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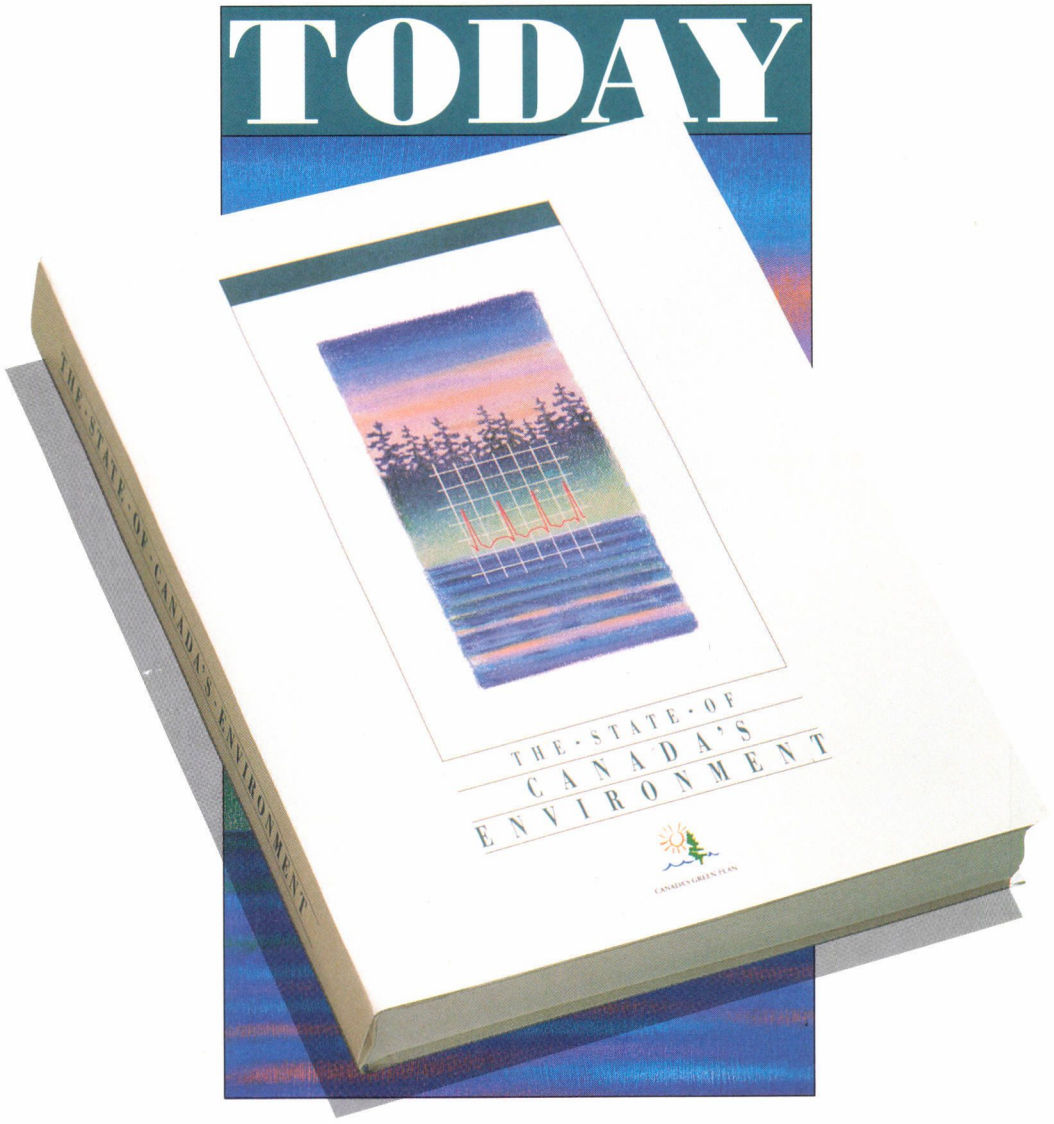
CANADA'S ENVIRONMENT TODAY



THE·STATE·OF·CANADA'S·ENVIRONMENT

SELECTED HIGHLIGHTS

CANADA'S GREEN PLAN

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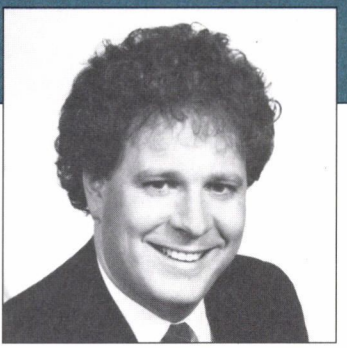
MINISTER'S MESSAGE



"CANADA'S ENVIRONMENT TODAY"

In 1990, *Canada's Green Plan* established sustainable development as our common goal. To realize the objectives of a strong economy and healthy natural surroundings, all decision-makers — government, industries and private citizens — need up-to-date, accurate information to help them make environmentally re-sponsible choices. *The State of Canada's Environment*, the second national state of the environment report, is a major step towards meeting that need.

If sustainable development is truly to be our common goal, however, then it must engage the interests and actions not only of government experts, but also of Canadians in all walks of life. With that in mind, I am pleased to present *Canada's Environment Today*, which offers selected highlights from the national report. It seeks to give people who are not altogether familiar with environmental matters a strong sense of the range of issues and the nature of the findings to be found in the national report.

I hope that you will find *Canada's Environment Today* thought provoking. I hope, too, that it will stimulate your interest enough to read the report itself and put the information it contains to good use.

Jean J. Charest
Minister of the Environment

UNDERSTANDING CANADA'S CHANGING ENVIRONMENT

State of the Environment Reporting

The environment is always changing. Some changes are natural and gradual, others arise from stresses imposed by human activities, such as urbanization, transportation, industry practices, and consumer choices. Some can have serious consequences for people, wildlife and the ecosystems which sustain them.

COURTESY OF U.S. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ENHANCED BY ATMOSPHERIC ENVIRONMENT SERVICE, DOWNSVIEW

Understanding those changes in the Canadian environment — their trends, causes and impact — is the objective of state of the environment (SOE) reporting. In 1988, the *Canadian Environmental Protection Act* established a legislative mandate for collecting, analyzing and reporting environmental information. An SOE reporting group was set up within Environment Canada to coordinate the efforts of many stakeholders and prepare a national report every five years.

The State of Canada's Environment

The State of Canada's Environment presents the latest analysis of how the Canadian environment is changing. It contains five sections: The Ecosphere, Environment and Human Activities, Regional Case Studies, Current Issues, and Living Within the Limits and Opportunities of the Ecosphere.

The report addresses four basic questions:

- What is happening?
- Why is it happening?
- What are the impacts?
- What is being done about it?

Over 100 scientists and technical specialists from universities, industry, government and environmental organizations were involved in the report's preparation. The SOE Public Advisory Committee, which represents industry, environmental, professional and consumer interests, helped develop the table of contents for the report and identified issues to be addressed. To ensure accuracy and objectivity, drafts of each chapter were reviewed by independent specialists from other organizations and levels of government, as well as by the Committee.

Information: The Key to Better Decisions

The actions of all Canadians — as consumers, business operators and policy makers — have an impact on the environment, though not everyone may realize it. Choices regarding commuter travel, home heating, business practices, selection of industrial machinery, recycling of municipal waste and land-use zoning, all have environmental consequences. While the actions of one person or group alone may appear insignificant, those of 26.9 million Canadians **do** matter, when combined at local, regional or national levels as decisions in government, corporations and households.

SOE reporting can help government, industry and individuals make "environmentally responsible" choices — choices that reduce or minimize their impact on the environment and promote long-term, sustainable use of resources.

The State of Canada's Environment provides up-to-date, reliable information in non-technical language on all aspects of the Canadian environment. By helping Canadians understand how their actions have affected the environment, it and other SOE reporting efforts can provide the basis for considering the environment at all levels of decision making.

