: mapping forest sensitivity to acid deposition (Forest Mapping); establishing a water quality monitoring network; establishing data exchange efforts that include developing real-time mapping of ozone and particulate matter; and building public awareness of the causes and impacts of acid rain throughout the Eastern Canadian Provinces and New England States.

This Vermont monitoring station, located a top the Zampieri State Office building in downtown Burlington, Vermont, has a continuous fine particulate matter ($PM_{2.5}$) monitor as well as a $PM_{2.5}$ speciation sampler used to identify the sources of $PM_{2.5}$ as part of the U.S. EPA $PM_{2.5}$ Speciation Network. In addition the site includes two other regular $PM_{2.5}$ samplers to measure Vermont's compliance with the U.S. National Ambient Air Quality Standards. Particulate matter, particularly fine particulate matter is associated with respiratory and pulmonary problems in humans and is associated with Acid Rain.

Work begins at Home

New England Governors and Eastern Canadian Premiers commit to reducing air pollution that causes acid rain

Encouraging coal-fired power plants to our west to reduce acid rain-causing emissions is an important strategy to reduce acid rain, but our governments recognize that work also needs to happen at home. As part of The Acid Rain Partnership, the 11 states and provinces are working to set reduction goals for nitrogen oxides and sulfur dioxide. These strategies differ by jurisdiction, but taken as a whole they represent an enormous commitment to removing the precursors of acid rain within our shared airshed.

The Acid Rain Action Plan adopted in 1998 by the New England Governors and Eastern Canadian Premiers calls for 50 percent reduction of sulfur dioxide by 2010 and 20 to 30 percent reduction of nitrogen oxides by 2007. To date nearly all states and provinces have made individual commitments ranging from 20 to 70 percent by 2009 for nitrogen oxides and 50 to 75 percent by 2010 for sulfur dioxide.

Sharing the evidence

U.S. & Canada work together to monitor the environment

Long-term problems require long-term attention and solutions. For nearly five years, 11 jurisdictions in the eastern U.S. and Canada have been working together to tell the acid rain story. This regional collaboration is necessary to maintain complementary scientific and policy efforts on acid rain.

The 11 states and provinces are working with the federal governments and regions to the west, which are contributing to much of New England's and Eastern Canada's acid rain problems. While this effort is vital, the group is also considering new strategies, particularly for efforts that will yield results in the national clean air debates.

Data without borders in action

Measuring air pollution daily

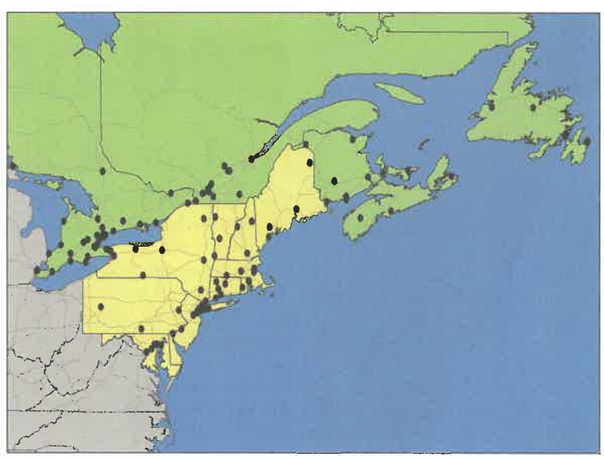
The Air Quality Monitoring Work Group data exchange project and real-time monitoring efforts are dramatically improving the collection and analysis of air quality data, providing timelier access to data. This allows both regulators and individual citizens to make better decisions with respect to air quality issues.

This work group has produced an electronic interactive map of Eastern North America showing real-time concentrations of ground-level ozone during the "smog season." The map is generated from electronically transmitted ozone monitoring stations to a centralized computer, which produces colorized animated maps of current ozone levels.

The real-time ozone map demonstrates how air quality monitoring data can be successfully collected and exchanged across international borders.

Building on the success of the ozone-mapping project, the work group has established a cross-border network of sites to monitor and report fine particulate matter ($PM_{2.5}$) levels. $PM_{2.5}$ can be used as an indicator of acid deposition as some particulate matter includes sulfates and nitrates that cause acid rain. Fine particulates have a diameter of 2.5 micrometers or less (a micrometer is a millionth of a meter). $PM_{2.5}$, like ground-level ozone, is linked to respiratory ailments. Unlike ozone, $PM_{2.5}$, can reach unhealthy levels throughout the year, not just during the summertime. Cross-border reporting of $PM_{2.5}$ data will allow for a greater understanding of unhealthy air conditions.

