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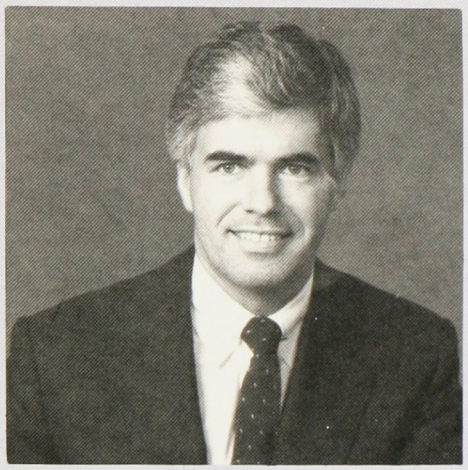
Environment

Canada

A word from the Honourable Tom McMillan



This issue of *Environmental Update* is dedicated to environmental success stories – not just Environment Canada's success, but also the excellent work being done outside by industry, private groups and other organizations.

The topics examined reflect the range of environmental concerns, from toxic chemicals to water quality, to meteorology, to endangered species and parks. Each story is but an example of what has been or is being done to preserve and enhance our natural heritage both in Canada and around the world.

The stewardship of our environment is not to be taken lightly. Only by the responsible management and thoughtful care of our planet's resources can we expect to maintain the delicate balance of life we too often take for granted.

Protecting our planet's life support systems is not the exclusive responsibility of the federal government. Only by the collective efforts of all governments, industry, private groups and of the general public can we hope to preserve and protect our priceless natural heritage. It is a responsibility we all share, one that transcends national borders and political differences and that affects all of Earth's inhabitants.

In order to carry out our responsibilities effectively, we must understand the problems that threaten our land, our air, our water – and the life systems they support. Canadian Environment Week is one way to bring the message to Canadians. By learning about the environment – the nature of nature – and how to live in harmony with it, we all become more involved in the urgent task of protection.

The articles you are about to read show that, with will and ingenuity, we can heal what we have harmed and guard the environment for the future generations for whom we hold it in trust.

Tom McMillan, P.C., M.P.
Hillsborough

Minister of the Environment

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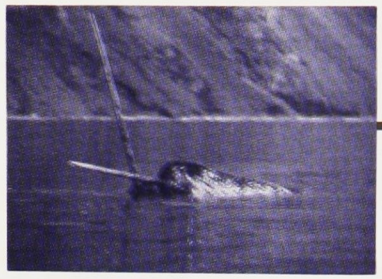

Update

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.

Effects of contamination can be turned around

D.N. NETTLESHIP

Gannets on Bonaventure Island

It is impossible to be interested in Canada's coastal regions without noticing the vast numbers of seabirds frequenting the inshore and offshore waters. However, increased activities in offshore oil drilling and exploration, domestic and industrial sewage disposal, and run off of toxic chemicals in these same waters, along with other activities such as fishing and marine transportation, are posing a potential threat to some seabird species.

In response to similar threats in 1969, the Canadian Wildlife Service initiated studies on the breeding activities, distribution, population size and species composition of seabirds in Atlantic Canada. The main focus was to identify the nature and source of the principal threats to seabirds, particularly colonially breeding species like the northern gannet, Atlantic puffin, common murre and the black-legged kittiwake.

In Atlantic Canada, these seabirds feed on fish such as mackerel and capelin which are found towards the top of the marine food chain. Humans also consume these fish. Researchers felt the study of these birds could offer a valuable means of monitoring the health of the marine environment and provide indications of problem areas which could affect other marine life, and consequently humans.

Seabirds are not randomly distributed in the environment. They concentrate at suitable locations for breeding, where they often form immense single-species or mixed-species colonies. During the non-breeding season, the birds are usually restricted to nutrient-rich waters. One obvious consequence of this clumped distribution throughout the year is a high risk of exposure to pollution and other hazardous human activities.

Several other characteristics of seabirds endanger them as a group. They are long lived, reach sexual maturity slowly – usually not laying eggs until they are five to six years of age, and have low reproductive rates. In the case of the northern gannet, it lays only one egg, which is rarely replaced if destroyed during incubation. As a result, when there are decreases in the size of a seabird population, the recovery rate is slow.

Between 1969 and 1973, a considerable decrease was noted in the gannet population in the Gulf of St. Lawrence. The 20,500 breeding pairs in 1969 dwindled to 17,300 pairs in 1973. The North American gannet population is concentrated in six colonies off the east coast of Atlantic Canada. Approximately 70% of the population is located in three colonies in the Gulf of St. Lawrence. The largest colony is on Bonaventure Island, where more than 50% of the North American population breeds. This area is also hard hit by the polluted waters of the St. Lawrence River flowing into the gulf.

The decrease was due to reduced fertility, egg-shell thinning and high embryo and chick mortality, caused by toxic chemical contamination.

The remaining 30% of the population is located off the east and south coasts of Newfoundland.

Canadian Wildlife Service researchers found that the decrease was due to reduced fertility, egg-shell thinning and high embryo and chick mortality, caused by toxic chemical contamination. Not only did the chemicals reduce the viability of embryos during development and the chicks after hatching, but they interfered with the gannets' ability to produce adequate calcium, thus producing thin egg-shells. Birds were accidently destroying many eggs during the incubation period by crushing them. Further studies revealed that high levels of chlorinated hydrocarbons, including DDT, occurred in eggs, young and adult gannets, as well as in their prime food source – mackerel and capelin.

In comparison, the colonies off Newfoundland were not experiencing the same problems of egg thinning and high embryo and chick mortality. Investigation showed no evidence of toxic chemical poisoning.

In the early 1970's, legislation was introduced to control the use of DDT. As a result, researchers saw an improvement in the gannet population at Bonaventure Island by the late 1970's. In 1984, population counts were 21,000 breeding pairs, nearing the 1966 population of 21,200. The next planned survey of the population will be in 1987.

