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Update

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A Word from the Editor

This issue of *Update* features articles on a variety of departmental activities in the fields of research, forecasting, clean up and heritage conservation.

Two new computer models have recently been used to help predict the impacts of environmental emergencies on the Grand Banks ecosystem, off the Newfoundland coast, and in the Pacific waters.

In the Arctic, Environment Canada has officially opened the first permanent research station to measure the concentration of industrial pollutants like CO₂, a "greenhouse gas" which reduces the ozone layer. This initiative is timely since Canada was the first nation to ratify the Vienna Convention for the protection of the ozone layer.

The Great Lakes are also highlighted in this issue. A new Communications Centre has recently been established to act as both a day-to-day source of lake-level data and as an emergency flood-watch centre, while remedial action plans are being developed to clean up areas of concern in the Great Lakes Basin.

The impact of the North American Waterfowl Management Plan and of the Canadian Atlantic Storms Program is also featured, as well as Province House in Charlottetown, the cradle of Confederation, which has been restored to its 19th-century elegance.

Readers of *Environment Update* will notice two new sections which we hope to include in future issues.

The first, *Environment News*, gives an overview of recent accomplishments by the Department. Among others, the first Governor General of Canada, Sir Charles Stanley Monck was commemorated; Riding Mountain National Park was declared a Unesco World Biosphere Reserve; PROJECT STRATOPROBE was launched; new regulations for migratory bird hunting were announced.

This issue also introduces *Update Reviews*, a quick look at a cross section of Environment Canada's latest publications. A new wall map showing federal holdings is now available; the annual report on carbon dioxide and climate change was released this summer; the report of the federal-provincial task force on expanded use of low sulphur coal in Ontario was also published.

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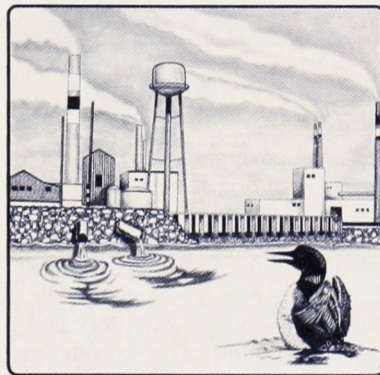
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Update

The world has witnessed in the last several years, the growth of an environmental ethic. Canadians and Environment Canada have very much been a part of this growth. In keeping with its mandate, Environment Canada has always worked hand-in-hand with all those who strive to protect and to enhance the environment.

It is in this context that the Communications Directorate publishes *Environment Update* four times a year.

Each issue of *Update* features a specific environmental topic and contains articles from all parts of the country in order to highlight the various services and projects carried out by the Department. Anyone wishing to reproduce articles may do so. We ask that credit be given to this publication.

Readers who wish to comment or require further information can write to the Editor, *Environment Update*, Communications Directorate, Environment Canada, Ottawa K1A 0H3.

Environment News

Rideau Hall and Canada's first Governor General commemorated

The Governor General of Canada, Jeanne Sauv , and the Minister of the Environment, Tom McMillan, unveiled two historic plaques at a special ceremony at Government House last July.

The bronze Historic Sites and Monuments Board of Canada plaques commemorate the national historic significance of Rideau Hall and of the first Governor General of the Dominion of Canada, Sir Charles Stanley Monck.

Rideau Hall was built in 1838 by Thomas MacKay, a masonry contractor who also built the lower locks of the Rideau Canal. It was enlarged in 1865 as a temporary residence to accommodate Governor General Monck. The Government of Canada purchased the house in 1868 for \$82,000. While the Citadel at Qu bec has been used as a summer residence by Canada's Governors General, only Rideau Hall is designated the official Government House.

Sir Charles Stanley Monck was born in 1819 in Tipperary County, Ireland. In 1861 he was appointed Governor General of British North America. During his tenure, Lord Monck helped to maintain peace between British North America and the United States at the time of the American Civil War. He also played an important role in the events that led to Canadian Confederation in 1867. ■

Pointe-au-P re marsh declared National Wildlife Area

The salt marsh at Pointe-au-P re has been designated a National Wildlife Area. This 44th National Wildlife Area is characterized by the high number of waterfowl that nest and feed there. The marsh is used by hundreds of waterfowl species, including double-crested cormorants, great blue herons, Canada and brant geese, and various ducks and gulls.

The designation of this National Wildlife Area is in keeping with the thrust of the North American Waterfowl Management Plan, the framework for which Canada and the United States signed an agreement last May. The plan proposes a far-reaching management agreement to be undertaken by the two countries to bring seriously declining waterfowl populations in North America up to approximately 100 million birds. ■



1986 migratory bird hunting regulations

New regulations governing the 1986 migratory game bird hunting seasons, bag and possession limits are in place for all provinces and territories across Canada.

Posters and abstracts displayed in post offices across the country summarize the regulations by province and territory and provide additional information to waterfowl hunters.

The regulations were enacted by the federal Environment department's Canadian Wildlife Service, the agency responsible for the management of migratory birds in Canada.

"Hunting regulations provide the degree of protection required to ensure that migratory bird populations are maintained or increased when declines are evident," Environment Minister Tom McMillan said. "In addition, the funds obtained through permit sales are used to protect and improve habitat for wildlife."

Migratory game-bird hunting permits are on sale at post offices. The \$7.50 fee, the same as last year, includes a \$4 habitat conservation stamp, already affixed to the permit.

Last year 385,000 migratory bird hunting permits were sold across Canada. ■

Misfuelling campaign

The second phase of a broad advertising and public awareness campaign to alert motorists to the dangers of misfuelling – using leaded gasoline in cars designed to run on lead-free fuel – began in August and will continue throughout the fall.

The \$1 million, two-year campaign, is co-sponsored by Environment Canada and the Petroleum Association for Conservation of the Canadian Environment (PACE). The first year focuses on the health, environmental and economic costs of misfuelling and the second will be devoted to proper car maintenance and pollution reduction. Mailings, advertisements, distribution of literature at service stations, etc. will be used to reach motorists.

The campaign, officially launched in June in Montreal, will provide the basis for a wider program to involve the provinces, consumer and automobile associations, car manufacturers and automobile servicing companies. ■

World Biosphere Reserve

Riding Mountain National Park, Manitoba, has been designated a World Biosphere Reserve by Unesco's Man and the Biosphere Program.

Biosphere reserves are representative examples of landscapes and ecological systems, each with characteristic plants, animals and human uses, which, ideally, have a core of protected natural habitat surrounded by a buffer zone affected by many different human activities. Such a mix provides ideal study material on the impact of humans on their environment and vice versa.

Riding Mountain National Park is located in a transition area stretching from the Manitoba lowlands to the Saskatchewan Plain. It includes a section of the Manitoba Escarpment that rises abruptly 475 metres from the lowland. There are headwater sources for 13 watersheds within the park, now basically an island of natural landscape surrounded by agricultural lands and small rural towns.

As of April 1986, there were 252 biosphere reserves in 66 countries around the world. There are now four in Canada: Waterton Lakes National Park, Alberta; Mont-Saint-Hilaire, Quebec; Riding Mountain National Park, Manitoba and Long Point, Ontario, on the Lake Erie shore. ■



1986 Wildlife Habitat Conservation Stamp

Canada's 1986 Wildlife Habitat Conservation Stamp was launched last August by federal Environment Minister Tom McMillan.