SELECTED HIGHLIGHTS

The State of Canada's Environment provides detailed analysis of trends, impacts and responses for a wide range of environmental issues and regional ecosystems. This document offers **selected highlights** for a number of these issues and regional case studies. It is not a summary of the report; rather, it reflects the range of issues addressed in the report and the nature of the findings presented.

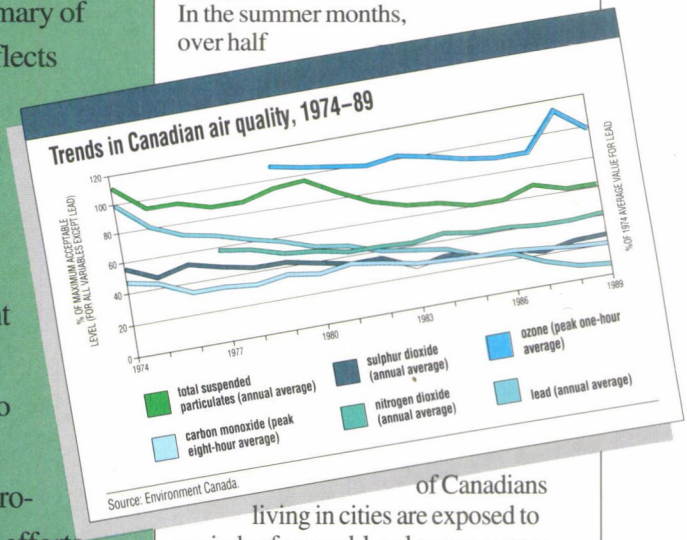
Each selected highlight focuses on the report's findings with respect to key trends, significant effects and, where appropriate, recent response efforts.

AIR QUALITY IN CITIES

The air Canadians breathe in their cities has lower levels of most common contaminants than it did 15 years ago.

Thanks to tougher motor vehicle emission standards and the phasing out of lead in gasoline, lead levels in urban areas dropped 93% from 1974 to 1989. Carbon monoxide was reduced by 63%, sulphur dioxide by more than 50% and dust particles by 44% over the same period.

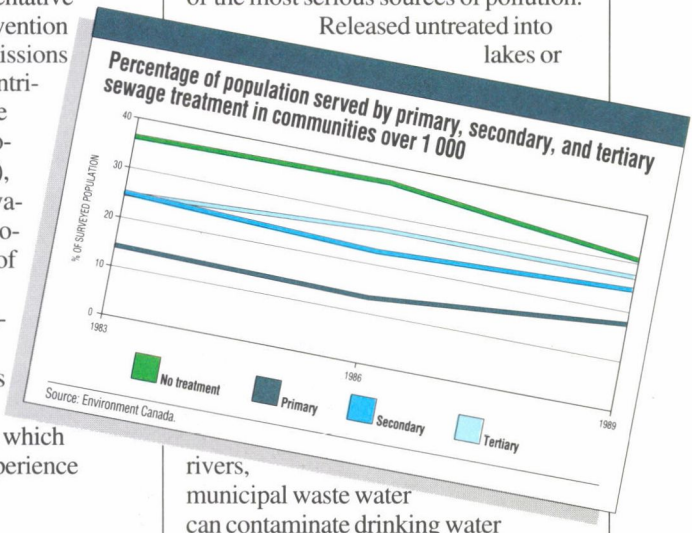
Of the contaminants regularly monitored over the 15-year period, only the concentration levels of ground-level ozone, a component of photo-chemical smog, failed to show a decline. In the summer months, over half



of Canadians living in cities are exposed to periods of ground-level ozone concentrations high enough to contribute to respiratory and lung problems in some people. The regions of greatest concern

are the Lower Fraser Valley of British Columbia, the Windsor-Quebec City corridor and the southern parts of New Brunswick and Nova Scotia.

In 1990, the federal and provincial governments jointly developed a strategy to reduce ground-level ozone, which included both preventative and remedial aspects. Prevention is focused on reducing emissions of the pollutants which contribute to ground-level ozone (from such sources as automobiles and power plants), improving energy conservation and efficiency, and promoting public awareness of the issue. The goal of the remedial aspect of the strategy is to reduce by 2005 peak ozone concentrations in the geographic areas affected to below levels at which those most susceptible experience adverse health effects.



MUNICIPAL SEWAGE TREATMENT ALONG THE ST. LAWRENCE RIVER

The St. Lawrence River extends some 1 500 km and is bordered by about 4 200 km of shoreline. It hosts many rich and diversified ecosystems centred on features such as lakes, rapids and shoreline wetlands. It is also the industrial lifeline of the region. Over four million Quebec residents live in the St. Lawrence Valley, and nearly 3 million draw their drinking water directly from the river.

For many years, the St. Lawrence River has been showing signs of severe stress. Industrial discharges, run-off of agricultural chemicals, filling-in of shoreline areas, drainage of wetlands and other activities have all affected the river's water quality and ecosystems. However, municipal sewage is one of the most serious sources of pollution. Released untreated into lakes or rivers, municipal waste water can contaminate drinking water supplies, lead to algal blooms which can harm fish populations, and force closures of beaches.

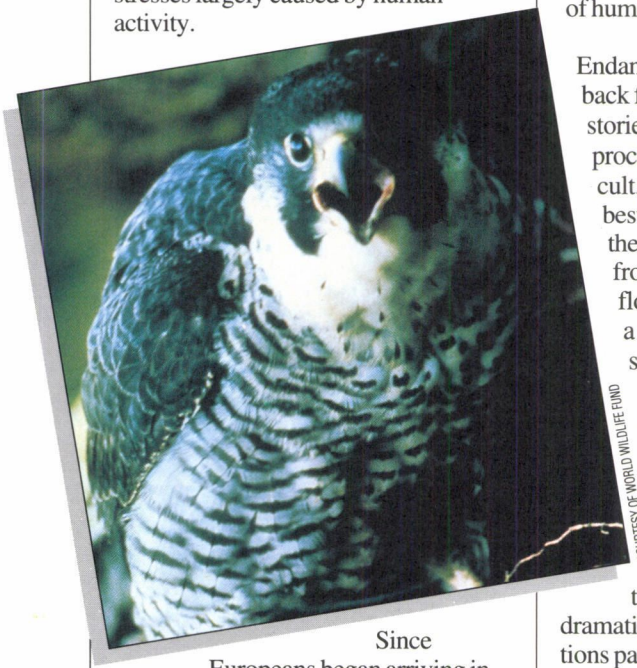
In 1978, the Quebec government began the Water Purification Program that financed, with municipalities, construction of wastewater treatment facilities in order to help restore water quality in the St. Lawrence River. By 1989, an estimated 36% of Quebec's population in communities of over 1 000 people were served by some form of wastewater treatment. As a result of the $6 billion program, it is expected that 85% of Quebec residents will be served by at least primary sewage treatment facilities by 1994.

Nationally, the campaign against untreated municipal sewage is progressing gradually. In 1983, 63% of Canadians

living in communities of over 1 000 people were served by some form of sewage treatment. By 1989, the level had risen to 70% — meaning that 30% of Canadians who live in communities of over 1,000 people continue to release untreated sewage into nearby lakes, rivers and oceans.

WILDLIFE HABITAT AT RISK

The health of Canada's wildlife is one measure of the health of the nation's environment. Loss of some species and reduced populations of others are often early warning signals of ecological stresses largely caused by human activity.



COURTESY OF WORLD WILDLIFE FUND

Since Europeans began arriving in the early 1500s, 19 species, subspecies or populations of animals and plants are known to have disappeared from Canada. Nine of these have become extinct; that is, they exist nowhere in the world. Overhunting and overfishing were long considered the greatest threats to wildlife: the Passenger Pigeon, sea mink and blue walleye, for example, were devastated by overharvesting before the advent of game laws, and have become extinct. Today, loss and degradation of habitat from such activities as agriculture, forestry, urbanization and industrial development, pose even greater dangers.