Establishing the $PM_{2.5}$ monitoring network has created a number of challenges for the state and provincial jurisdictions. These challenges include differences and biases in instrumentation, adequate network coverage, consistency with the ozone mapping project, and establishing consistent health messages that reflect cross-border differences in the $PM_{2.5}$ standard.



This map shows the location of planned and operating real-time $PM_{2.5}$ monitoring sites.

Eastern Canada and New England have started sending data to a centralized location where computerized pilot maps are being generated to test the system, ensure data accuracy and substantiate data availability. It is hoped that the real-time animated $PM_{2.5}$ maps will be available to the public in the near future.

Is water quality of our lakes and rivers being damaged?

The Water Quality Monitoring Work Group has been measuring the acidic deposition impacts on the water quality of lakes and ponds. Their objective is to create maps that will identify water bodies that may be sensitive to the effects of acid deposition.

WARNING Network
The group is collecting and analyzing data to document trends in water quality over time. The data is being compiled to create a water quality sensitivity WARNING Network (Water Acidity Regional Network to Inform Northeastern Governments). More than 180 sites are set up across the 11 states and provinces as part of the WARNING Network. Trends analysis maps will be prepared for five water quality variables—pH, sulfates, nitrates, alkalinity, and basic cations (calcium+magnesium).

Trends analysis show a general decrease in sulfate concentrations in lakes due to the direct influence of sulfur dioxide emission reductions. Reductions have been greatest in Canada. In addition, several sites now show an improvement in pH and alkalinity over the years following these sulfate decreases. Greater improvement has been observed in places where sulfur dioxide emissions and sulfate deposition reductions have been greatest.

Critical load maps
In addition to the trend analysis maps, critical load maps are being developed to identify critical levels of deposition of nitrates and sulfates that could affect water quality. Critical load is the level of acidification above which damage to the environment can occur. Both sets of maps may be used by jurisdictions to identify areas of sensitivity and will provide useful information when setting emission standards in the future.

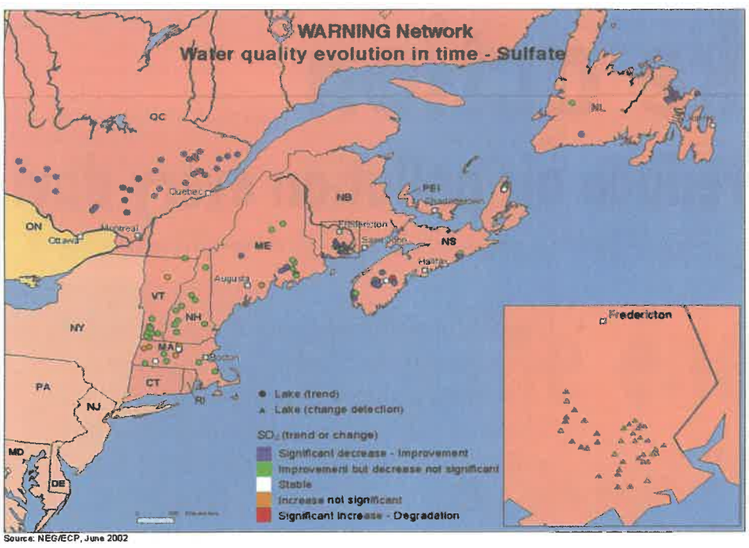
Critical load for combined sulfur and nitrogen deposition can be very low in some lake regions such as the Canadian shield area, southwestern New Brunswick, southwestern Nova Scotia, Newfoundland & Labrador, Maine, New Hampshire and Vermont. Exceedances from the critical load values are observed in these parts where acidic deposition shows high values.