"This stamp will provide Canadians with both an attractive collectible and a means of contributing to the survival of Canada's wildlife," said Mr. McMillan. "Wildlife habitat conservation stamps generated well over \$2 million last year — obviously, this program has captured Canadians' imaginations and we look forward to raising even more funds this year to devote to habitat projects."

Non-government wildlife groups across the country are selling the \$4 stamp. It will also be available through Canada Post philatelic counters and mail order service. Migratory game-bird hunters across the country are required to purchase the stamp along with their hunting permits.

Proceeds from the sale of the stamp will go to Wildlife Habitat Canada, an independent non-profit organization, established to support wildlife habitat improvement and protection projects across Canada.

This second of the series of Wildlife Habitat Conservation Stamps, "Canvasbacks in Spring", is reproduced from a painting donated by internationally recognized Canadian wildlife artist J. Fenwick Lansdowne. ■

Canadian research balloon to study ozone in the atmosphere

In August, Canada launched a 20 thousand cubic metre helium-filled research balloon from Ainsworth, Nebraska, to study the ozone layer.

A team of ten research personnel from Environment Canada's Atmospheric Environment Service, Downsview, Ontario sent the balloon payload up 29 km into the stratosphere where it took measurements of ozone and other gases.

The Canadian experiment, known as PROJECT STRATOPROBE, is linked to parallel measurements being carried out by the United States aboard a satellite under the program SAGE II.

"The project proves that Canada, the first nation to ratify the Vienna Convention for the Protection of the Ozone Layer, is deeply interested in co-operating fully in research and is committed to taking action before irrevocable damage is done," said Environment Minister Tom McMillan.

The STRATOPROBE balloon carried an infrared remote sensing instrument which measured various gases by their own spectroscopic "fingerprint" in the atmospheric spectrum. By studying the intensity of the fingerprint, scientists can monitor variations in the concentration of atmospheric gases with altitude.

The balloon also measured the absorption of infrared radiation by chlorofluorocarbons (CFCs) in the lower atmosphere. Improving our knowledge of this process is important because CFCs are among the "greenhouse gases" whose increasing concentrations are expected to lead to significant climate warming over the next several decades. ■



Wildlife '87: year of wildlife conservation

Next year, 1987, has been designated a year of wildlife conservation in Canada, Environment Minister Tom McMillan announced last July while speaking at the annual meeting of the Canadian Nature Federation.

Spearheaded by the Canadian Nature Federation, Wildlife '87, as it is to be known, will be a special year for recognizing the importance of wildlife conservation in Canada and will be celebrated with activities throughout the year.

"I am particularly pleased that non-government wildlife groups have taken this initiative and will be playing the lead role in making Wildlife '87 a success," Mr. McMillan said.

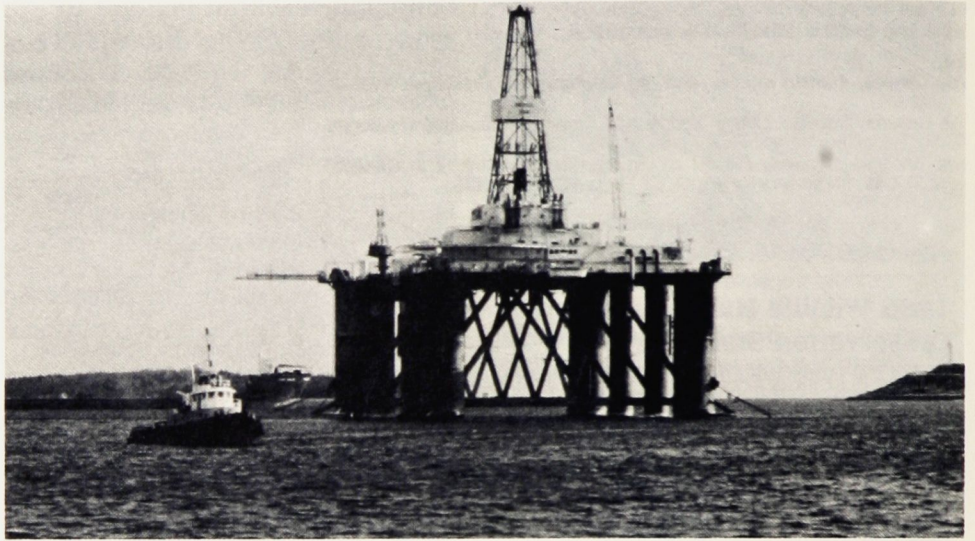
The year will mark a number of significant national anniversaries, notably the establishment, by Sir John A. MacDonald on June 8, 1887, of the first migratory bird sanctuary in Canada at Last Mountain Lake, Saskatchewan.

A national committee comprised of representatives from major non-governmental organizations has been established to facilitate communication and co-ordination among the many groups and organizations across the country. Environment Canada's Canadian Wildlife Service will provide a secretariat for the national committee.

All participating organizations will include the theme "Wildlife '87: Gaining Momentum" in their 1987 programs. ■

Modelling the Grand Banks

A computer model simulating the ecosystems of the Grand Banks has been developed to test the various possible environmental impacts of oil spills and overfishing on the Bank. The Canadian Wildlife Service of Environment Canada has been assisting the Department of Fisheries and Oceans in developing the project over the past three years.



The computer model will help biologists to understand how the various components of the Grand Banks' ecosystems interact.

The computer model will help biologists to understand how the various components of the Grand Banks' ecosystems interact, enabling them to predict the effects of human disturbances primarily related to offshore oil industry activity, and the intensive new fisheries for species central to the marine food web.

The Canadian Wildlife Service's involvement is related to its concern for the management and conservation of seabirds, which are highly vulnerable even to small oil spills. Offshore oil production will inevitably increase the potential hazards. Since the Grand Banks are a crossroads in the North Atlantic for seabirds not only from Newfoundland but from as far away as the High Arctic, Russia and Antarctica, oil spills off Atlantic Canada could have global repercussions on some species. The model could, for example, assess the potential impact of fishing capelin, the principal food source for seabirds in Newfoundland waters.

The computer model takes into account a variety of factors including currents, cloud cover, the concentrations of dissolved nutrients, the timing of the annual production cycles of phytoplankton, and of the herbivorous and carnivorous zooplankton, and higher predators such as cod, seals, whales and seabirds. The recycling of organic matter, by way of the bottom sediments and water columns, the organisms living on or in the ocean bottom and upwelling, are also considered.

Although more testing will be done to refine the accuracy of the model, a workshop held earlier this year showed that the model works. The participants, including biologists and oceanographers from government, universities and the private sector, tested several simulations. One involved the medium- to long-term effects of an oil spill under average weather conditions; another was a test of a worst-case scenario. The primary use of the model will be to predict long-term impacts on the environment that may be caused by reductions in phytoplankton productivity and the mortality of fish eggs and larvae, in order to predict what will happen to zooplankton and fish populations, and, ultimately, the fisheries industry several months or years in the future.