As of 1991, 193 species, subspecies or populations were considered at risk of eventual disappearance, mostly due to loss or degradation of critical habitats. The list is likely to grow in the coming years as more is learned about the state of the nation's wildlife and the impact of human activity.

Endangered species can be brought back from the brink, but success stories are rare and the recovery process is typically slow and difficult. The population of Canada's best-known endangered species, the Whooping Crane, has grown from 21 birds in 1940 to a wild flock of about 134 in 1991 — a positive trend, although the species is still very much at risk.

By focusing only on the recovery of wildlife at risk, it is easy to lose sight of the underlying need to ensure adequate habitat for all of Canada's wild plants and animals before they are at risk. Responding to dramatic declines in waterfowl populations particularly in the Prairies, the North American Waterfowl Management Plan is the largest of many programs addressing the critical role of habitat preservation. Involving the Canadian and American governments, provinces, states, several conservation

organizations and individual landowners, the 15-year, $1.5 billion effort is restoring and maintaining wetland habitat in all regions of Canada and the United States. Another program, the federal-provincial Endangered Species Recovery Fund, offers assistance to local communities for wildlife habitat improvement projects. By 1990, 48 such projects were under way.

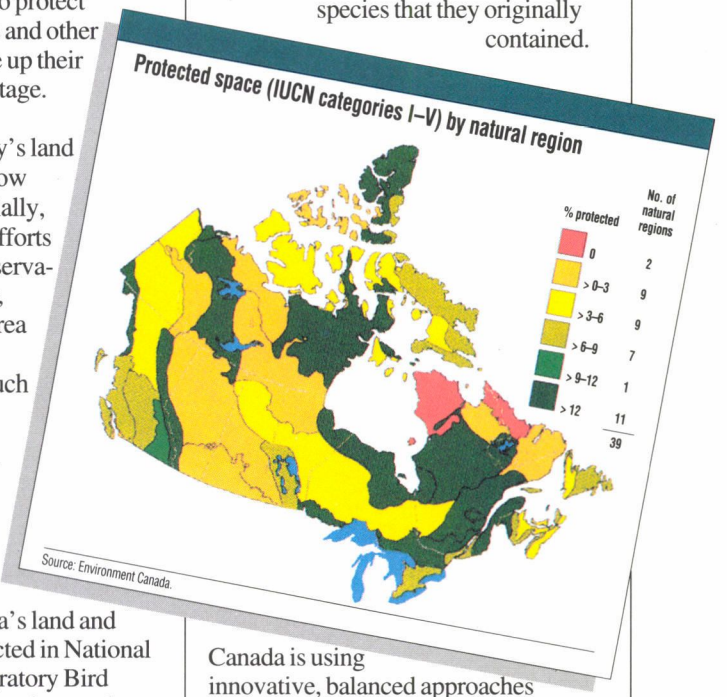
PROTECTED AREAS

Protecting Canada's special places from the pressures of human development is necessary to provide a legacy to future generations. Yet Canadians have a "window of opportunity" of perhaps only 10 years in which to protect many of the ecosystems and other special places that make up their natural and cultural heritage.

About 7% of the country's land and freshwater area is now protected totally or partially, through the combined efforts of government and conservation agencies. However, only about half of this area is completely free from commercial activities such as forestry and mining.

Slightly less than 2% of Canada's land territory is protected in national parks — an increase of 28% since 1986. An additional 1% of Canada's land and freshwater area is protected in National Wildlife Areas and Migratory Bird Sanctuaries. Provincial parks, another form of protected area, have expanded in area by 14% since 1986. Although progress is being made, not all areas and ecosystems in Canada are represented in protected areas. Of Canada's 39 natural land regions, 21 are represented in the national parks system. Lands still to be represented include areas of the far North, the British Columbia interior, Manitoba, northern Quebec and Labrador.

Establishing park and reserve boundaries does not guarantee the protection of species. Some protected areas are still subject to the effects of overuse, and air and water pollution from external sources. Kejimkujik National Park in Nova Scotia, for example, has been seriously affected by acid rain. Other protected areas are too small or fragmented to provide sufficient habitat for many of the plant and animal species that they originally contained.



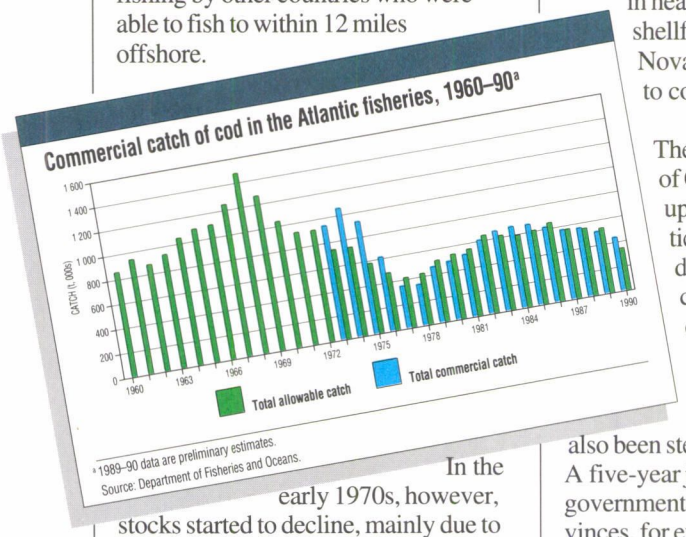
Canada is using innovative, balanced approaches involving all stakeholders to protect significant areas. Several wildlife organizations, businesses and private groups are acquiring special sites

through purchase or donation in order protect them from development and preserve habitat. In addition, private stewardship agreements between individual landowners and the Ontario government are protecting parts of the Niagara Escarpment and other special areas of the southwestern region of the province.

ATLANTIC FISHERIES

By far the most important sector of Canada's $3.1 billion-a-year commercial fishing industry, the Atlantic fisheries account for more than 75% of the approximately 1.5 million tonnes of fish landed in Canada each year. However, over the last two decades, some of Canada's Atlantic fish stocks have come under pressure from overfishing and habitat destruction.

During the 1960s, catches of commercial groundfish and open sea species in Canada's Atlantic waters increased rapidly, primarily because of increased fishing by other countries who were able to fish to within 12 miles offshore.



In the early 1970s, however, stocks started to decline, mainly due to intense harvesting. In recognition of the resource's limited capacity to sustain itself, the International Commission for the Northwest Atlantic Fisheries introduced gear restrictions and then catch limits. Following Canada's establishment of a 200-mile fishing zone off its coastline in 1977, the management of fisheries was intensified. As a result, stocks of some groundfish species have increased. Stocks of shellfish such as shrimp and lobster are at historic high levels off the Atlantic coast.

Despite management efforts, overfishing and habitat destruction continue to threaten some stocks of Canada's Atlantic fisheries resource. Declines in cod, haddock and other groundfish off Nova Scotia have occurred due to overcapacity in the region's fishing fleet, domestic overfishing and misreporting of catches by the industry. These declines have led to layoffs in the region's fish processing industry. Flatfish stocks on the Grand Banks have also been reduced as a result of overfishing by foreign fleets outside the 200-mile zone. In addition, pollution has resulted in nearly 50% of the nearshore shellfish-growing areas in Nova Scotia being closed due to contamination.