The connection between wood burning and air pollution

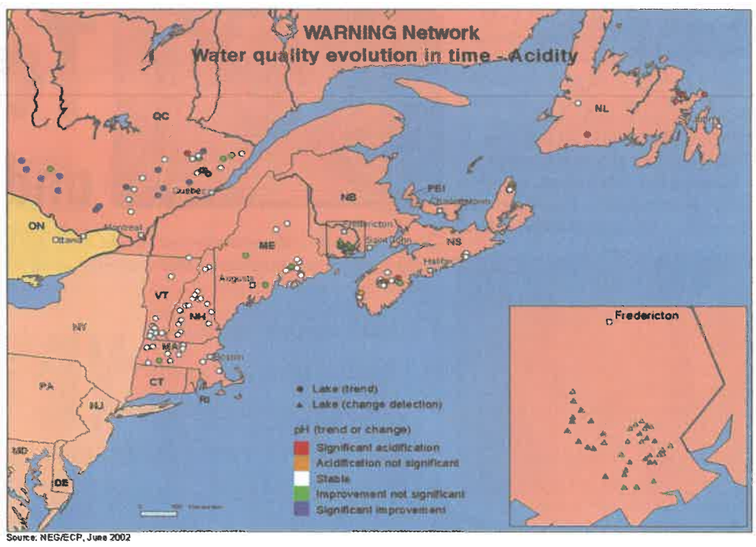
Many New Englanders and Eastern Canadians use wood to heat their homes or to enjoy a wood fire during the long, cold winters in our region. However, burning wood can release pollutants into the air we breathe when poor burning techniques are used. Wood smoke contains harmful pollutants that can trigger coughs, headaches and eye and throat irritation. Breathing wood smoke can also contribute to increased incidences of emergency room visits, hospitalizations and days lost from school and work—even in otherwise healthy people.

Some of the pollutants in wood smoke also contribute to acid rain—these include particulate matter and nitrogen oxides (NOx). Wood smoke can also release hazardous air pollutants including carcinogens like acrolein, formaldehyde, dioxins, furans as well as hydrocarbons and volatile organic compounds.

There are ways to reduce these harmful pollutants. Canada has a program called "Burn it Smart" which addresses the health and environmental effects of inefficient burning. The program challenges Canadians to change their wood-burning habits to reduce pollution from wood heating. New England residents can use the same techniques in this program to minimize pollution from wood burning. For more information, go to **www.burnitsmart.org**. For steps on reducing pollution created by wood combustion, see page 4.



Source: NEG/ECP, June 2002



Source: NEG/ECP, June 2002

Is forest health being damaged by air pollution?

The Forest Mapping Project

The objective of the Forest Mapping Project is to create maps of the forests in the NEG/ECP region that will identify the regions and forest species most at risk from acid deposition. Ultimately, these maps can be used by foresters and land use planners. These maps will be created using geology, soil and forest characteristics and human use patterns.

Acid rain interferes with soil chemistry by activating aluminum from the soil which becomes toxic in its inorganic form, thus blocking the uptake of nutrients to trees. Acidity can leach other nutrients such as calcium out of the soils which can cause the trees to stop growing and even to die off. The nitrogen in the soil can leach into ground water and wreak havoc with the aquatic ecosystems by causing acidification of the surface water in lakes and ponds. Site sensitivity depends upon the amount of deposition and local geology characteristics. The species of concern include sugar maples and red spruce. The red spruce is affected by acidity within cloud mist that leaches calcium from foliage (needles) causing the loss of needles, which in turn reduces growth rates and can lead to mortality of the tree and ultimately the species.

The actual mapping process includes gathering soil information, inventorying specific tree species, understanding the naturally occurring nutrients within a forest ecosystem and considering the impacts of forestry practices. The maps will eventually show predicted sensitivity of trees to acidic deposition (e.g. the areas which show unacceptable levels of nutrients due to acid rain) and the resultant impacts on forest sustainability.

Stakeholder workshops were held in Newfoundland and Vermont in early 2002 as the pilot forest mapping project is focusing on these two regions. An overview of the project goals was presented to area foresters and government land use planners to get feedback on how this information could be useful in managing forests in a sustainable way.

Thanks to the contributions and participation of Massachusetts, Vermont, and Newfoundland & Labrador during 2002 and 2003, the forest mapping group will continue to refine its work based on the pilot studies in Vermont and Newfoundland. The work will try to identify what level of nitrogen deposition our soils and forests can tolerate without critical effects on the forest.

What have we learned and what can we all do? Lots...