The Canadian Wildlife Service expects that the model will provide answers to several key questions. For example, if capelin stocks are reduced, will seabirds be able to compete with cod, seals and whales for the food that remains? ■

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Computer game technology at work

On the computer screen an oil slick oozes toward the coastline and then coils back with the tide. The viewer watches intently as the screen shows in minutes the movement of the oil during the next ten hours.

Not a sophisticated computer game, but a unique tool, this micro-computer spills-modelling program helps the Conservation and Protection Service (C&P) in Pacific/Yukon region forecast how an oil spill will move in the water given the winds, currents and tides of the site.

In use since February 1985, this system underwent its most severe test last December when the Alaska oil tanker *Arco Anchorage* went aground near Port Angeles, Washington, 25 kilometres south of Vancouver Island. More than 400,000 litres of crude oil leaked into Juan de Fuca Strait — the largest spill ever in these waters.

Winter fog made air surveillance impossible. The black slick of crude oil was spreading in the rapidly changing currents. Yet, we remained confident it would not reach Canadian shores as long as the predicted weather patterns held.

Fred Beech, a member of the Environmental Emergencies Group at C&P, says the *Arco Anchorage* incident proved the computer program was invaluable.

"The computer showed we wouldn't face significant problems with this spill. We knew, given the tides and wind, it could be cleaned up before it hit Vancouver Island."

This innovative system enables us to quickly obtain the complex tidal data so crucial for spill clean up. In the past, we had to rely on the Institute of Ocean Sciences (IOS) in Sidney, B.C. where an oceanographer required about two hours to extract the information from a mainframe computer.

In addition to saving time, the computer program helps pinpoint where and when to bring in clean up equipment. To forecast spill movement, the user simply punches in the longitude and latitude of the spill, the wind speed and direction, and immediately the screen draws a map of the area showing in lapsed time the hourly movement of the oil. The Department then relays the information to other federal and provincial agencies jointly responding to environmental emergencies.

"It's a great predictive tool we never had before, especially when it's bad weather and we can't get observations from the air," says Beech.



Fred Beech

The program also make a great detective, says Beech. Not only does the system forecast a spill's movement, it can work backwards and trace a spill to its origins. This feature is useful for tracing hit-and-run spills.

"A possible scenario would be if oil hits a beach in Nanaimo, we can hindcast it back to where and when it was dumped, and see which ships passed through that point of origin."

The computer modelling focuses on the most travelled waters along Canada's West Coast.

The computer modelling focuses on the most travelled waters along Canada's West Coast. About 90% of all inbound vessel traffic headed for Vancouver and the Puget Sound pass through Georgia Strait or Juan De Fuca Strait. Although major spills have been rare, they are an ever-present risk because of the heavy marine traffic. Also, the currents in the Straits of Juan de Fuca and Georgia are extremely complex due to the winds, tides and continuous inflow from the Fraser River.

The idea of a micro computer program sprang from the highly successful manual, *A Sailing Atlas for the Strait of Georgia and Juan de Fucas*, published by the Canadian Hydrographic Service in 1983. Based on 15 years worth of data, the atlas gives detailed vector plots of hourly currents through typical tide cycles.

Pacific Ocean Sciences Ltd., a B.C. consulting firm, proposed that a micro computer program go one step further and visually display the tidal currents, including the variables of wind and estuarine currents. The study was jointly financed by Environment Canada, the Institute of Ocean Sciences and the Department of Supply and Services.

At present, the Department is the sole user of the spills modelling program. Despite its obvious value, the system has not been duplicated elsewhere because its large memory (seven disks) requires a dedicated computer — an expense few agencies can afford.

However, Environment Canada shares the time-saving system with other federal and provincial agencies, assisting the Canadian Coast Guard, for example, during searches for boats or persons overboard.

The computer system has also increased our effectiveness at tackling smaller spills. When an oceanographer was the only source of tidal information, calls were limited to the larger spills. Now we can use the spills modelling technique to plot even minor slicks.

"The system adds tremendously to our capability," says Beech. ■

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A first in the high Arctic

Canada's first permanent research station for the continuous monitoring of background air pollution was officially opened at Alert, N.W.T. on August 29, 1986 by Mr. Howard Ferguson, Assistant Deputy Minister for the Atmospheric Environment Service. The opening of this new research facility in the high Arctic signifies Environment Canada's commitment to the Canadian environment and to that of the international community at large. The laboratory is part of an international network of stations — in Australia, the United States, Japan, France, Germany, Norway and Sweden — co-ordinated by the World Meteorological Organization under its Background Air Pollution Monitoring Program (BAPMoN) to study the long-term effects of pollution on our atmospheric environment. The opening of this lab marks the end of several years of planning and co-ordination and the beginning of a new phase of continuous monitoring in Canada.



Because of its isolated location at 82° N 30', 62° W 20' on the north-eastern tip of Ellesmere Island, Alert is ideally suited to the monitoring of global atmospheric pollutants. If the pollutants are present in the atmosphere here, far removed from the major industrial regions of the northern hemisphere, then they represent a contribution to the background pollution of the northern hemisphere as a whole.

Because of its isolated location Alert is ideally suited to the monitoring of global atmospheric pollutants.

The purpose of this laboratory is to measure the concentration of industrial pollutants, for example, carbon dioxide, halogenated organic compounds and sulphates, and to monitor the changes in their concentrations over time. Increases in the atmospheric concentration of carbon dioxide, a common by-product of fossil fuel burning, have been the focus of concern for several decades now because of the "greenhouse" effect. Carbon dioxide acts as a filter in the sky permitting sunlight to enter the atmosphere but preventing the earth's heat from radiating back into space.

Increasing the concentration of carbon dioxide increases the insulating effect of the atmosphere. One of the consequences of this will be a warming of the earth's climate on a scale unprecedented in recorded history. Recently methane and chlorofluorocarbons, used in refrigerants, solvents and plastic foam, have been receiving attention as "greenhouse gases".

Chlorofluorocarbons are also important because of their effect on the ozone layer which protects us from the harmful effects of ultraviolet radiation. It has been estimated by the United States Environmental Protection Agency that a reduction of 2.5% of the ozone layer would result in a global increase of 470,000 additional cases of non-melanoma skin cancer each year. In a recent issue of the science journal, *Nature*, U.S. scientists reported a 30% reduction in the ozone layer over Antarctica. However, our own scientists found no corresponding decrease in the ozone layer in the north polar region during an experiment conducted at Alert in April of this year. Although Canada and the United States have banned the use of chlorofluorocarbons in aerosol spray cans since 1980, industrialized nations use about 700,000 tonnes each year, most of which eventually gets into the atmosphere.



Canada: First nation to ratify Vienna Convention

Both Canada and the United States, under the United Nations Environment Program, have signed a convention on the protection of the stratospheric ozone layer and are currently in the process of drafting a global control protocol.

The new laboratory will also study another type of pollution, aerosols, which cause a phenomenon known as Arctic haze. Arctic haze is caused by a man-made mixture of gases and particles consisting mainly of soot, metals, and organic and acidic sulphates. The concentration in the Arctic atmosphere of these by-products of industrial processes have increased by over 75% since 1956 paralleling a doubling of acidic sulphur dioxide emissions in Europe and the Soviet Union. These acidic ions are the major components of what is called acid rain or, in the case of Alert, acid snow. How acidic gases and aerosols make their way into the Arctic environment and how widespread they are have been the focus of two recent international experiments involving Norway, Sweden, West Germany, the United States and Canada. Canadian and American researchers have found evidence of man-made pollutants in layers as high as 6000 metres in the atmosphere over Alert.