In addition to observing the positive effect legislation regulating the use of toxic chemicals can have on preserving seabirds, Canadian Wildlife Service researchers were able to show the valuable role seabirds can play in monitoring the health of the marine ecosystem. ■

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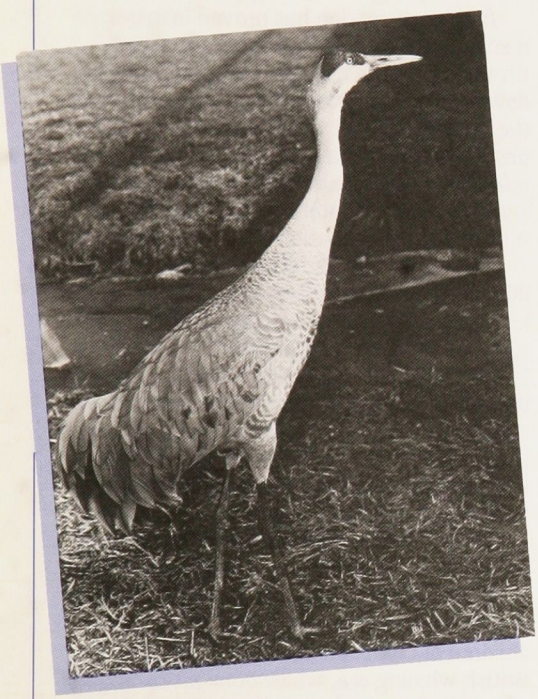
Remarkable recovery for endangered whooping cranes

A record 95 whooping cranes are expected to fly north this year, from their winter residence on the Aransas National Wildlife Refuge, Texas, to their breeding grounds at Wood Buffalo National Park. That is 11 more than made the trip in 1985 and the largest population since at least 1938, when annual counts were first made.



CWS

Sandhill crane

There are now about 175 whooping cranes in the world, compared to only 21 in 1941. Their remarkable comeback is a result of one of the most intensive rehabilitation programs for an endangered species in North America.

This comeback has not happened overnight. Naturalists have been concerned about the possible extinction of the whooping crane for many years. They believe that destruction of its breeding habitat was the main reason for its decline.

Whooping cranes were hunted openly up to the early 1900's, but were never numerous enough to be an important sport species. The birds were protected by law in 1916, but nonetheless their population continued to decrease. In the early 1940's, the National Audubon Society decided to try to prevent the whooper's extinction. The society sponsored studies of the crane and subsequently Canadian and American wildlife managers conceived programs which boosted the whoopers' chances of survival.

In the decade following 1945, the seriousness of accidental or intentional kill by hunters was publicized by federal, state, provincial and private agencies along the whoopers' migration route.

From 1922, when a pair of whoopers nested at Muddy Lake near Unity, Saskatchewan, not a single nest was found until 1954. That year, forestry officer G.M. Wilson and a helicopter pilot, J.D. Landells, spotted a family group near the Sass River just west of Fort Smith, NWT. Canadian Wildlife Service biologist W.A. Fuller confirmed the sighting the next day and the next year found several nests.

There is no question that a major factor contributing to the survival of the whooping crane is the inaccessibility and protected status of its nesting area in Wood Buffalo National Park, on the Alberta-Northwest Territories border.

In June 1967, a team of scientists from the Canadian Wildlife Service and the U.S. Fish and Wildlife Service took six eggs from Wood Buffalo National Park for artificial incubation. The collected eggs were placed in a special portable incubator, heated by hot water bottles and flown to a rearing station near Laurel, Maryland. Incidentally, the disturbance did not prevent the adult whoopers from successfully hatching the remaining eggs.

More eggs were collected in 1968, 1969, 1971, 1974, and yearly since 1982, with the intention of establishing a captive flock and eventually releasing offspring to bolster the wild population. Because the cranes often failed to breed in captivity, progress was slow and scientists decided to try a shortcut. Now they ship the eggs by air to the Grays Lake National Wildlife Refuge in Idaho and place them in the nests of greater sandhill cranes, which are closely related to whoopers. The sandhill crane egg is removed and the adults hatch their "foster-egg". The sandhills raise the whooper chick as if it were their own.

This egg transfer is now an annual program designed to re-establish whooping cranes into their former range. Previous transfers of eggs into Idaho have resulted in a new population of about 40 birds. This population will hopefully become self-perpetuating, with its own migration path between Idaho and New Mexico – distinct from the Northwest Territories-Texas population.

The survival of introduced wild whoopers in Idaho is a bonus added to the increase in the established population.

Whooping Crane

Since the egg collections began, the Wood Buffalo National Park breeding population has increased from about 20 to 60 birds. The Canadian Wildlife Service expects the total number to reach 150 by 1990.

The battle isn't over yet: the whooping crane's long struggle for survival has many more years to go before the species is at a safe level. In the meantime, several other lesser known species, the Eskimo curlew, the Ispwich sparrow, and the greater prairie chicken for example—urgently require the attention that the whooping crane has received if they are to escape extinction. ■

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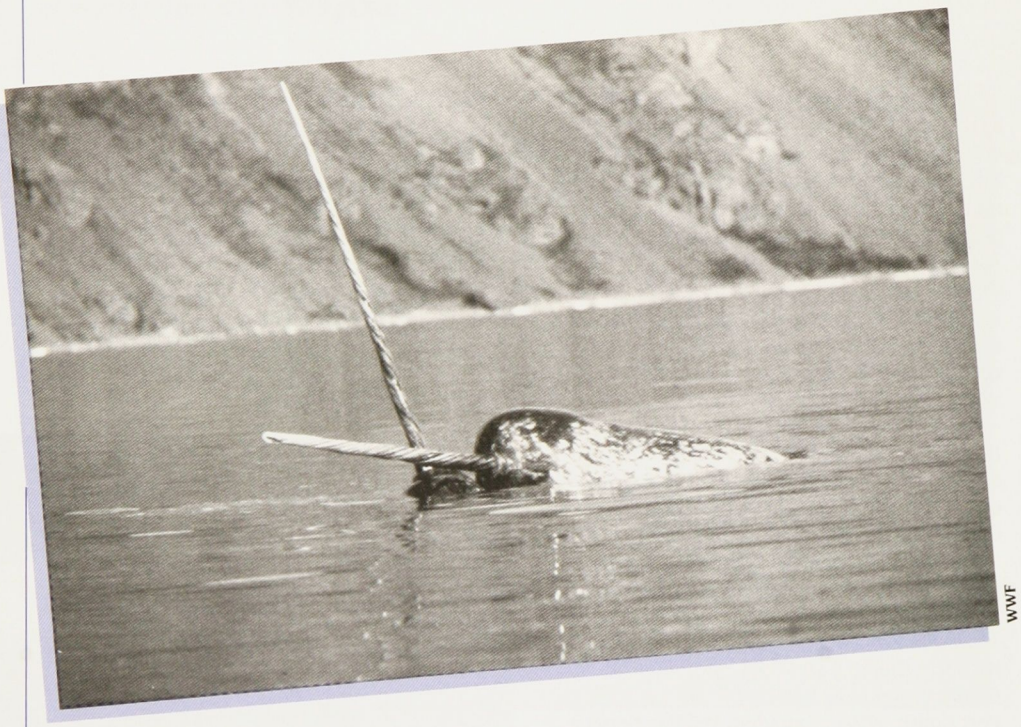
Whales beneath the ice



WWF

Narwhals

A small band of scientists has begun to peel back the layers of mystery surrounding the behaviour and biology of the bowhead whale. Assisted by the communities of Clyde and Broughton Island (NWT), researchers supported by World Wildlife Fund Canada are gaining a better understanding of this slow-moving Arctic giant.