The long-term sustainability of Canada's fisheries depends upon sound harvesting practices, and healthy and productive habitat. Canada's current objective is to set quotas at levels which will increase fish stocks that are below optimal levels. Habitat restoration has also been stepped up in recent years. A five-year joint effort by the federal government and the four Atlantic provinces, for example, is promoting scien-

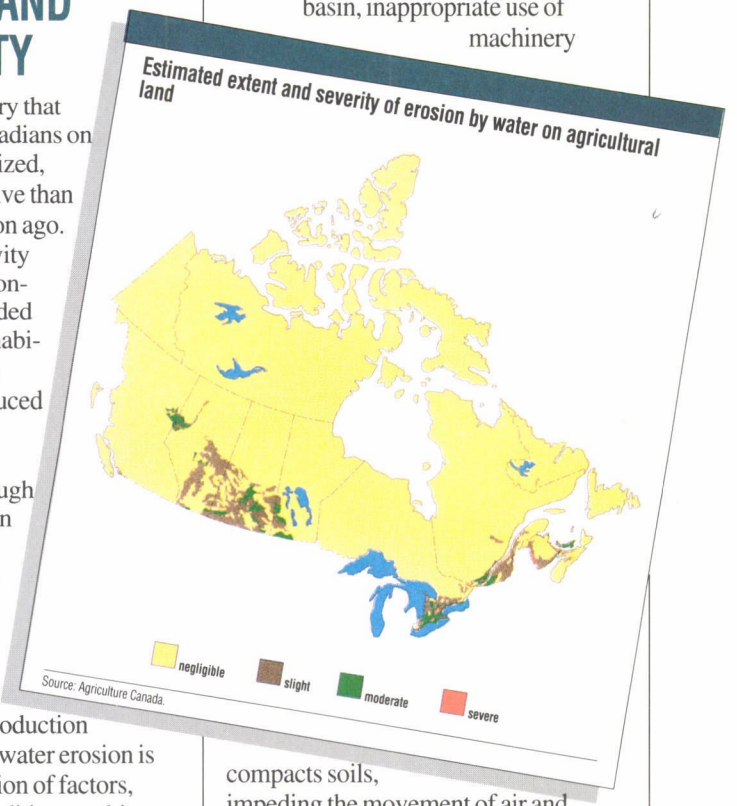
tific research and conservation, and helping the fishing industry to diversify into other areas, such as aquaculture.

AGRICULTURAL PRACTICES AND SOIL QUALITY

Agriculture, an industry that employs 450 000 Canadians on farms, is more specialized, intensive and productive than it was even a generation ago. The gains in productivity have come with environmental costs — degraded soils, loss of wildlife habitat, chemicals in some water courses and reduced genetic diversity.

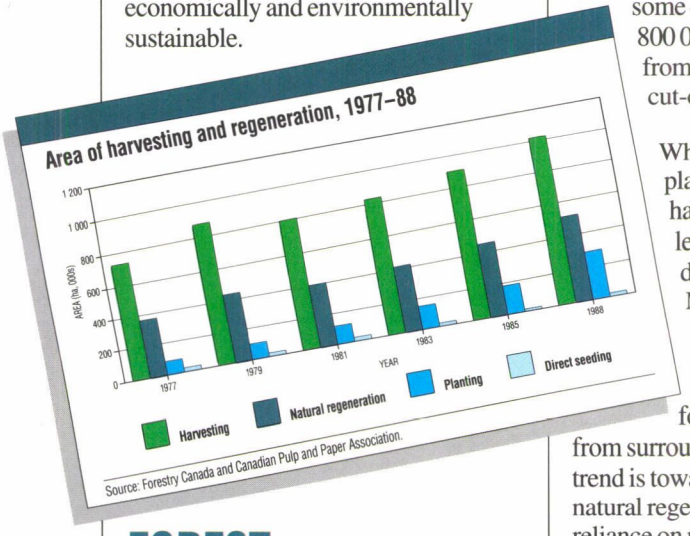
Soil degradation, through wind and water erosion and, to a lesser extent, salinization, soil compaction and loss of organic matter, costs Canadian farmers an estimated $600 to $900 million in lost production every year. Wind and water erosion is caused by a combination of factors, including weather conditions, cultivation of marginal farmlands, excessive tillage, monoculture and summer fallowing. In Saskatchewan and Alberta, about 5 million hectares (ha) of farmland are affected by erosion from water. In areas of intensive cultivation in central and eastern Canada, organic matter in soils, nature's raw material for sources of plant nutrients, is 30-40% lower today than under the forage rotation system common until the 1960s.

Secondary salinization of soils, which affects about 6% of improved agricultural land in the Prairies, is also associated with summer fallowing and long-term irrigation. Meanwhile, on moist clay soils, particularly in southern Ontario and the Lower Fraser River basin, inappropriate use of machinery compacts soils, impeding the movement of air and water essential to plant survival.



There is a growing recognition of both the environmental problems arising from some modern agricultural practices and of the practical solutions to them. Soil and water conservation programs, including the $150 million National Soil Conservation Program, have been implemented by federal and provincial governments. Through these

and other efforts, individual farmers are adopting practices that promote optimum productivity while reducing soil degradation. For example, increased use of hedgerows and terracing, reduced tillage and decreased summer fallowing help control erosion. Such efforts will help to achieve the balance required to make agriculture both economically and environmentally sustainable.



FOREST REGENERATION

The area of timber harvested each year in Canada is some 200 000 hectares more than the area that successfully regenerates to commercial standards. The importance of regenerating tree stands as living parts of forest ecosystems is widely recognized today. In addition to providing commercial timber, forests play a valuable role as wildlife habitat, in conserving water and soil, in moderating climate and in purifying the air.

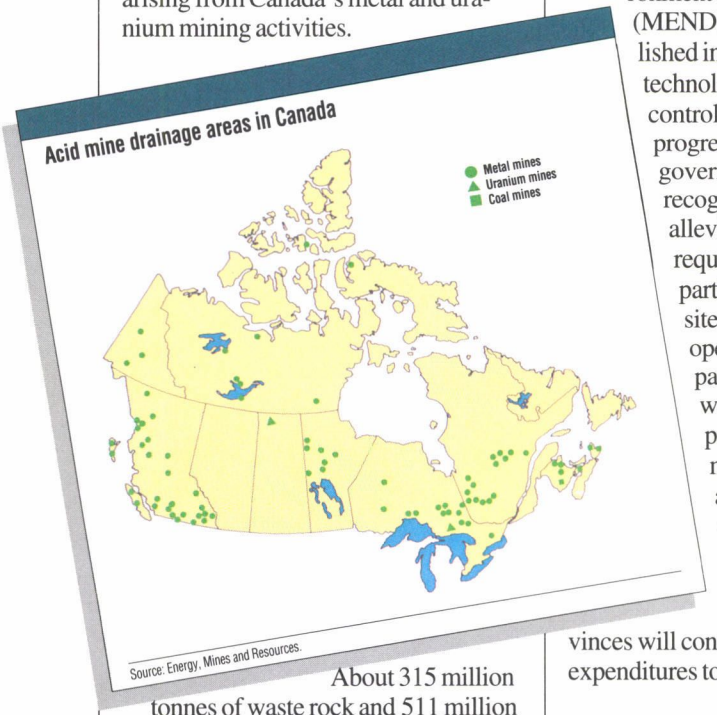
The area harvested annually in Canada has increased from approximately 700 000 hectares in the mid-1970s to over 1 000 000 hectares in 1988. This represents less than 0.5% of the country's productive forest land. Between 1975 and 1988, the area of forest land planted and tended almost tripled, from some 125 000 hectares to over 400 000 hectares annually. During the same period, the overall area successfully regenerated increased from some 450 000 hectares to over 800 000 hectares per year, or from 66% to over 80% of the cut-over forest land.

While the area of forest plantations planted annually has increased, it represents less than 0.2% of the productive forest land base. Most of the reforestation is achieved through natural succession, whereby the cut-over area is prepared for the germination of seed from surrounding trees. The recent trend is toward even greater use of natural regeneration since a strong reliance on plantation forestry would raise questions about forest biodiversity, vulnerability to insects and disease infestations, and the possibility of increased use of pesticides.

The provincial and federal forestry ministers are sponsoring a new national forest strategy, to be completed in 1992. Based on broad public input, the strategy will direct activities for the sustainable development of Canada's forests.

ACID MINE DRAINAGE

Acid drainage from the accumulation of waste rock and mine tailings — at some active and abandoned mines — is the most serious environmental problem arising from Canada's metal and uranium mining activities.