The new laboratory will also study another type of pollution, aerosols, which cause a phenomenon known as Arctic haze.

The physical facilities consist of a 4-metre by 9-metre laboratory with twin 10-metre towers attached to one end of the laboratory. The laboratory is located 50 metres East-North-East of the main meteorological tower. This tower is equipped with instruments to measure temperature and wind at five levels – 2m, 5m, 10m, 20m and 40m. Humidity is measured at the 2-metre level. Both gaseous and aerosol pollutants can be measured. ■

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On June 4, 1986 Canada became the first nation to ratify the Vienna Convention for the Protection of the Ozone Layer. The Canadian Instrument of Ratification was deposited at the United Nations in New York and announced by Secretary of State for External Affairs Joe Clark and the Minister of the Environment, Tom McMillan.

Under the terms of the Convention, participating nations commit themselves to protect human health and the environment from the adverse effects resulting from modifications to the ozone layer. The Convention provides for international co-operation in research, monitoring, scientific assessment and the exchange of information on matters pertaining to the status of the ozone layer.

Under the terms of the Convention, participating nations commit themselves to protect human health and the environment from the adverse effects resulting from modifications to the ozone layer.

Even small changes in the ozone layer are important: a 1% depletion of ozone leads to a 2% increase in ultraviolet radiation and a 4% increase in skin cancer. Recent calculations suggest ozone depletions of more than 10% in the next 70 years if chlorofluorocarbon (CFC) emissions continue to grow. Recently an as yet unexplained 30% reduction in the Antarctic ozone layer was detected.

What are CFCs? CFCs are gases used to propel aerosol sprays, manufacture foam plastics, and operate refrigerators, air conditioners and heat pumps. They are man-made and do not occur in nature.

What do they do? In the upper atmosphere these gases are broken down by ultraviolet radiation, and release chlorine. Chlorine depletes the ozone layer, which normally protects the earth from

Because man is entirely responsible for the introduction of CFCs into the environment, it is possible to control their manufacture and emission. However their extremely long life (approximately 100 years) means that action must be taken decades in advance. It is clear that the combined impact of CFCs both on the ozone layer and on global climate is reason enough to raise their importance on the global environmental agenda.

In announcing the Ratification, Mr. McMillan said, "Consistent with our general concern about toxic burden in the atmosphere, Canada has been one of the leading nations in research, monitoring and regulatory measures to protect the ozone layer. Canada operates the World Zone Data Centre for the World Meteorological Organization. A Canadian remote-sensing instrument, the Brewer spectrophotometer, is being sold internationally to modernize the global network of ground-based ozone layer measurements. Since 1980, regulations under the Environmental Contaminants Act have banned the use of CFCs in hairsprays, anti-perspirants and deodorants. The use of these chemicals in Canada has been reduced by 45%.

International efforts to protect the ozone layer have already begun. A series of socio-economic workshops and conferences are expected to result in a draft protocol to the Convention in 1987. ■

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harmful levels of ultraviolet radiation. Increased ultraviolet radiation increases the incidence of skin cancer, decreases human immune response, and would decrease production in some of the world's most important food crops: wheat, rice, corn and soybeans. CFCs also contribute to the greenhouse effect, the global warming of the earth's climate.



Great Lakes "War Room"



Staff at the Canada Centre for Inland Waters (CCIW) calls it the "war room" but the Great Lakes Water Level Communications Centre in Burlington is more of a nerve centre than a command post.

Established last spring by Environment Minister Tom McMillan to deal with the threat posed by record-high water levels on the Great Lakes, the Communications Centre acts as both a day-to-day source of lake-level data and as an emergency flood-watch centre.

The Communications Centre acts as both a day-to-day source of lake-level data and as an emergency flood-watch centre.

Calling fast, accurate information "the first line of defence against floods" Mr. McMillan described the new operation as Canada's first co-ordinated storm information and evaluation centre.

"Technology is enabling us to learn more about future weather – and to learn about it more rapidly than ever before; but, to be of maximum use, the data must be pulled together, understood and announced as quickly as they are received. The new Centre makes that possible in a way never before attempted in this country," Mr. McMillan said.

The Communications Centre draws heavily on expertise existing in the Water Planning and Management Branch of the Inland Waters Directorate at CCIW and also has ready access there to staff of the National Water Research Institute and the Canadian Hydrographic Service.

Warnings of wind, waves and high water are provided by another new venture – the Great Lakes Water Level Forecast Centre, part of the Ontario Weather Centre in Toronto.

With all the Great Lakes at above-average levels, and Lakes Michigan, Huron and Erie setting new records, shoreline residents are especially worried about the effects of fall and winter storms. To help them take precautions, the Forecast Centre has stepped up efforts to warn of weather posing special risk to coastal areas and has expanded forecasting from Lakes St. Clair and Erie to Huron and Superior.

The Communications Centre can analyse the weather data, pinpoint potential trouble spots and alert local officials, news media and residents who call for information. The Centre can also direct callers to the appropriate agency when help is needed.

The most recent serious storm occurred last December 2, when the eastern shore of Lake Erie was battered by wind and waves that caused widespread property damage, but weather watches are issued frequently – especially for Erie where it takes very little under present conditions to send water sloshing up on shore.

In the first three months of operation, Communications Centre staffers answered scores of public inquiries about Great Lakes levels and were frequently interviewed by radio, TV and newspaper reporters.

On at least a dozen occasions, the Centre was in operation at night or on weekends when high-water watches or warnings were in effect.

On at least a dozen occasions, the Centre was in operation at night or on weekends when high-water watches or warnings were in effect.

In the quieter periods, Centre Manager Ralph Moulton was recruiting National Water Research Institute scientists to study shore processes, dispatching teams to inspect some of the hard-hit Erie shore and starting to collect technical data to help the International Joint Commission in its recently announced new study on lake regulation.

The Great Lakes Water Level Forecast Centre offers a toll-free telephone service with taped messages. The number is 1-800-265-5036 (English) and 1-800-265-5037 (French). Other information is available from the Communications Centre at (416) 336-4581. ■

Help for the Great Lakes Basin

Industrial and municipal discharges, toxic waste dumps, agricultural runoff and air-borne toxic chemicals all contribute to pollution problems in the Great Lakes Basin. Urbanization, industrialization and our chemical society have produced a legacy of pollution problems which governments at all levels must solve. We know what the problems are. We have the technology to make some improvements. Now we must plan the clean-up of the most affected areas.

Environment Canada and the Ontario Ministry of the Environment, under the Canada Ontario Agreement on Great Lakes Water Quality (COA), are developing remedial action plans (RPA) to tackle 17 Canadian "Areas of Concern" in the Great Lakes Basin. These areas are where the worst environmental threats around the Great Lakes shores are located. Under COA, first signed in 1971, the province of Ontario is required to deliver Canadian commitments on Great Lakes water quality made to the International Joint Commission (IJC).