The research team, headed by Dr. Rolph Davis and Mr. Kerry Finley, have come north to Baffin Island's Isabella Bay for the past three summers. The Bay, located on the northeast coast and known traditionally as Tullagujak (''the place of fog''), has long been regarded by local Inuit as one of the most important summer concentration areas for bowhead in the eastern Arctic. Pack ice kept the whales away from Isabella Bay during the summer of 1983, but large numbers of the bowhead whales were observed in 1984 and again in 1985.

The project, which is providing fascinating new insights into the numbers and behaviour of the bowhead, is just one component of the World Wildlife Fund's cooperative research program with northerners to ensure the future of Canada's Arctic whales. Known as Whales Beneath the Ice, the program includes seven research projects aimed at providing critical conservation information on the Arctic's bowhead, narwhal and beluga whales. To date, information about all three whale species has been so scarce that the development of meaningful management plans has been impossible. With oil exploration in the High Arctic well underway and oil and gas developments pending, the need for solid scientific data to guide conservation efforts has become especially important.

While the Baffin Island/Davis Strait region once boasted a population of more than 11,000 bowheads, the large baleen whales were brought to the brink of extinction by European commercial whalers in the 1800's.

There has been no appreciable recovery of the stock since, and the current eastern Arctic population is thought to be in the low hundreds. Reaching over 20 metres in length and weighing up to 100 tons, just one bowhead could feed three communities for a year. Now this magnificent whale has the status of one of the world's endangered species.

Understanding why Isabella Bay is important to the bowhead has been a focus of much of World Wildlife Fund's research effort. The team has gathered data on the physical and biological characteristics of the bay and documented the links between bowhead feeding activities and certain oceanographic features.

The large baleen whales were brought to the brink of extinction by European commercial whalers in the 1800's.

Inuit participation has proven instrumental to the project's success. Clyde and Broughton Island hunters, travelling up and down the coast of North Baffin, have assisted the research effort by recording their whale observations on siting cards. Such first-hand information has enabled the scientists to sketch a more comprehensive picture of the numbers and distribution of the bowhead.

Through Josepi Tigullaraq, the local wildlife officer, the community of Clyde has been kept fully informed of the project. Research results have been translated into Inuktitut by Tigullaraq and made available to local residents through meetings and the community radio network. In 1984, Apak Qaqqasiq, President of the Clyde Hunters and Trappers Association, also worked closely with the World Wildlife Fund team.

The project has touched even the smallest members of the hamlet. A wildlife education program, incorporating the project's research results, has been developed for the school children of Clyde. Illustrations from the British whaling era, whale bone artifacts, jars of zooplankton and recordings of the underwater sounds of bowheads have provided an educational link between the study and the rich whaling heritage of the area.

The bowhead field work has been challenging and ripe with the unexpected. Fog and ice have played havoc with the research schedule, and a hasty escape from a polar bear resulted in a badly injured knee for one of the members of the scientific team during the summer of 1984.

A rare research opportunity presented itself during the same summer when a killer whale, or ''black fish'', attacked a bowhead. While the bowhead escaped with wounds, the incident had a profound impact on the remaining whales, causing them to flee the offshore waters and hug the shore area for the rest of the study period. In this case, the adult was able to survive, but immature bowheads may not fare nearly as well.

Throughout the three field seasons, the mood of the research team has remained buoyant.

"We are really excited," Kerry Finley said in a recent interview. "We have learned an immense amount about bowhead biology, and this information will be essential to provide some means of protection for Isabella Bay. The project has given local people a sense of involvement. Because of this involvement, the area is more likely to be preserved."

Monte Hummel, President of World Wildlife Fund Canada, is also heartened by the scientific results of the bowhead work, as well as by the bridges that are being built between the scientists and local communities on North Baffin Island. He is quick to point out, however, that the conservation battle is far from over.

"I am very concerned about the future of Arctic whale research," he said. "There are rumours of budget cuts to Canada's Department of Fisheries and Oceans which could affect the important start that has been made by World Wildlife Fund. With northern threats in the form of oil exploration, drilling and transport, this is the time when the government should be boosting its cooperative efforts in the Arctic. World Wildlife Fund Canada will continue to remind governments at all levels of their responsibilities in the North." ■

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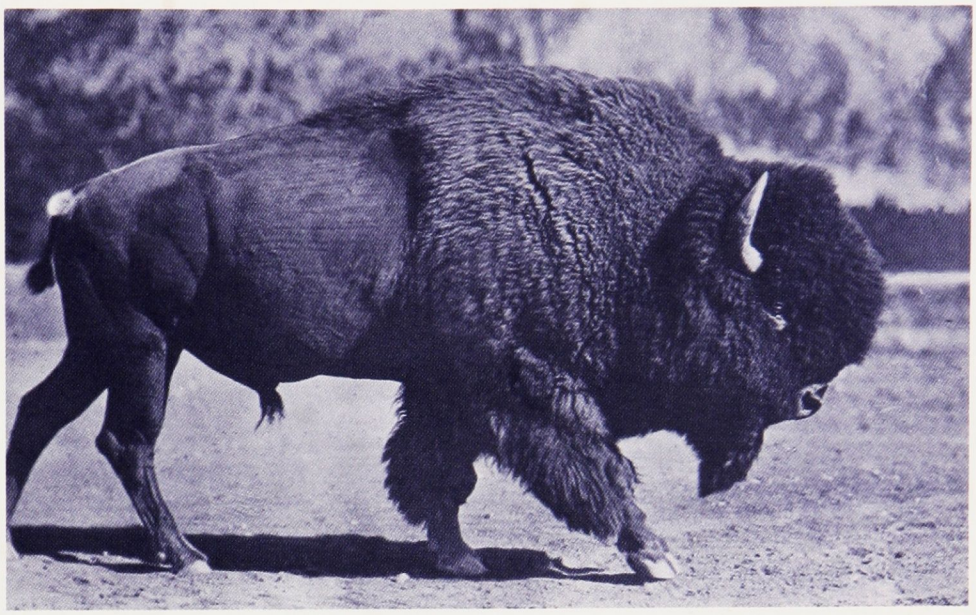
The Waterhen wood bison



Wood bison once numbered more than 100,000 and freely roamed the forests of Northwestern Canada. But after 1865, they started to vanish at an alarming rate and were extirpated in Manitoba by the end of the 19th century. Now, wood bison is internationally recognized as an endangered species.