About 315 million tonnes of waste rock and 511 million tonnes of tailings with acid-generating potential are stored at active and abandoned mine sites across Canada. Of particular concern is the role of acid mine drainage in leaching metals which may be released into the environment and persist for many years. Acid generating wastes, or wastes with the potential to generate acid, are located at more than 100 mine sites - generally those where the minerals include iron sulphides.

The physical, chemical and biological processes controlling the generation of acid in mine wastes are becoming better understood as a result of industry and government research. For example, the government-industry Mine Environment Neutral Drainage (MEND) program was established in 1988 to develop new technologies to prevent and control acid drainage. While progress has been made, government and industry both recognize that finding ways to alleviate the problem still requires a great deal of effort, particularly in dealing with site-specific conditions. At operating mine sites, companies must treat tailings, waste rock and effluents to prevent or control acid mine drainage, including abandoned sites still owned by active companies. At orphaned sites, however, governments in various provinces will continue to face large expenditures to deal with the problem.

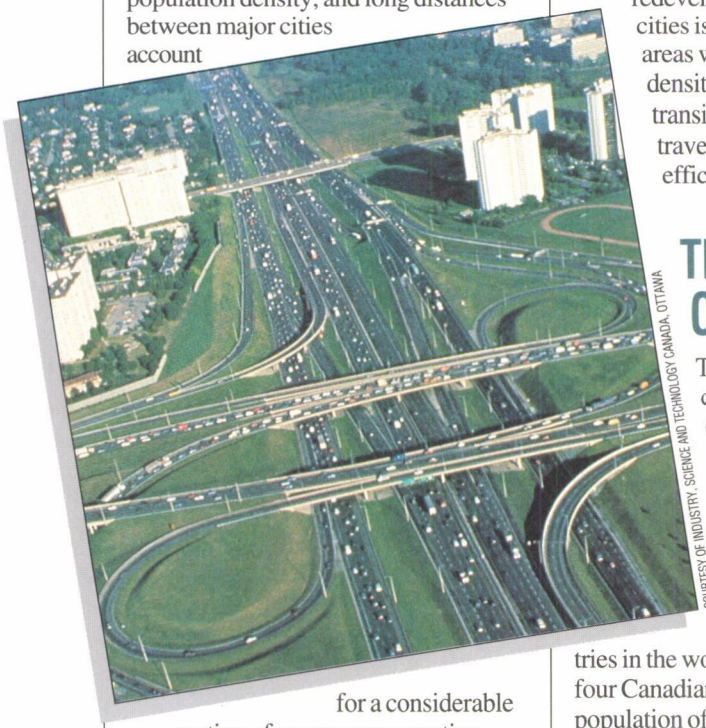
ENERGY USE AND LIFESTYLES

Every day, 7.0 million of Canada's 9.4 million commuters go to work in a private car — each of them consuming about 15 times more energy than a person using mass transit and other modes of transportation.

As of 1987, Canadian per capita energy use was the highest in the world: the equivalent of 291 gigajoules (GJ) a year. (One gigajoule of energy is about equal to a 30 litre gasoline fill-up.) This compared with 280 GJ in the United States and about 194 GJ in the U.S.S.R. Much of this energy comes from non-renewable sources, such as oil, natural gas and coal which contribute to environmental problems such as air pollution, acid rain and global warming.

Canada's cold climate, relatively low population density, and long distances between major cities account for a considerable portion of energy consumption. However, consumer preferences and lifestyles are also factors. The predominance of single-family homes in new suburban neighbourhoods, for example, leads not only to heating and cooling costs that are higher than in centrally-located townhouses, but also to longer drives for commuters. The overwhelming dependence on the private automobile for personal transportation within cities is another major factor.

Canadian consumers and industry made progress in energy efficiency during the oil crises of the 1970s and early 1980s. However, as oil prices declined, so did energy conservation efforts. As a result, per capita energy consumption in Canada has remained relatively unchanged since the mid-1980s. Nevertheless, urban infill, rehabilitation and redevelopment in some Canadian cities is resulting in multiple use areas with increased population densities that can encourage transit use, bicycle and foot travel, and greater energy efficiency for heating.



COURTESY OF INDUSTRY, SCIENCE AND TECHNOLOGY CANADA, OTTAWA

THE GROWTH OF CITIES

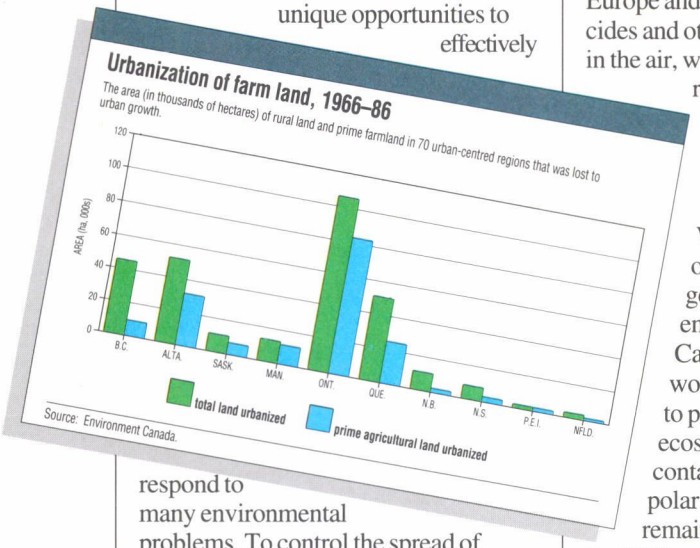
The growth of Canada's cities over the past quarter century illustrates that urban areas can be both the sources of, and solutions to, many environmental stresses.

Canada is one of the most urbanized countries in the world. Three out of every four Canadians live in centres with a population of 1 000 or more. Between 1966 and 1986, about 300 000 ha of rural land — three times the size of the built-up portion of the Toronto metropolitan area — were converted from rural to urban use by the 70 Canadian cities with populations of more than 25 000. Six out of every 10 ha of that

land were of high agricultural capability. This trend poses a serious problem. Despite Canada's vast size, only about 5% of the total land area is capable of producing crops of any kind, and a substantial portion of this high capability land is located near the nation's largest urban areas.

Equally important are the indirect effects of urbanization on nearby agricultural areas. Land value increases, higher property taxes, land use conflicts, absentee ownership of farmland and urban-related uses, such as gravel pits and golf courses in the countryside, can combine to seriously undermine the viability of a region's agricultural industry.

Although urban areas concentrate environmental stresses, they also provide unique opportunities to effectively respond to many environmental problems. To control the spread of urban areas into the country side, a variety of innovative urban planning measures have been applied in some Canadian communities. For example, mass transit, cycling and walking have been promoted by multiple use of land and increased residential densities. Savings in land, energy and municipal services have been realized by rehabilitating older buildings and neighbourhoods. In some new neighbourhoods, residential densities have been substantially increased through the use of smaller lots and alternatives to the single, detached house, such as "row" or "stacked" condominium and cooperative housing.