Government involvement with Great Lakes water quality dates back to 1909, when Canada and the United States signed the boundary waters treaty. Article IV of this treaty prohibits pollution of the waters of the Great Lakes "to the injury of health or property on the other side". In 1964, the IJC reported serious pollution problems in the lower Great Lakes, but it wasn't until 1972 that the first Great Lakes Water Quality Agreement was signed. This agreement encouraged co-operation between the two countries in fighting phosphorus pollution, the largest known pollution problem

at the time. But the federal bodies couldn't solve pollution problems alone, so the "Water Quality Board" was formed in 1973. It consists of federal members, as well as representatives of the one provincial and eight state jurisdictions that surround the lakes.

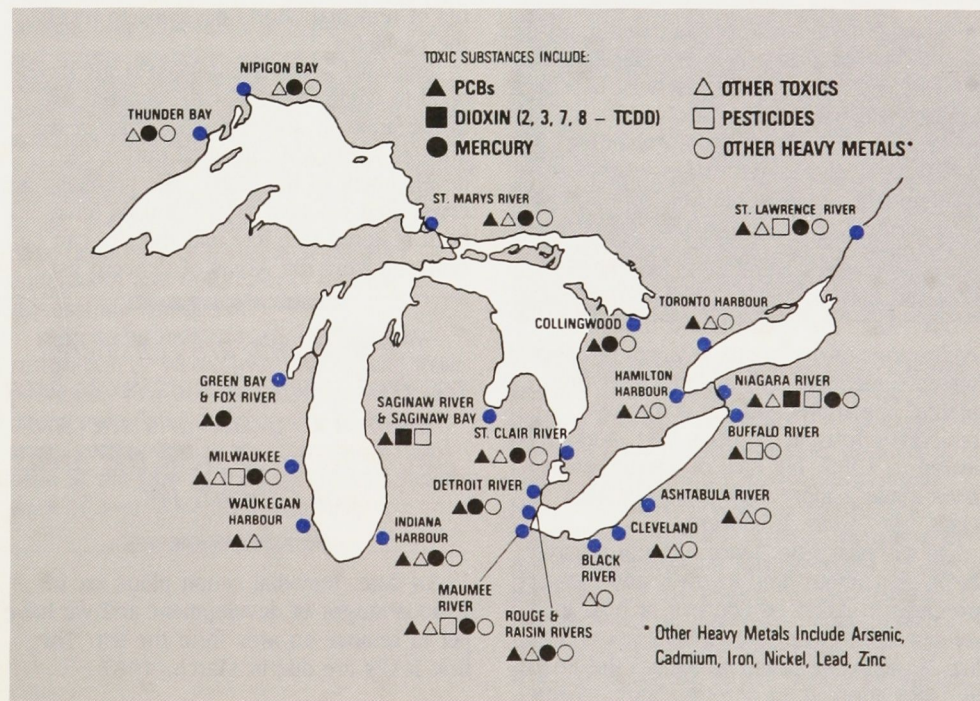
Since then, the Board, in its annual assessments of water quality in the Great Lakes, has identified areas with serious water pollution problems.

In 1974, the Board identified 23 such areas in the upper Great Lakes and 46 in the lower Great Lakes. These sites, including harbours, river mouths and connecting channels, were termed "problem areas".

In 1975, the Board described water quality conditions, identified the worst industrial and municipal dischargers and described pollution control efforts for a modified list of 63 problems areas. The list was further reduced to 47 in 1976, after a more thorough analysis of the data collected the previous year.

In 1978, a new Canada-U.S. water quality agreement was signed. For the first time, it included objectives for toxic chemicals and recognized the problem of long-range transport of pollutants through the air. Phosphorus, which has been the main

Problem areas of toxic substances in the Great Lakes



Source: International Joint Commission, 1985.

pollution problem in the basin, was now under control. Using the new criteria, the Board identified 48 problem areas in the Great Lakes Basin. The Board also proposed three categories of problem areas where:

- water quality objectives had not been achieved because remedial programs were not yet completed;
- remedial programs had been completed, but a delay could be expected before conditions in the lake showed improvement;
- further remedial programs might be required.

The Board established "Areas of Concern", based on data for sediment, biota and water.

But, a "problem area" approach made it hard to compare findings from different jurisdictions and identification and assessment of problems usually relied only on water quality data. To provide an ecosystem perspective, the Board established "Areas of Concern", based on data for sediment, biota and water.

The Board classified areas of concern into one of two categories:

- class "A" – those areas exhibiting significant environmental degradation, where impairment of beneficial uses was deemed to be severe; and
- class "B" – those areas exhibiting environmental degradation where uses might be impaired.

Eighteen class "A" and 21 class "B" areas of concern were identified and reported in 1981.

In 1982, the Board found that most environmental programs in areas of concern weren't adequate. An update of environmental conditions and the status of remedial efforts in 18 class "A" areas followed in 1983, but lack of specific guidelines made it more difficult to evaluate class "B" areas of concern.

In the past, the Board had not always been clear about how to track and measure progress in Areas of Concern or how to remove a site from the Areas of Concern list. To alleviate these problems, the Board in 1985 adopted an accountability scheme, a system of steps which provide a logical sequence for problem solving and action.



The steps identify the status of the information base, programs which are underway to fill gaps in this information and the status of remedial efforts designed to rectify the problems.

Remedial action plans (RAPs) are developed to come to grips with impaired use of the areas in question. Residents of the affected areas are consulted during the development of the plans. The problems are considered resolved when all uses have been restored to a site and the site can be removed from the Areas of Concern list.

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To date, remedial action plans are in various stages of development and we have yet to remove an area from the list. The first RAPs are due in March, 1987.

Jurisdictions will now describe each area of concern in terms of the following steps:

1. Causative factors unknown and no investigative program underway
2. Causative factors unknown but investigation program underway
3. Causative factors known but remedial action plan not developed and remedial measures not fully implemented
4. Causative factors known, remedial action plan developed but remedial measures not fully implemented
5. Causative factors known, remedial action plan developed and all remedial measures identified in the plan have been implemented
6. Confirmation that uses have been restored and deletion as an area of concern (in the next Board report)

Where will this lead us? Scientists working on the plans hope that it will lead to the restoration of the Great Lakes Basin. They hope for an environment in which industry, municipalities and all of us who depend on the environment will be in complete harmony. ■

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Enhancing waterfowl habitat



Conservation of North American waterfowl is the objective of a \$1.5 billion plan signed in May by Environment Minister Tom McMillan and U.S. Secretary of the Interior Don Hodel.

The North American Waterfowl Management Plan proposes a far-reaching management agreement be undertaken jointly by private and public interests in both Canada and the United States to bring seriously declining waterfowl populations back to their 1970s annual fall migration levels of about 100 million birds.

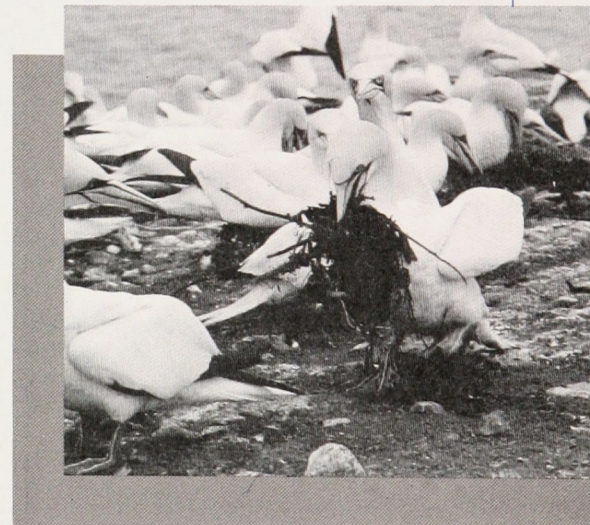
Waterfowl are the most prominent and economically important group of migratory birds in North America.