The Canadian Wildlife Federation has worked with the Waterhen Indian band, the province of Manitoba, and the federal departments of Indian and Northern Affairs and Environment to reintroduce wood bison to Manitoba. The Wood Bison Project received an initial donation of $70,000, raised through the efforts of the late Princess Grace of Monaco and the CWF. This money was raised by the sale of limited edition prints of a Robert Bateman painting, which Mr. Bateman had presented to Princess Grace in 1982.

The bison now total 76, and this number is expected to rise to 100 within the next year or so.

On September 27, 1984, the Wood Bison Project was dedicated by Prince Albert of Monaco, Princess Grace's son. The first 17 bison from Elk Island National Park in Alberta had arrived seven months earlier and were brought into a 14.5 square kilometre compound near the Waterhen reserve. This area's hills, meadows, coniferous forests and aspen park land are reminiscent of wood bison's traditional habitat. The bison now total 76, and this number is expected to rise to 100 within the next year or so.

Because of the wood bison's strong homing instinct, only the offspring of the bison introduced from Elk Island will be released in the wild. Once the herd is sufficiently large, a commercial ranching operation will hopefully be established. The use of the captive wood bison herd for meat production and breeding stock would be the first of its kind in the world and would provide jobs for the Waterhen band members. The band has already enjoyed some benefits from the project. Firstly, short-term jobs have been created by the construction of the special enclosure and other facilities for the bison. Secondly, the project has attracted tourists to the region with spinoff benefits to service industries.

The wood bison re-establishment project holds special significance for the Waterhen Indian people. Historically, these Indians were involved in the harvesting of natural resources, but they are now involved in long-term wildlife management. The Waterhen Wood Bison Project will not only rehabilitate the wood bison but will ensure that a sacred and valuable part of Indian culture is preserved. ■

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The Valhallas: Canada's Shangri-La

British Columbia's famed Valhalla Mountain Range, on the western edge of the Kootenays, officially became the province's newest park in May 1983. The new park preserves an area of extraordinary beauty, with its mountain ranges, glaciers, lakes, creeks, forests and diversified flora and fauna. The park status announcement came after 12 years of pressure from public groups and a $300,000 government study.

The 49,600 hectare class "A" park is located in the Slocan valley and adds about 193 square miles of some of the finest wilderness and recreation lands in the province to the park system. The class "A" designation gives the park the highest level of protection provided for a natural wilderness area.

The Valhalla range's documented history goes back to 1907, when the Town Improvement Society built a trail and hut system for tourists to the New Denver Glacier. In 1953, recreational reserves were established around some Valhalla lakes.

In 1970, the Kootenay Mountaineering Club proposed a park in the area. The Parks Division also confirmed its provincial significance.

Brief sets framework

In 1974, a well-documented brief by Ave Eweson proposed a 50,000 hectare nature conservancy. A Valhalla Committee was formed, which later became the Valhalla Wilderness Society.

In 1978, the Canadian Broadcasting Corporation's 'Klahanne' program presented a feature about the Valhallas. The show drew widespread acclaim, and thousands of letters were written in support of a park. The same year, plans were announced for the eventual logging of the Valhallas.

In 1979, the park proposal, which received local government endorsement was increased to 67,000 hectares and a 5,000-name petition was presented to Premier Bennett. The Ministry of Forests also prepared a plan for Valhalla logging.

Over the next few years, controversy continued in the clash between loggers and proponents of a park. In 1982, the Slocan Planning Study, appointed the year before, favored a Valhalla park. Meanwhile, media coverage and public support escalated for the proposed park.

In 1983, conservation groups representing 120,000 residents expressed a need for more B.C. parks, including the Valhallas. On May 23, Victoria Day, the Government declared the area a class "A" park, and received widespread acclaim and endorsement for the move.

Magnificent giant cedars

The park preserves some magnificent groves of western red cedars that are estimated to be more than 600 years old. Immediately, an inventory was planned to map out the more important areas. These statuesque trees, some up to ten feet across, are monuments of time, similar to the redwoods and sequoias of California.

The decision to create the Valhalla park was partly the result of the Slocan Valley Planning study, which included other areas of land-use study. It was the first of its kind in British Columbia, as it was a joint effort between government independent agencies. It gathered facts, briefs and tons of information from industry and the public, in an unbiased manner. After years of lobbying, the Valhalla Wilderness Society hailed the decision.

Well managed to prevent abuse and overuse, the park will serve as a living museum of natural history and provide a wealth of recreational opportunities for generations to come, while living up to its reputation as Canada's Shangri-La. ■

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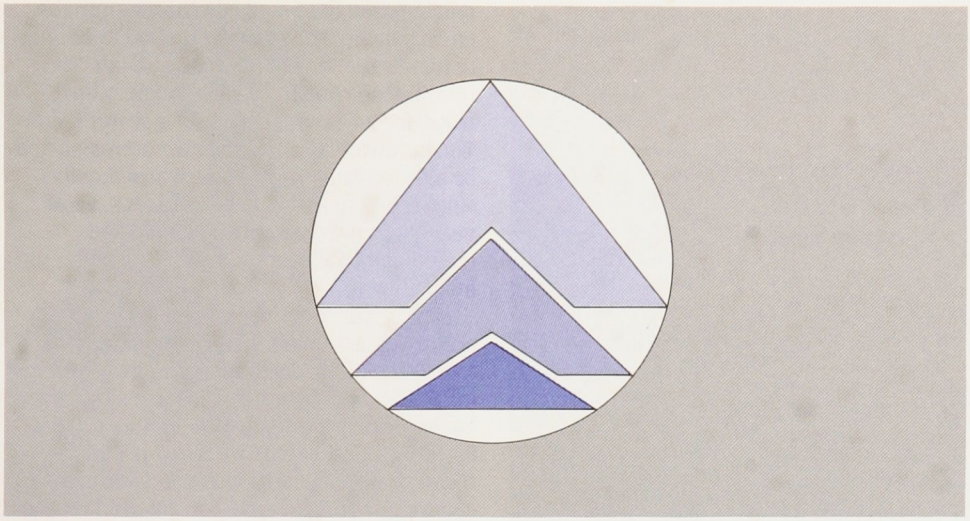
The World Conservation Strategy



Recent probes into space have given mankind a vicarious look at other worlds. They have also made us look back at our own world. Through the eyes of our astronauts and their sophisticated instruments, we have been reminded that we are planet-dwellers. Our only home in this vast universe, the earth, has a fixed size and is enveloped by a thin, sensitive layer of air, water, soil and other living things that sustain human life.

That envelope – earth's biosphere, is deteriorating. This deterioration continues because of the burdens of our ever-increasing population and our seemingly limitless hunger for resources.

The stewardship for this global concern reaches far beyond the influence of individuals, governments or even nations acting in isolation.