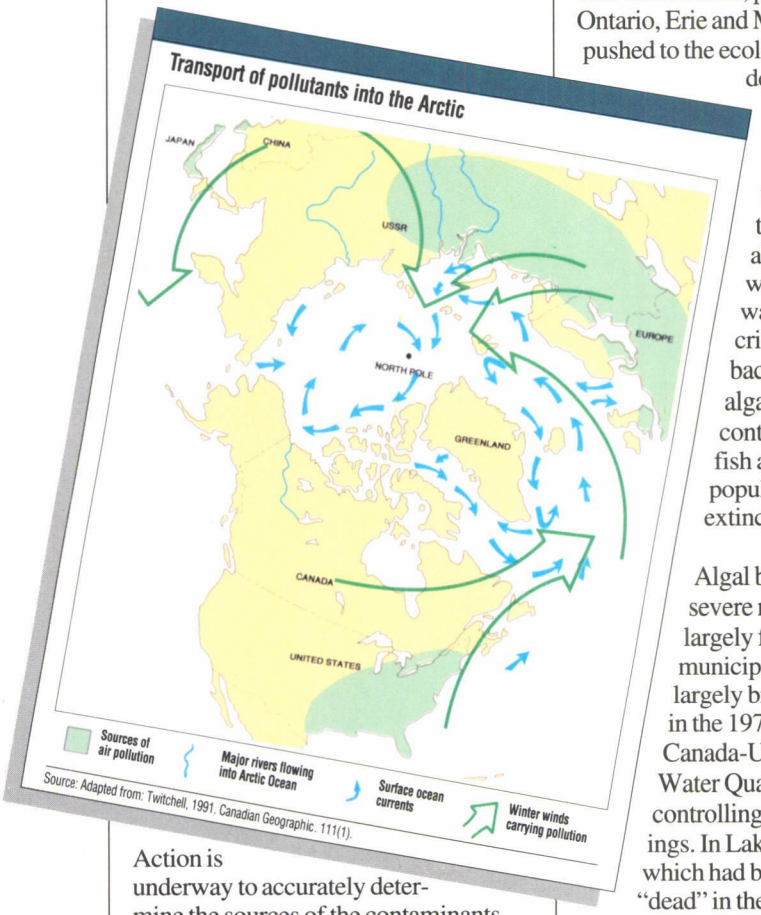


POLLUTION IN THE ARCTIC

Despite its remoteness, the Arctic has not escaped pollution from southern Canada, the United States, and even Europe and Asia. Lead, PCBs, pesticides and other contaminants are found in the air, water, soils and wildlife of the region, carried by winds high in the atmosphere, as well as by north-flowing rivers and ocean currents.

While concentration levels of these contaminants are generally lower in the Arctic environment than in southern Canada and most parts of the world, toxic contaminants tend to persist longer in the Arctic ecosystems. Organoclorine contaminants such as PCBs in polar bears, for example, have remained high in samples from the 1960s to the 1990s.

The higher up the Arctic food chain, the more concentrated many of these contaminants become. Elevated levels of some contaminants have been found at the top of the Arctic food chain, including in whales, seals, and caribou. This trend raises concerns for the health of native people in the Arctic: four out of five of them rely on the meat and fish they harvest from the Arctic sea and land.



Action is underway to accurately determine the sources of the contaminants and the risks they pose to the health of the Arctic ecosystem and its residents. This knowledge will help Canada and other nations develop effective domestic and international emission controls.

The initiative is one part of the Arctic Environmental Strategy, involving the federal government, the governments of the Yukon and Northwest Territories, and native organizations.

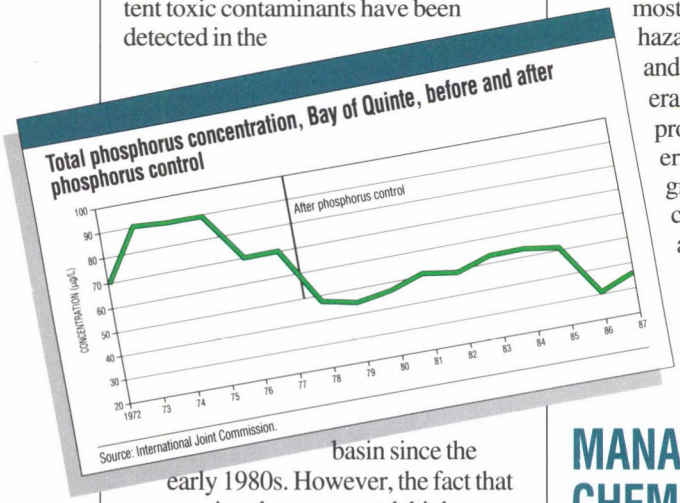
CLEAN-UP IN THE GREAT LAKES BASIN

The Great Lakes, particularly lakes Ontario, Erie and Michigan, have been pushed to the ecological brink by decades of pollution and other impacts of human activity. Since the late 1800s, the Great Lakes system, which contains almost 20% of the world's surface fresh water, has suffered crisis after crisis — bacterial contamination, algal blooms, toxic contaminants, declining fish and other wildlife populations, and even the extinction of some species.

Algal blooms, a sign of severe nutrient enrichment largely from industrial and municipal effluents, were largely brought under control in the 1970s through the Canada-U.S. Great Lakes Water Quality Agreement controlling phosphorus loadings. In Lake Erie, for example, which had been proclaimed "dead" in the 1960s, phosphorus levels declined 50% between 1972 and 1990. However, increasing levels of

nitrogen, primarily from land runoff and industrial effluents, now raise concern about a possible new round of nutrient enrichment in the basin.

In the waters and lake sediments of the basin, 362 chemical contaminants that are potentially toxic to humans and wildlife have been identified. Concentrations of toxic contaminants declined during the 1970s and stabilized in the 1980s. No new widespread and persistent toxic contaminants have been detected in the basin since the early 1980s. However, the fact that some toxic substances reach high concentrations in the upper levels of the food chain has lead to the closure of some fishing areas and to health advisories in other areas on consumption of certain fish species. More broadly, the recent federal report, *Toxic Chemicals in the Great Lakes and Associated Effects*, stated that while the precise nature and extent of the impact on human health of contaminants in the Great Lakes basin is unclear, elevated levels of contaminants do pose a threat to health. In 1991, the International Joint Commission called for virtual elimination of 11 of the most worrisome chemicals, including several that are considered "reproductive toxins", capable of damaging the human reproductive cycle.



While there are signs of progress in the fight to restore the overall health of the Great Lakes basin, much remains to be done. The next phase of recovery will be slow and costly. Remedial Action Plans are being developed for 43 priority "Areas of Concern" in both Canada and the United States — the sites of the most severe contamination from hazardous waste dumps, mills and sewage plants. The two federal governments, along with provincial, state and local governments, industries, interest groups and individuals are cooperating in developing and implementing the plans. Implementing the clean-up plans is expected to cost billions of dollars over several decades.

MANAGEMENT OF CHEMICALS

Every nine hours, on average, a new chemical product is introduced somewhere in the world — often with little understanding of its long-term impact on the environment.

An estimated 70 000 chemical products are in use world-wide, and as many as 1 000 new ones enter the market every year. Many are part of modern life,

commonly used in households and industrial plants, and on gardens, farms, and forests.

In recent years, there has been increasing concern about the impact of some of these products on the environment and human health. Some chemicals can pose threats at every stage of their "lifecycle" — from development and manufacture through transport, distribution, use and storage to their ultimate disposal. Storage and transportation usually present the highest risks. The 1989 fire at a PCB storage facility in St-Basile-le-Grand, Quebec, and the 1979 derailment of train cars carrying toxic chemicals in Mississauga, Ontario, are two well-known examples.

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Chemicals that are released into the environment may be carried by air and water, with some building up gradually in sediments and others accumulating in the food chain, particularly in the fatty tissues of animals. While the effects of chemicals in high concentrations are generally well documented, the environmental and health effects of long-term exposure to low concentrations are far less certain.

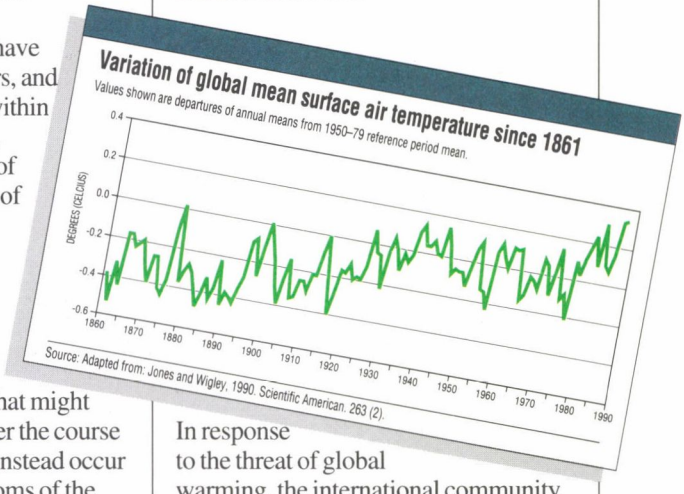
Government and industry have begun to introduce stricter regulatory and improved management practices for chemicals, though there is a long backlog of products requiring attention. The Canadian Chemical Producers' Association, through its Responsible Care Policy, has made a commitment to the responsible management of chemical products at all stages of a product's lifecycle so as to minimize adverse effects on human health and the environment. The *Canadian Environmental Protection Act* (CEPA) also establishes a lifecycle, or "cradle-to-grave", approach to managing chemicals. Under CEPA, 44 priority substances have been identified for assessment and, if necessary, regulation, by 1994.