We've established that almost everything we do, from driving to the grocery store to reading by lamplight on a cozy winter evening, directly or indirectly causes air pollution that contributes to acid rain formation. We also know that we really care about our health, and the quality of our air and water (Acid Rain Public Opinion Survey, Summer 2000). So what can we do?

Public opinion studies clearly demonstrate that people don't want all the scientific information pollutant by pollutant. This overloads us with technical details. People simply want to know what is broken and how to fix it. Taking a multi-pollutant approach to building public capacity for pollution prevention will be the most effective in the long run. An air quality index that addresses multiple pollutants and is used consistently from jurisdiction to jurisdiction by the general population is needed. This index if widely understood can be used as a tool to inform and direct appropriate behaviors that can minimize air pollution and protect public health as needed.

Our air and water quality as well as our health are compromised due to pollutants such as sulfur dioxide, nitrogen oxides, fine particulate matter, mercury, ozone and carbon dioxide. The scientists have told us what is broken. We know burning coal produces excessive amounts of sulfur and nitrogen oxides causing acid rain. We know that current automotive technologies and fuel quality standards could do more to reduce harmful emissions. Cars do produce less air pollution than in the past, but we are driving more miles every year.

The evidence is more clear than ever -

- Acid rain (the wet deposition) is damaging lakes and streams and estuaries.
- Fine particulate matter (a dry deposition component of acid rain) is increasing mortality rates.
- High ozone (smog) levels in our cities and our rural communities threaten our health, especially our children and people with chronic respiratory or pulmonary ailments.

For additional information contact:

Connecticut Department of Environmental Protection:
www.dep.state.ct.us
Maine Department of Environmental Protection:
www.state.me.us/dep/air/
Massachusetts Department of Environmental Protection:
www.mass.gov/dep
New Hampshire Department of Environmental Services:
www.des.state.nh.us
Rhode Island Department of Environmental Protection:
www.state.ri.us/dem
Vermont Department of Environmental Conservation:
www.anr.state.vt.us/dec/dec.htm

New Brunswick Department of the Environment and Local Government:
www.gnb.ca/0009
Nova Scotia Department of Environment and Labour:
www.gov.ns.ca/enla
Newfoundland & Labrador Department of Environment:
www.gov.nl.ca/env
Prince Edward Island Department of Environment:
www.gov.pe.ca/fae/index.php3
Québec Ministère de l'Environnement:
www.menv.gouv.qc.ca

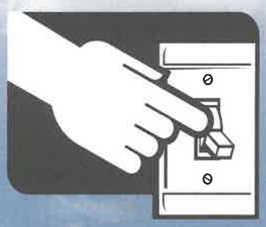
ECP Secretariat: www.cmp.ca
NEGC Inc.: www.negc.org

The energy connection, continued from p.1

efficient appliances and conservation can make a big difference in reducing air pollution. The choices we all make as energy consumers can help support government policy and convince the utility industry that reducing air pollution is important.

We can urge utilities to solve the problem by installing modernized technology in power plants to reduce emissions. As electricity consumers, it is time to reevaluate the tradeoff of cheaper electricity versus healthy air.

For more information on energy efficiency and conservation strategies to use less energy and prevent acid rain, see the story "*What have we learned and what can we all do?*" on this page.



Take action and reduce air pollution every day!

There are a variety of actions we can all take every day to reduce the air pollutants that cause acid rain. Below is a list of suggested actions that relate to transportation, energy efficiency and residential wood burning.

- Walk or ride a bike
- Share a ride or use public transportation
- Combine errands for fewer trips
- Keep vehicles well-maintained, with tires properly inflated
- Avoid idling cars and trucks
- Turn off lights, computers & TVs when not in use
- Choose environmentally friendly consumer products
- Use energy-efficient light bulbs & appliances (look for the Energy Star label)
- Run dishwashers, washing machines and dryers only when full
- Use a high-efficiency wood stove, fireplace or insert that is certified as low emission by the U.S. EPA, a standard accepted in Canada. These wood-burning appliances can cut emissions by up to 90 percent
- Burn small, hot fires - they produce much less smoke than ones that are left to smoulder
- Burn seasoned wood - burning green or wet wood produces significantly more smoke
- Reduce heating needs by making your house more energy efficient
- Have heating appliances and chimneys cleaned and inspected at least once a year
- Reduce, reuse & recycle
- Spread the word....if everyone took just a few of these simple easy steps, it could make a big difference!