In recognition of the scope of this concern, the United Nations Environment Program, in concert with the World Wildlife Fund, commissioned the World Conservation Strategy. Five years after its launch in 1980, the Strategy is being cited as the single most important natural resource planning document available today, and is supported by over 35 countries. Canada became a signatory to the World Conservation Strategy in 1981.

The Strategy is a blueprint for global action that must be taken to conserve our planet's renewable resources so that their development for human use can be sustained.

"... there is a growing realization that a sound economy is based on a sound environment; the two sides must develop in concert if progress is to be maintained ..."

The World Conservation Strategy offers three main objectives which are applicable from a regional to an international level:

- to maintain essential ecological processes and life-support systems on which human survival and development depend;
- to preserve genetic diversity; and
- to ensure the sustainable utilization of species and ecosystems.

In 1981, Environment Canada, as the agency responsible for coordinating the federal response to the Strategy, produced an interdepartmental review of the Strategy's priority requirements and priority national actions. This review produced 22 specific recommendations for action at the federal level. It also generated direct support from no less than 17 federal agencies in the implementation of those recommendations.

In June, Canada will be host to over 300 invited participants and observers comprised of high-level decision-makers from governments, non-governmental organizations and industry at an international conference to discuss and exchange information on the Strategy. It is expected that over two-thirds of the participants will be from developing countries. The participants will examine the progress made in implementing the Strategy, and the use of its principles to integrate conservation and development internationally.

As one of its contributions to the conference, Environment Canada has coordinated the preparation of a report by federal and provincial agencies on Canada's progress in implementing the Strategy since 1982. This report will be one of the several progress reports from countries around the world to be tabled at the June conference.

The Canadian report is expected to be an example of the inter-agency cooperation necessary to implement the Strategy in Canada. The Canadian experience will hopefully be useful to others at the international forum and will foster an awareness at home of the importance of specific Canadian actions to promote conservation and sustainable development.

The conference takes place in Ottawa from May 31 to June 5, 1986. Decision-makers and professionals in development, planning, conservation and environmental management from around the world will have a unique opportunity to share information, expertise and views on the implementation of the World Conservation Strategy guidelines. They will also pursue the development of new approaches for the integration of conservation and development.

Achieving conservation and sustainable development within our world's biosphere is a challenge which transcends national, cultural and philosophical boundaries. It stands to reason that the solution lies beyond those boundaries. The World Conservation Strategy, on the strength of its mandate, is the vehicle by which individuals, governments and nations may together find solutions for a global concern. ■

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Gibraltar's moat

Acidic mine drainage is not a new term to the mining industry; on the contrary, the leaching of waste and low grade rock near mines often produces acidic drainage water. At Gibraltar Mines, near Williams Lake, B.C., however, acidic mine drainage (A.M.D.) was worse than expected. By implementing long-term measures, Gibraltar Mines was able to counter this potentially damaging problem.

Several hundred million tonnes of waste and rock have been deposited near the Gibraltar mine site since start-up in 1972. After several years of operation, small quantities of leachate were detected at the base of one of the dumps. Since none of the other dumps in the area were discharging acid at the time, the event was dismissed as a local phenomenon. When record precipitation in 1982 flushed the dumps, however, the situation became increasingly difficult to handle.

Temporary pumping facilities were brought to the site to control the effluent, but it became obvious that a long-term system had to be installed.

The treatment of effluent from the dumps was proposed, but since water discharged from the mine sites ultimately flows into the nearby Cuisson lakes basin, a popular recreational site with many residents, the idea was rejected. Sealing the dumps was impossible because all sites were still active.

It soon became obvious that the only solution laid in the reclaiming and neutralizing of all mine drainage waters. Building an A.M.D. collection system was a challenge because of many technical, environmental and mining constraints. After 18 months and an expenditure of almost two million dollars, Gibraltar was able to meet its current and future pollution control obligations.

A system of collecting acid mine drainage and directing it towards impoundment ponds carved in impervious glacial till was designed. The collected A.M.D. is then pumped to the concentrator to be neutralized. Under normal conditions, the system pumps 28,000 litres per minute to the concentrator; the system's capacity at this point is more than 50,000 litres per minute. In all, more than seven kilometres of pipe were installed, with dual pipelines throughout, adding to the reliability of the system.

The A.M.D. collection system first had to meet numerous criteria and was dogged by many constraints. First of all, it had to be reliable enough to avoid discharges into the environment. The system also had to be able to handle the 'one in 50 year' rainfall. The runoff ponds had to be big enough to hold water for 24 hours, in case of a power failure. The hardware also had to resist corrosion and be able to handle very acidic water. Lastly, since the system would be used for several years, it had to be fully automated and require minimal operational control and maintenance.

The greatest problem, however, was accurately determining the amount of waste to be handled by the drainage control system. It had to be calculated by the mine site's size, while considering future development. Luckily, good weather data had been kept since the mine opened and it was relatively easy to determine the maximum 24-hour rainfall and total annual snowfall. Other complicated calculations had to be made, concerning the ratio of runoff to precipitation, and so on.

Much care had to go into each decision, from pump station placement to pipeline materials. Very important technical standards had to be met, as did the high specifications of the materials used.

The system is totally automated. Each pumphouse is equipped with a 'Modicom' unit which monitors pond levels and controls the pumping cycles. The units include protection devices and display their status on a diagnostic panel in each pumphouse, requiring only periodic inspection. If a crisis occurs, an alarm rings on the concentrator operating floor, which is under 24-hour surveillance, thus maintenance can be done quickly.

The system has performed very well since start-up. Checks were done to verify the original assumptions on runoff. The design and construction of the drainage control system has proven to be quite a gratifying engineering experience for Gibraltar Mines, primarily because all the work was done in-house, on time, and within budget. It is also comforting to know Gibraltar can coexist in a recreation area without the threat of environmental damage. ■

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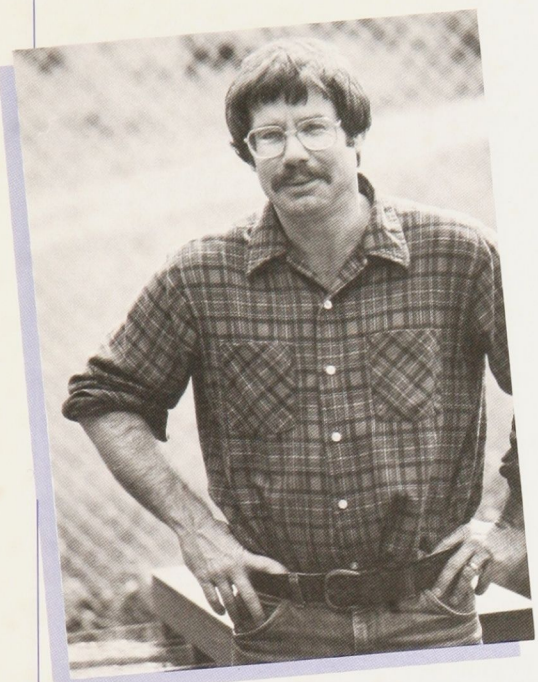
Research blows whistle on algal bloom



Dr. Bothwell, NWRI scientist

It was the brownish-green slime in the Thompson River that spurred Environment Canada to cooperate with industry in conducting groundbreaking research into the effects of industrial and residential sewage on algal growth.