GLOBAL WARMING

Since the dawn of the Industrial Age about 200 years ago, human activity has changed the atmosphere at a pace unmatched in history. Activities such as the burning of fossil fuels for energy and transportation, the clearing of forests, and, more recently, the production of synthetic gases such as chloro-

fluorocarbons (CFCs), have increased concentrations of "greenhouse" gases in the atmosphere, which trap some of the sun's energy. At the same time, average global temperatures have risen by about 0.5° C since 1900 — a trend which if it continues, will have implications for ecosystems in Canada and around the world.

Levels of carbon dioxide have increased 25% in the last 200 years, methane levels have doubled in the last 100 years, and CFC levels have doubled within the last 20 years. Although, Canada produces only 2% of the world's total emissions of greenhouse gases, it ranks among the highest in per capita emissions.



Should levels of greenhouse gases continue to rise, temperature changes that might have occurred naturally over the course of thousands of years may instead occur over mere decades. Symptoms of the problem may already be evident: the 6 warmest years ever recorded globally all occurred in the last 10 years. Scientists predict that without major changes in, for example, energy production, industrial activities and deforestation practices, average annual global temperatures could rise by another 1°C by 2025, and by 3°C over current levels by the year 2100.

Climate is a fundamental factor controlling the pattern of life on earth. Significant global warming will have consequences for entire ecosystems and their inhabitants. Sea levels could increase by 20 cm by the year 2030 and 65 cm by 2100 — enough to threaten low-lying coastal communities around the world, including several in Canada. The distribution of fish populations, forest growth and agricultural production could shift in response to changes in temperature and precipitation regimes. Droughts, for example, could become more frequent and more severe in the Prairies. The Great Lakes could enjoy longer ice-free navigation seasons, but be adversely affected by lower water levels.

In response to the threat of global warming, the international community is focusing on curbing emissions of greenhouse gases and preparing for changes which may occur. But the work is only beginning. An international framework convention on climate change is scheduled to be signed in 1992. As an active player in the global effort, Canada is committed to phasing out the production and use of CFCs by 1995, and stabilizing emissions of carbon dioxide and other greenhouse gases at 1990 levels by the year 2000.

OZONE DEPLETION

For years, chemicals used in some everyday household products have been destroying ozone in the stratosphere.

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Stratospheric ozone has a critical job: it protects the earth's surface from the sun's harmful ultraviolet-B (UV-B) radiation. But certain chemicals, particularly chlorofluorocarbons (CFCs), are now depleting the ozone layer. CFCs and related chemicals have been commonly used in refrigerators, fire extinguishers, air conditioners and production of foam insulation.

Since 1978, the concentration of ozone in the stratosphere has been declining at an average global rate of 0.2% to 0.3% a year. Scientists estimate that for every 1% reduction in the amount of ozone in the atmosphere, there will be a 2% increase in the amount of UV-B radiation reaching the earth's surface. That, in turn, could mean an increase in the rate of skin cancer of around 4%. As UV-B radiation affects the photosynthesis activity of plants, increased levels could also affect food production, forestry, and even the delicate balance of life in oceans.

Under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, and follow-up agreements, most nations in the world have agreed to end the production and importation of most ozone-depleting chemicals by the year 2000. Canada is expected to reach this target for CFCs by 1995. In addition, industry is now developing "environmentally friendly" alternative products to replace CFCs and other ozone-damaging chemicals. Even so, ozone depletion due to CFCs already in the atmosphere is expected to continue for another 30 to 40 years.

ACID RAIN

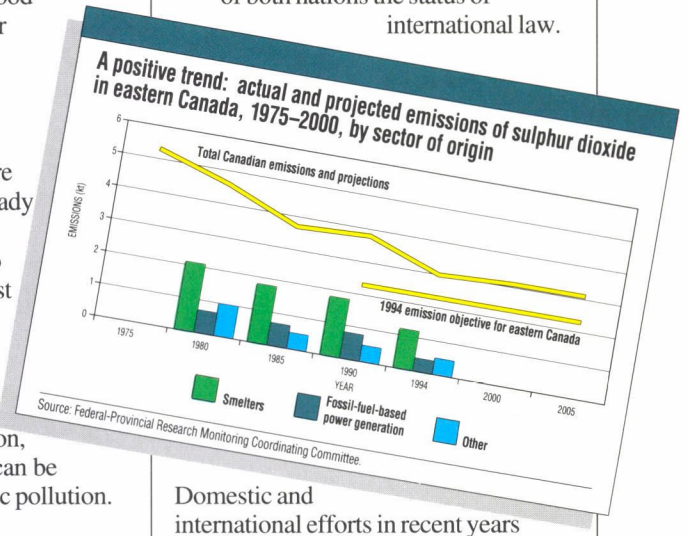
"Acid rain" gives a graphic image of dead lakes and dying forests. In 1970, Canadian smelters, power generating stations and other sources pumped 6.7 million tonnes of sulphur dioxide pollutants into the atmosphere. A greater amount of acidic pollutants came into Canada from coal- and oil-fired generating stations in the United States.

Over 46% of Canada is considered to be highly sensitive to acidic deposition. Much of this vulnerable area is in south-eastern Canada, where the largest amounts of acidic pollutants are deposited, and where some of the nation's most extensive lake systems, and some of the more productive forests, agricultural lands and fishery streams, are located. An estimated 775 000 lakes and 15 million ha of hardwood and mixed wood forests, for example, are exposed to significant levels of acidic pollution.

Scientists estimate that more than 14 000 lakes have already been "killed" by acidic pollution, "Acid Rain" also appears to be linked to forest declines. Exposure to these pollutants can aggravate health problems in some people, including bronchitis and asthma. In addition, buildings and monuments can be seriously damaged by acidic pollution.

In 1985, the federal government and the seven eastern most provinces launched emission control programs which will reduce the total 1980 levels of sulphur dioxide emissions from Canadian sources — 4.6 million tonnes — by about 50% by 1994. As of 1991, all seven provinces were on schedule and had met about 80% of the emission reduction targets. By the year 2000, Canada's sulphur dioxide emission control program will be expanded to implement a permanent national cap of 3.2 million tonnes of emissions annually. In 1990, the U.S. Clean Air Act was amended to include a 10 million ton average annual reduction in American sulphur dioxide emissions by the year 2000. This is expected to reduce the flow of American sulphur dioxide emissions into eastern Canada by about 50%. In 1991, the Canada/United States air quality agreement was signed. Among other initiatives, this agreement gave the acid rain programs of both nations the status of international law.

A positive trend: actual and projected emissions of sulphur dioxide in eastern Canada, 1975–2000, by sector of origin



Source: Federal-Provincial Research Monitoring Coordinating Committee.

Domestic and international efforts in recent years have been successful in reducing sulphur dioxide emissions. The combination of Canadian and American emission control actions are expected to eliminate the majority of damage related to acid deposition in aquatic ecosystems in Canada. The most recent national assessments of aquatic resources, however, show that critical load values for wet sulphate deposition may be less than 8 kg/ha a year,

especially in parts of Atlantic Canada. Consequently, further reductions in acid deposition may be necessary to fully protect all lakes and streams, particularly in Atlantic Canada. Research and monitoring are being continued to verify the progress and determine whether additional emission control actions are warranted. Greater research emphasis will be placed on the areas of forestry and human health impacts.