Waterfowl are the most prominent and economically important group of migratory birds in North America. Supported by an abundance and diversity of wetland ecosystems on the North American continent, this resource is of direct benefit to substantial numbers of both Canadian and American interest groups which include recreationists, naturalists, and subsistence and sport hunters. In Canada, these activi-

ties generate direct and indirect expenditures in excess of one billion dollars annually and provide over 40,000 jobs.

The 1916 Convention for the Protection of Migratory Birds between Canada and the United States serves as the foundation for co-operative waterfowl management programs in North America. Through this convention and the efforts of provincial, state and federal agencies, numerous private conservation groups and thousands of dedicated individuals, millions of acres of prime wetlands have been saved from destruction, a large chain of waterfowl refuges spanning the migration flyways have been established, regulations protecting waterfowl have been enforced, research projects undertaken and outbreaks of disease successfully contained.

Successful undertakings include the restoration of wood duck populations from previously low numbers to those of abundance today and the recovery of greater snow geese populations from a few thousand at the turn of the century to a healthy flock of over 200,000 birds today.

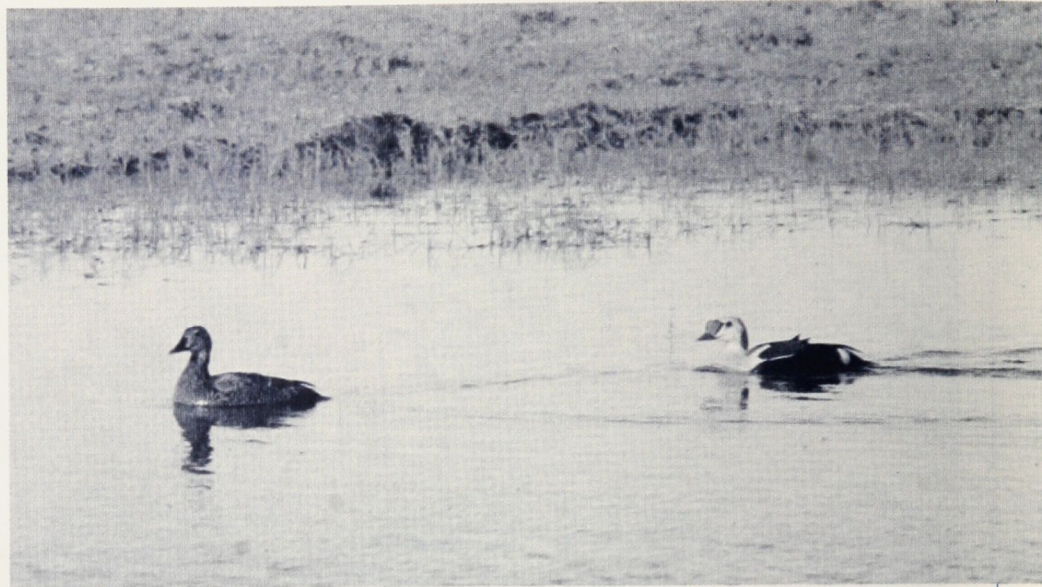


Despite these accomplishments, Canada and the United States recognize that recent gradual loss and degradation of wetland habitats have caused dramatic declines in North American duck populations. Large scale alteration to wetland habitats by increased agricultural activity, urbanization and industrialization have affected the distribution and abundance of certain duck populations. Key concerns include loss of nesting cover, wetland drainage and destruction of migration and wintering habitat.



For example, in the Canadian west, losses of grassland continue at the rate of 2% annually and, in the last decade, one-third of the remaining grasslands necessary to nesting mallards and pintails has been converted to cropland. Over 50% of the original prairie wetlands in the United States has been lost, and the same factors are diminishing wetlands in Canada.

These losses of habitat and the downward trend in migratory bird populations required an examination of prevailing management practices. Recognizing that the conservation of North American waterfowl must be pursued through co-operative planning and co-ordinated management, representatives from federal, provincial and territorial wildlife agencies initiated discussions with the United States Fish and Wildlife Service in August of 1984 and developed the North American Waterfowl Management Plan.



Of the \$1 billion required to accomplish habitat protection and improvement in the Canadian west, \$239 million will be provided by Canadian sources, and \$717 million from sources in the United States. Canada is expected to spend \$20 million in the St. Lawrence valley and \$5 million in the Atlantic region to enhance migratory bird habitat.

Further, the United States will require \$477 million (U.S.) for similar ventures in that country.

Funding for these ventures will come largely from groups who benefit from enhanced waterfowl populations. Traditionally, these groups have included conservationists, sport-hunters and other private interest organizations. The proposed work is in addition to currently planned public and private conservation expenditures to the year 2000.

Incentives may also be provided to private landowners to promote soil, wetland and water conservation. The overall objective is to work with the agricultural sector in implementing practices of greater long-term viability and in a manner that maintains waterfowl in abundance. The protection of privately owned waterfowl habitats, programs to assess environmental impacts of proposed developments, and efforts towards increasing the productivity of existing public lands are other measures under consideration.

Incentives may also be provided to private landowners to promote soil, wetland and water conservation.

A waterfowl management plan committee will be created soon to co-ordinate the implementation of the plan. Comprised of representatives from both signatory countries and contributing organizations, the committee will develop an implementation agreement and direct all recommendations to the Canadian Wildlife Service and the United States Fish and Wildlife Service. Funds will be committed to the projects proposed in the plan. ■

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CASP field work a success



Rawinsondes launched from the ship Gadus Atlantica over the Gulf Stream area.

After several months of agreeable summer weather, not many people are inclined to think about winter, particularly storms at sea. Yet one group of scientists and meteorologists has not stopped thinking about or working on Atlantic Canada's winter storms.

From January 15 to March 15, 1986, over twenty agencies and one hundred individuals collaborated to track and study sixteen storms that passed through a designated project zone off the East coast.

The Canadian Atlantic Storms Program (CASP) team members have now begun data analysis on mesoscale (small-scale) storm features such as squall line, cold fronts and snow, rain or freezing rain bands. The first of a series of analysis workshops planned over the next two years was held at Atmospheric Environment Service (AES) headquarters in June, 1986. Similarly, the experimental forecast guidance, site-specific forecasts and electronic display stations tested during the field work will be evaluated for possible future incorporation into Canadian weather centres. Through these studies, Environment Canada's meteorologists aim to better understand storm structure and movement in Atlantic Canada and to improve the accuracy of forecasts.