The National Water Research Institute (NWRI) of Environment Canada and Weyerhaeuser Canada Ltd. equally financed a $500,000, four year study on the effect of phosphorus-laden effluent on algal growth in moving water. This study was designed by Dr. Max Bothwell, a water quality researcher at NWRI.

''There have been many studies on algal growth in lakes, but very few in rivers.

''There have been many studies on algal growth in lakes, but very few in rivers. Hopefully the research technology we used here can be used to clean up other rivers in the country,'' says Dr. Bothwell, a PhD limnologist biologist.

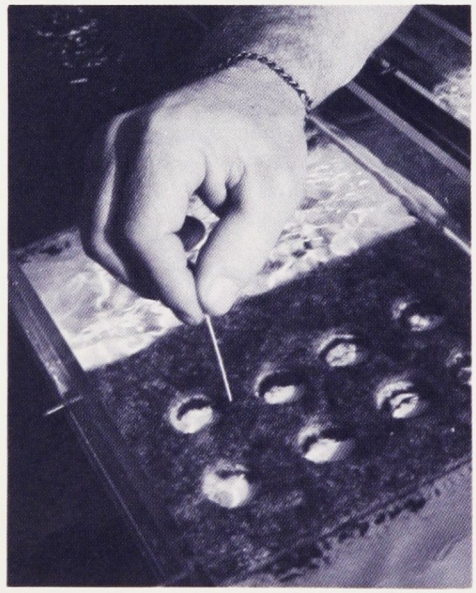
Weyerhaeuser backed the research, says Dr. Bothwell to substantiate a belief that its pulpmill effluent did indeed cause the algal growth before embarking on an expensive effluent-control program.

Public concern over the issue started in the late 1970's when green algal slime began to cover the shoreline of the Thompson River. Residents complained the water smelled and tasted bad. Fishermen said algae was clogging salmon spawning beds in the previously clean river.

A 1974 federal-provincial task force report named the Weyerhaeuser pulp mill and City of Kamloops sewage lagoons as the prime sources of phosphorus in the Thompson River. The sources of phosphorus in the mill's effluent are the chips and sawdust used in pulp production.

Bob Ryan, Weyerhaeuser's technical supervisor, praises the research as original and valuable work. ''The quality of Dr. Bothwell's scientific inquiry is extremely high,'' he says. ''Weyerhaeuser is extremely pleased with the projet since it's providing information that's unavailable anywhere else.''

He adds the program was crucial for the cost analysis of Weyerhaeuser's effluent control program. ''We needed some facts before going ahead and spending millions of dollars.''



Algae sample

In 1981, Dr. Bothwell confirmed in the first phase of his tests that phosphorus in the river was a direct cause of excessive algal growth in the lower Thompson during the low-water winter months.

The second phase of his research involved pumping water from the South Thompson into a series of plexiglass troughs in which algae grew. Different amounts of phosphorus were added to the water flowing through each of the troughs and measurements were made to determine how the algae responded.

While Dr. Bothwell has determined it takes an extremely low level of phosphorus concentration (less than one part per billion) to induce the growth of algae, he adds he is still working on the percentage of phosphorus reduction required at Weyerhaeuser to control algal growth.

Earlier tests had shown that 47 per cent of the downstream phosphorus came from treated pulpmill effluent. Another nine per cent was from the City of Kamloops' sewage treatment system, while the remaining 44 per cent came from natural, agricultural and municipal sources upstream of the mill. The Weyerhaeuser pulpmill currently discharges about 135 kilograms of phosphorus into the Thompson River everyday.

Dr. Bothwell says his investigation will be useful to other water researchers in Canada and the United States. One result will be more stringent water quality objectives, since current phosphorus standards are based on guidelines for lakes which are too high, he explains.

His next step is to share the technology. ''My hope is to develop a compact portable testing unit capable of assaying particular situations anywhere in Canada,'' he says.

The project has already attracted international attention. New Zealand government officials recently toured the research site and will be using Dr. Bothwell's methods to establish new water quality objectives. ■

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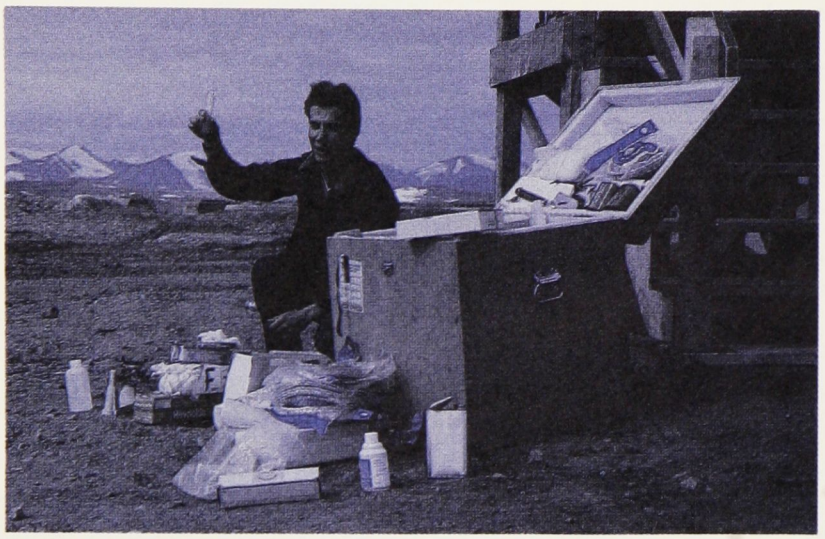
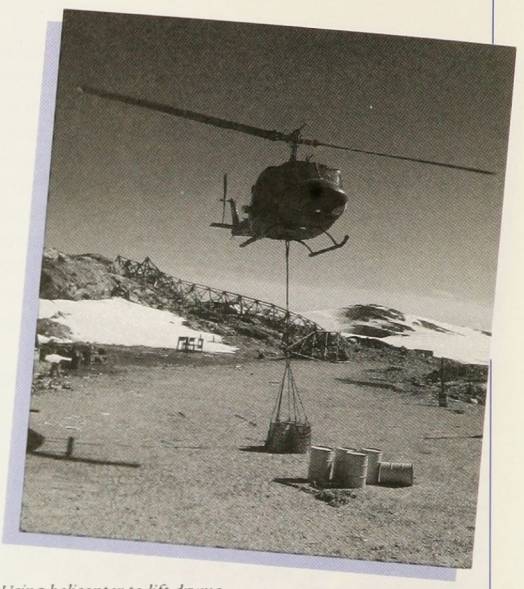
Dew Line '85 cleanup



W. Wilson testing soils for PCB's



Using helicopter to lift drums

The single most important factor contributing to the success of last year's DEW Line cleanup was the weather. It is usually considered the least dependable factor, especially in the High Arctic, where the massive cleanup took place.