SOLID WASTE MANAGEMENT: THE LOWER FRASER RIVER BASIN AS AN EXAMPLE

Canadians are among the leading "garbage producers" in the world. Citizens produced some 30 million tonnes of municipal solid waste in 1988, including 16 million tonnes of residential waste. Indeed, Canadians "throw away" about 1.8 kg of residential waste per person every day. The most common material in municipal waste is paper — 4.6 million tonnes annually. More than 80% of municipal waste ends up in landfill sites, which can contaminate local soil and groundwater. Incineration, another approach to solid waste management with appropriate emission controls, however, can produce quantities of ash which often must be disposed of in facilities licensed to treat hazardous waste.

The experience of the densely populated lower Fraser River basin illustrates the challenges posed by solid waste management. As the region's population has grown, so too have the solid waste problems. In 1988, about 1.3 million tonnes of solid waste were generated in the lower Fraser River basin, an increase of 11% from 1982. During the same period, the volume of solid waste recycled increased from 6% to 10%. Yet population growth threatens to outstrip the capacity of existing and planned solid waste systems in the region as early as 1995, even with successful recycling efforts. For example, Greater Vancouver has begun trucking municipal waste about 300 km to a landfill site in the British Columbia interior.

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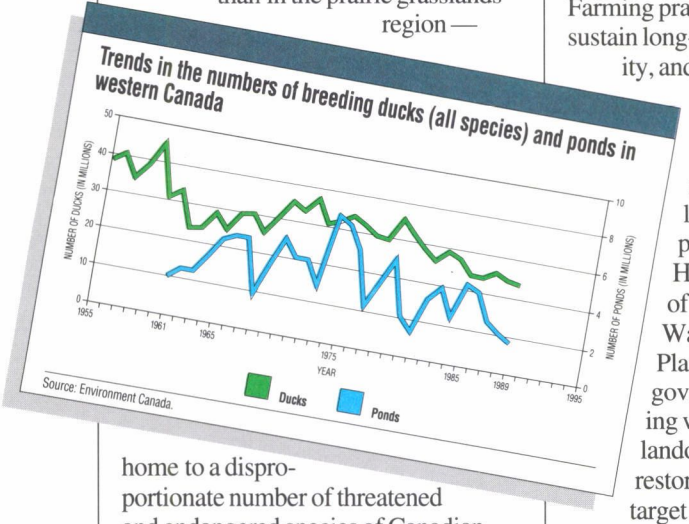
Long-term approaches to solid waste management involve reduction, reuse, recycling and recovery programs. Many communities in Canada, including those in the lower Fraser River

basin, have introduced programs such as curbside pickup for recycling. About 10% of municipal waste in Canada was recycled in 1988. Waste exchanges have also been established by private groups in many regions. At the national level, government and industry are committed to reducing the weight of their discarded packaging to 80% of 1988 levels by 1992.

HABITAT CHANGE ON THE PRAIRIES

Human activity is threatening the habitat of many of Canada's 72 000 known species of wild plants and animals. Nowhere is the threat more evident than in the prairie grasslands region — home to a disproportionate number of threatened and endangered species of Canadian wildlife.



Over the last century, the prairie grasslands have been radically transformed. Only a small fraction of the region remains in its native state. About 87% is now farmland — with 15% of the nation's population, the region has 71% of Canada's total cultivated land area. Virtually every major river system in the region has been intensely developed for power generation, irrigation, flood protection and water supply.

Wildlife cannot survive without adequate, healthy habitat. About 71% of the wetlands in the prairies — critical habitat for more than half of North America's waterfowl — have been lost, largely as a result of drainage or other agricultural uses. Industrial and municipal effluents, and climate change pose additional threats to prairie habitats.

One hundred years of change on the prairie grasslands cannot be reversed, but work has started in the region to reduce further habitat damage, and to preserve and restore critical habitats. Farming practices are being altered to sustain long-term agricultural capability, and provide food and shelter for wildlife. For example, hedgerows, wetlands and water courses are being maintained, and marginal lands are being left in pasture. Under the Prairie Habitat Joint Venture, part of the North American Waterfowl Management Plan, governments and non-government groups are working with farmers and other landowners to preserve and restore waterfowl habitat, with a target 1.45 million ha by the year 2000. The Prairie Conservation Action Plan, sponsored by conservation groups and the provinces, also emphasizes the study and preservation of critical habitat for threatened and endangered species in the region.

TOWARDS BETTER ENVIRONMENTAL INFORMATION

Canadians are only beginning to understand the full environmental impact of government, industry and consumer practices. Sometimes, what people don't know **can** hurt them.

Over the past several years, SOE reporting has become a tool for helping Canadians understand their changing environment. However, it has the potential to become an even more powerful and timely source of environmental information for decision makers in all walks of life. This concluding section outlines four steps that are being taken to strengthen SOE reporting in Canada.

Environmental Monitoring

Environmental monitoring, the scientific collection and analysis of data over time, is the foundation for all SOE reporting. Monitoring provides information on past and present environmental trends, and allows projections of future conditions.

By 1993, a long-term state of the environment monitoring and assessment capability will be established. As the consistency, uniformity and integration of environmental data are improved, the monitoring network will provide the capability to study resources at risk, ecosystem response, and the impact of major disruptions to ecosystems.

Environmental Indicators

Monitoring also provides the basis for developing environmental indicators. Indicators can convey complex information in a clear and understandable manner. The gross national product and the unemployment rate, for example, are indicators that help measure the state of the economy. In Canada, comparable indicators are being developed to assess the state of the environment. The SOE reporting group in Environment Canada has developed a preliminary set of about 40 indicators, published in *A Report on Canada's Progress Towards a National Set of Environmental Indicators*. A more comprehensive set of indicators to help measure progress towards environmental goals is to be published regularly by the federal government, starting in 1993.

National Environmental Network

A national environmental network is to be established by 1994 to provide regular access to the latest available SOE information. Using state-of-the-art technology, the network will link the federal government and participating provincial and territorial governments, universities, the private sector and non-governmental organizations.

National State of the Environment Organization

Over the long run, objective and comprehensive SOE information can be provided most effectively through an organization operating at "arm's length" from government, rather than as part of any particular department. The SOE reporting group currently within Environment Canada will become a national SOE reporting organization, at "arm's length" from the federal government within the next few years.

Conclusion

As stewards of a significant portion of the planet's air, water, land and wildlife, Canadians have a responsibility to ensure that these resources are protected. More and more, people across Canada are recognizing this responsibility and are seeking accurate, up-to-date information about the state of the environment to help them make environmentally responsible choices in all aspects of their lives.

The State of Canada's Environment helps meet this need. Many institutions, governments, environmental groups and industries have contributed data and expertise to its development. Some federal departments, provincial governments, municipalities and industry associations have produced related environmental information reports.

Only through such broadly-based efforts can SOE reporting provide the kind of environmental information that Canadians need and want to make better decisions in their corporate boardrooms, government offices, factories, schools, shopping centres and homes.

ACKNOWLEDGEMENTS

This Highlights Report was compiled and written by Tom Shillington, consultant (Ottawa) and Wayne Bond of State of the Environment Reporting, Environment Canada (Ottawa).

Direction and advice was provided by the staff of State of the Environment Reporting. Each Highlight was thoroughly reviewed by the respective federal department and by the Services within Environment Canada.

Related Publications

The third edition of *Human Activity and the Environment* was published by *Statistics Canada* in October 1991. This publication contains authoritative information about the population, the environment, and socio-economic activity in Canada, presented in a systematic manner relevant to environmental analysis.

Health and Welfare Canada is preparing a document on the subject of human health and the environment. This report, titled, *A Vital Link: Health and the Environment in Canada* is scheduled for release in the spring of 1992. It will examine how Canadians are exposed to environmental contaminants, how human health is affected by that exposure, and what is being done to address such concerns.

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