In co-operation with Environment Canada, the Bedford Institute of Oceanography (BIO) in Dartmouth, Nova Scotia, is directing research on ocean/atmosphere interaction. Several BIO scientists are

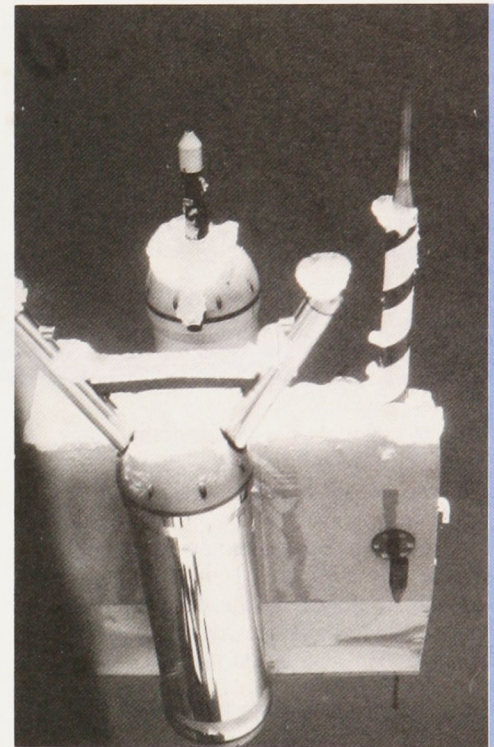
studying the influence of storms on sea surface temperature, the movement of ice fields during storm periods and the effects a storm's structure has on ocean circulation and sea state.

All the investigation now taking place depends on hours of work logged by individuals in often cold, unpleasant weather. Enhanced observations were provided by 900 upper-air balloon releases from AES and Department of National Defence stations. One hundred hours of detailed sampling of cloud and precipitation were made on the Canada Centre for Remote Sensing (CCRS) DC-3 aircraft and the National Aeronautics Establishment (NAE) Twin Otter aircraft. Other airborne data were gathered by DND Aurora aircraft and during AES ice reconnaissance flights. There was virtually complete three-dimensional scanning of the storms by weather radars at Halifax, Nova Scotia and at Trepassey, Newfoundland.

Other sophisticated ground-based measurements of cloud and precipitation particles and vertical temperature profile were made at CFB Shearwater using state-of-the-art technology. Additional surface observations were made by regular surface observ-

ing stations, by volunteer climate observers using special computer terminals to communicate with the CASP Operations Centre in Bedford, Nova Scotia, and by two 10-metre tower networks, one on mainland Nova Scotia and the other on Sable Island.

With few exceptions, all of the equipment worked extremely well. The weather co-operated by being "bad" enough to be interesting, but not bad enough to completely thwart observation attempts.



The Y-shaped probe measures particles up to several millimetres in diameter, the "barber pole" probe is a pilot tube for deducing aircraft wind speed and the remaining probe measures micron-sized particles.

This success, coupled with the dedication and long hours contributed by the CASP field observing and forecasting personnel, has produced the most comprehensive meteorological data-set of Atlantic winter storms. CASP managers are looking forward to improvements to forecasting in the future as well as direct benefits for the marine industry. ■

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Cradle of Confederation restored



One of Canada's most historic buildings, Province House in Charlottetown, Prince Edward Island, has been restored to its 19th-century elegance.

Governor General Jeanne Sauvé and Environment Minister Tom McMillan joined provincial officials in the Island capital June 20th to mark the completion of the \$3.5 million restoration project.

The impressive three-storey sandstone building is the birthplace of Canadian Confederation.

Built between 1843 and 1847, the impressive three-storey sandstone building is the seat of the P.E.I Legislative Assembly and the birthplace of Canadian Confederation. In September 1864, delegates from what is now Ontario and Quebec met with representatives from the maritime colonies of Nova Scotia, New Brunswick and Prince Edward Island to discuss proposals of a political union. That historic conference was held in the elegant Executive Council Chamber, later named the Confederation Chamber in honour of the event.

Canada and Prince Edward Island signed an agreement in 1974 that granted the federal government a 99-year lease to restore, preserve and interpret Province House. The Parks programme of Environment Canada began the work four years later, installing the final furnishings just last year.

The Confederation Chamber, the library room and various colonial offices have been restored to re-create as closely as possible the atmosphere that greeted the Fathers of Confederation when they met in the building 122 years ago.

Determining the original nature of the building was not always easy. Over the years, alterations changed large parts of the original structure. A great deal of historical and archaeological research was necessary to confirm many 19th-century features.

Beginning with the exterior, the sandstone was patched and cleaned and some stones replaced. A roof of slate and copper was installed according to the original specifications. Chimneys and skylights had to be reconstructed.

The interior had seen much painting and plastering. Careful research led to the accurate reproduction of the paint types and styles used when the rooms were first decorated. Refurnishing the restored rooms

was especially challenging. Carpets, curtains, mahogany desks, bookcases, chairs, inkwells and countless other items were needed. Curators found an array of original pieces and commissioned others to re-create as faithfully as possible the mid-Victorian era.

In addition to the restored areas, Province House contains exhibits on Island history and a 59-seat theatre where a special 16-minute audio-visual show is presented. The building has been made accessible to wheelchairs, as have the carefully landscaped grounds surrounding it.

In his remarks at the official opening, Mr. McMillan described the work done at Province House as "one of the finest heritage restorations ever undertaken in Canada".

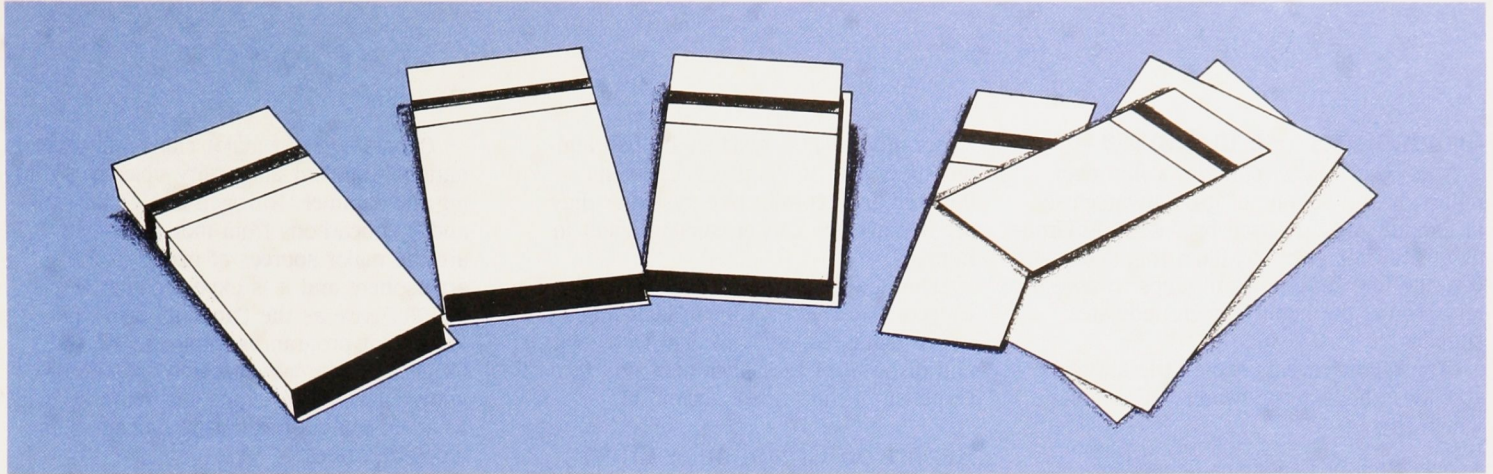
The Minister added that "Province House is not a suffocating relic of the past: it is a living link with history, an opportunity for us and our children, and their children to bring past and present together, and thereby understand both more profoundly."