According to Mary Anne Sharpe, of the Environmental Protection Service in Edmonton, "We were crossing our fingers hoping to be done with the cleanup by mid-September, but because the weather cooperated we were actually finished by mid-August".

The cleanup of abandoned DEW Line radar sites in Canada's Arctic was a joint effort of the Departments of National Defence (DND), Indian and Northern Affairs (DINA), and Environment Canada. It began in mid-July 1985 and concluded in mid-August of the same year.

The Distant Early Warning (DEW) Line is a series of radar stations spread across the Arctic between the Arctic Circle and 70°N. latitude. They were constructed by the Canadian and American military in the 1950's to act as an early warning system in the event of an attack by the Soviet Union.

When parts of the system became obsolete in the mid-1960's, 22 of the 42 stations were abandoned. Since the sites are isolated, cleanup and removal of the equipment would have been difficult and expensive. As a result, the buildings and much of the equipment were left at the abandoned sites.

Later it became apparent that hazardous materials could pose long-term threats to the health of both people and wildlife. As environmental awareness in Canada's north increased, concern grew that the abandoned sites could contain materials that would increase that threat.

Later it became apparent that hazardous materials could pose long-term threats to the health of both people and wildlife.

In 1984, Environment Canada conducted two field surveys at nine stations to develop an inventory of materials and to estimate the amount of hazardous material at all of the abandoned sites. The survey indicated that a considerable amount of hazardous material, including some polychlorinated biphenyl (PCB) contaminated material remained at the sites.

Based on the findings of the studies, DINA, DND and Environment Canada agreed to conduct a cleanup and removal of hazardous materials at all of the abandoned sites. To inform the northern population of the operation, Health and Welfare Canada and the Government of the Northwest Territories helped the three departments with community consultation.

Two cleanup crews were involved, each consisting of seven military personnel, one representative from DINA and one representative from Environment Canada. Each crew was supported by two Twin Huey helicopters and Buffalo aircraft supplied by DND. As with most military operations the cleanups were extensively planned, right down to the last paperclip. One crew started in Tuktoyaktuk in the Western Arctic and worked its way east while the other began at Cape Dyer in the east and worked its way west.

Before crews were deployed, a reconnaissance of each site was conducted by the crew commander and advisors. This served to establish on-site procedures and determine equipment needed for the removal of hazardous materials. Upon arrival at each site, the entire crew, walking at ten pace intervals, swept the site, marking with stakes points where equipment, barrels, suspect spills or burial sites were present.

The military crew removed and packaged easily-identified PCB-containing equipment from the buildings. The equipment was then listed, wrapped in heavy plastic, placed in drums and sealed. Each drum was marked with a serialized Environmental Protection Service hazard warning label and placed in an Enviropac container.

The drums and Enviropacs were flown back to main staging areas each day for interim storage until the containers were brought to Hall Beach.

By mid-August, all 22 of the abandoned sites were cleaned up and 134 drums of material were removed by helicopter or aircraft. Most of the material was electrical equipment and contaminated soil. In September, all containers were shipped to the United States by U.S. military personnel for ultimate disposal. ■

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Automated Shipboard Aerological Program

Across the rough seas of the North Pacific, a container on the cargo ship Skeena launches a large white balloon twice daily. The balloon is equipped with a radio sonde instrument and rises 25,000 metres before bursting, gathering valuable data for the use of meteorologists around the world.

The Skeena, like a number of other commercial vessels, is part of the Automated Shipboard Aerological Program (ASAP). A unique system first tested in Canada, ASAP obtains weather data from the upper atmosphere over data-sparse ocean areas such as the North Pacific.

ASAP was designed by Environment Canada's Atmospheric Environment Service (AES), the National Weather Service of the National Oceanic Atmospheric Administration (NOAA) and the National Centre for Atmospheric Research (NCAR) in Boulder, Colorado.

''The program started in 1981 when a group of meteorologists and scientists from AES and NOAA started to brainstorm the idea of a new system to obtain upper air measurements from the North Pacific,'' says Dave Phillips, Chief of Data Acquisition at Pacific AES.

Phillips explains they wanted to combine three elements: a lightweight sonde, the use of satellite communications system equipment and the use of commercial ships.

This innovative program has spread worldwide. There are now similar systems in France and Germany. ASAP has also been successfully tested on the North Atlantic Ocean in cooperation with Great Britain. Recently, AES trained a Danish technician in the ASAP program.

The program relies on ''ships of opportunity'' suitable to carrying ASAP. These are commercial vessels such as car carriers, container ships and bulk carriers plying the North Pacific Ocean primarily between Japan and the West Coast of North America. An average round trip for a car carrier is approximately one month, with up to 70 per cent of the time spent at sea. During the sea time, balloon ascents number between 28 and 40.

Cooperation from the ship's owners, captain and crew is vital. The ASAP container is a six-by-two metre container on the open deck of the ship. It's cost-effective, requiring less than $200,000 to outfit. The container is also easy to off-load quickly, without disturbing the ship's activities.

Interior of the ASAP container

ASAP operates independently of the ship's daily activities and requires only a hook-up to the ship's electrical power system. The program is semi-automatic so it doesn't require a fully qualified weather technician to operate.

Within the container are the microcomputer, upper air processing system and the uplink transmitter to the satellite. There's also a launcher which has helium for filling the balloons.

After launching a balloon, the operator enters the ship's surface observations into the computer. Moments later, the computer automatically prints out the data received from the sonde including time, rate of ascent, height, pressure, temperature, humidity, wind speed and direction. The computer continues printing the data until the balloon bursts.

The microcomputer processes the data and feeds it through a transmitter to a meteorological satellite and on to the satellite receiving station in Vancouver. The data is then transmitted via the Global Telecommunications System for use throughout the world.

The ASAP data serves as a valuable ''ground truth'' of other weather information such as satellite photos and data collected from land stations and drifting buoys, providing meteorologists with more detail for a more accurate picture of the weather.