Province House National Historic Site is open year-round. In summer, interpretation staff are available to give guided tours. ■

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Update Reviews



Urban air quality trends

A new fact sheet from Conservation and Protection entitled *Urban Air Quality Trends* is now available. The fact sheet outlines the sources and effects of air pollution in Canada, details Environment Canada's effort to monitor the quality of the air, and cites trends for specific air contaminants.

Air pollutants come from a variety of man-made and natural sources. Motor vehicles, home heating fuels, and industrial activities produce lead, carbon monoxide, hydrocarbons, nitrogen dioxide, ozone, and other gases; wind, electrical storms, volcanoes, forest fires, and decay of vegetation produce gases and particulates at lower levels, referred to as the "natural background".

Air pollution affects not only animal and human health, but also the growth of forest and agricultural crop yields. Buildings can be damaged by the chemical action of polluted air, as can electrical power distribution systems.

The Clean Air Act permits the federal government to set regulations to limit pollution emissions from stationary sources, and, for example, to limit lead in gasoline. The National Air Pollution Surveillance (NAPS) network monitors specific contaminants which include sulphur dioxide, suspended particulates, lead, ozone, nitrogen dioxide and carbon monoxide. ■

New map of Canada's federal lands

A new map of major federal land holdings entitled *Canada's Federal Lands*, was released this July by Environment Minister Tom McMillan. The new wall map, the first of its kind produced in Canada, shows all federal lands greater than 64.7 hectares.

"It's a quick but complete reference guide to major federal land holdings and their uses," said Mr. McMillan. "By providing a composite look at the nature and significance of our large land holdings, this map will contribute to the improved management and use of these federal assets."

The federal government is the single largest land owner/manager in the country, responsible for over 1,800 land holdings across Canada. These include airports, harbours, national defence installations and penitentiaries as well as the 31 national parks, 42 historic parks, 142 historic sites, 45 national wildlife areas and 82 migratory bird sanctuaries directly or jointly administered by Environment Canada. Environment Canada is the largest manager of federal lands within the provinces, managing 7.37 million hectares of land, that is, 61% of the total.

Environment Canada's Lands Directorate prepared the map from data gathered from records and archives of various federal departments and agencies. The accompanying text provides a brief history of Canadian Crown lands, while numerous pie diagrams illustrate the distribution of land by use, and the managing authority at the national and provincial levels. ■

Ministers support Western Canadian Coal

The report of the federal-provincial task force on *Expanded Use in Ontario of Low Sulphur Western Coal* was released in August. The federal Ministers of Environment, Mines, and Transport promised to examine the report, noting that the implementation of its recommendations will depend on their acceptance by the Ontario government and Ontario Hydro.

The task force, established in 1984 to assess the costs and benefits of increasing western coal consumption in Ontario, states that the use of the low sulphur western coal would create up to 205,000 person-years of jobs over the next 15 years, and generate \$4.1 billion in income while allowing Ontario Hydro to meet its emission limits. Ontario government regulations require Ontario Hydro to reduce its annual emissions of sulphur dioxide, a principal source of acid rain, by 50% by 1994.

Environment Minister Tom McMillan said that the task force's conclusions are "clear proof that environmental concerns and economic development go hand-in-hand. The report offers Canadians significant environmental, economic and employment opportunities. We can protect our forests, streams and lakes from acid rain. We can improve the competitiveness of western Canadian coal while creating new markets. We can also generate employment." ■

Groundwater use in Canada

Groundwater Use in Canada, a first-ever report on the volume of groundwater used in Canada, was released by federal Environment Minister Tom McMillan this September, the first in a series of steps to assess and protect the quality of groundwater supplies.

The report reveals some little known statistics about groundwater use, among which that:

- over 26% of Canadians depend on groundwater for their domestic water supply, ranging from 17% in Quebec to 100% in P.E.I.,
- approximately 38% of Canadian municipalities rely on groundwater either in whole or in part,
- approximately 87% of the water used by livestock is groundwater.

Six regional maps accompanying the report show the locations of major industrial and municipal users as well as percentages of rural and agricultural use.

Mr. McMillan noted that the pollution of groundwater is a growing problem for everyone in Canada. The report will aid in developing a management strategy to ensure the conservation of a valuable resource. ■

The PCB story

In August, the Canadian Council of Resource and Environment Ministers issued a series of three brochures and a 32-page booklet on PCBs (polychlorinated biphenyls) designed to stimulate greater public understanding and involvement in the process of controlling PCBs and other hazardous waste.

PCBs are synthetic compounds used in a wide variety of industrial and consumer products. Until 1977 they were used in many familiar substances such as caulking, synthetic resins, paints, waxes and asphalt. The major industrial use for PCBs was as a cooling and insulating fluid in transformers and capacitors.

Canada imported some 40 thousand tonnes of PCBs before their manufacture was banned in 1977. Of this amount, only 24 thousand tonnes are known to be in use or in storage. The remainder are assumed either to be in mineral oil in small concentrations or to have already entered the environment, largely through the disposal of the many products that contain them.

Absorption of PCB residues by fish and birds has led to disturbances of the immune and reproductive systems; they are a suspected cancer-causing agent in humans.

The new publications deal with all aspects of the PCB problem including government strategies to deal with control and disposal of the substances and the response of the private sector. ■

Report on Greenhouse Effect

The report, *Understanding Carbon Dioxide and Climate*, was released in August by federal Environment Minister Tom McMillan. The report, produced annually by the Canadian Climate Centre, provides an update on scientific research into the greenhouse effect – the potential global warming caused by the build-up of carbon dioxide and other gases in the atmosphere. Canada is one of the world's largest per-capita producers of the gases that produce the greenhouse effect.

The report predicts climate changes during the next 50-100 years that include warmer temperatures and shifts in rainfall patterns, resulting in drought in the southern prairies and higher sea levels in coastal areas.

"Environment Canada is working to understand more fully climate changes and their potential impacts on our society. Canadians will need to prepare for these changes if they wish to avoid major social and economic hardship and take advantage of any benefits that a warmer climate might bring," Mr. McMillan said.

The extent of climate change will depend on future energy policies and industrial strategies. ■

Good News on Air Pollution

Environment Minister Tom McMillan released the latest Clean Air Annual Report this July. The report reveals that Canadians are breathing cleaner air today than they were ten years ago.

The report shows that lead levels have decreased by 66% since 1976, while concentrations of sulphur dioxide and carbon monoxide are down by 31% and 54% respectively. Total suspended particulates have decreased by 41% over the past decade.

Ozone levels in major cities still exceed national ambient air quality objectives during the summer. Nitrogen oxide emissions and hydrocarbons from motor vehicles are the major sources of ozone in the atmosphere and it is expected that levels will decrease as the Canadian acid rain abatement program is implemented and tougher automobile emissions standards show effect. High ozone levels are known to affect human health and damage some crops and trees.

The report also outlines other programs predicted to lead to better air quality in the future. ■