ASAP is currently operating on three ships in the Pacific program. ■

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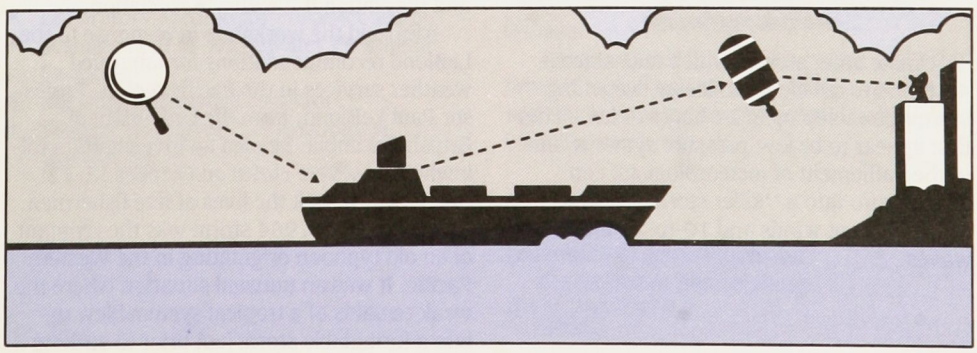

Information from the sonde goes to the ASAP computer, is processed, then transmitted via the satellite to the ground station.

Better knowledge ... for better forecasting

Two or three times a year a ''bomb'' explodes in the Pacific Ocean. Oceanic storms, which intensify explosively and rapidly, are generally unpredictable and dangerous.

Unlike other storms which take at least 48 hours to develop, explosive deepening storms can whip up in 24 hours or less.

Unlike other storms which take at least 48 hours to develop, explosive deepening storms can whip up in 24 hours or less. They first appear to be low-pressure systems, but to the bafflement of meteorologists, can quickly turn into a ''killer storm'' with 50-to-70 knot winds and 10-to-20 metre waves.

''They're dangerous to mariners because they develop so rapidly. Meteorologists don't yet have enough knowledge to accurately predict them,'' says Bary Wells, Chief of the Pacific Weather Centre.

The Pacific regional office of the Atmospheric Environment Service (AES) organized an international workshop in September, 1985 to determine current levels of knowledge and find the causes of these storms. The workshop, which was held at the University of Washington in Seattle, WA., was jointly sponsored by Environment Canada, the U.S. National Weather Service and the National Weather Association.

AES held the workshop in response to the LeBlond recommendations for improved weather services in the Pacific region. Professor Paul LeBlond, from the University of British Columbia, headed an investigation following the severe storm on October 11-12, 1984, which took the lives of five fishermen.

The October 1984 storm was the remnant of an old typhoon originating in the Western Pacific. It was an unusual situation where the weak remains of a tropical system blew up into a formidable storm just prior to striking the B.C. Coast.

At present, there aren't many forecasting techniques for predicting these ''bombs''.

At present, there aren't many forecasting techniques for predicting these ''bombs''. Workshop participants analyzed past storms and compared findings, but were unable to reach a definitive answer on how to forecast these systems. However, members were able to agree that bombs are storms in which the central pressure falls 24 millibars or more in 24 hours. Previously, no standard definition existed.

Members also defined the common features of ''bombs'', finding such traits as strong temperature gradients, a jet stream with winds higher than 140 knots and moisture laden-air.

An eye-opener at the workshop was the daily lab session where more than 35 metereologists, supplied with surface and upper air maps and satellite images, reforecasted the storm of October 11-12, 1984. The lab provoked considerable debate. Although the meteorologists knew from hindsight that it was a bomb and the time it would explode, they were unable to predict the storm in this exercise until it was in full force.

The case study highlighted the need for meterologists to maintain their analysis skills. Participants identified three major areas for future study: real-time studies, post-mortem diagnoses and forecast techniques.

AES will be conducting research based on the workshop conclusions to better understand these weather systems. For example, meteorologists at the Pacific Weather Centre will conduct real-time research, investigating and evaluating bombs as they occur.

AES has proposed to host the next international workshop on oceanic storms in the fall of 1987. ■

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Water quality starts with proper training

Operator at work

The Federation of Associations on the Canadian Environment (F.A.C.E.), a national volunteer association consisting mainly of waterworks and wastewater managers, engineers and operators, has been deeply involved in the improvement of the environment.

Members of these associations are designing, managing and operating new advanced treatment facilities for both drinking water and wastewater.

It is possible to have well designed treatment plants operating inefficiently, because operators are not well trained.

New treatment plants in Quebec and in Saskatchewan are good examples of Canadian efforts to ensure the quality of our water resources. However, it is possible to have well-designed treatment plants operating inefficiently, because operators are not well trained. To address this problem, F.A.C.E., in cooperation with governments and associations, introduced two operator training courses to provide the expertise required to maximize the effectiveness of both potable water and wastewater treatment facilities.

An internationally recognized wastewater operator training course was first developed in the early 1970's. The course, which features basic, intermediate and advanced levels, has been taught to over 32,000 students in Canada and the United States.

The basic course includes information on characteristics of sewage, natural biological treatment, waste treatment methods, disinfection, tests and sampling, record-keeping, maintenance, and safety.

The advanced course consists of packages which deal, in considerable detail, with a particular aspect of wastewater treatment. To date, skill packages have been developed for:

- Chlorination
- Activated Sludge
- Extended Aeration
- Anaerobic Digestion
- Waste Stabilization Ponds
- Collection System
- Laboratory Method for Process Control
- Management of Wastewater Treatment Facilities
- Rotating Biological Contactors
- Sludge Conditioning, Thickening & Dewatering

The second program of operator training was developed by F.A.C.E. in the early 1980's, to provide a basic level of knowledge to all those working in drinking water treatment plants across the country.

The program includes eleven modules:

- Intake and Pretreatment
- Coagulation and Flocculation
- Sedimentation
- Filtration
- Ground Water Source and Supply
- Well Structure and Components
- Record Keeping for Well Operators
- Well Operation and Maintenance
- Pumps
- Chlorination/Disinfection
- Water Distribution

The modules cover the spectrum of the basic steps in treating both surface and ground water.

Although this course is just coming to completion, more than 2,000 modules are being used in over 200 communities across Canada.

These water treatment programs will help provide Canadians with good water quality without sacrificing environmental or health considerations. ■

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State of the environment in Canada

Canadians will be given a new perspective on the changes taking place in their environment, with the release of a new report published by Environment Canada.

The report, known as the *State of the Environment Report for Canada*, was jointly produced by Environment Canada and Statistics Canada. A statistical compendium entitled *Human Activity and the Environment*, published by Statistics Canada, was also released at the same time.

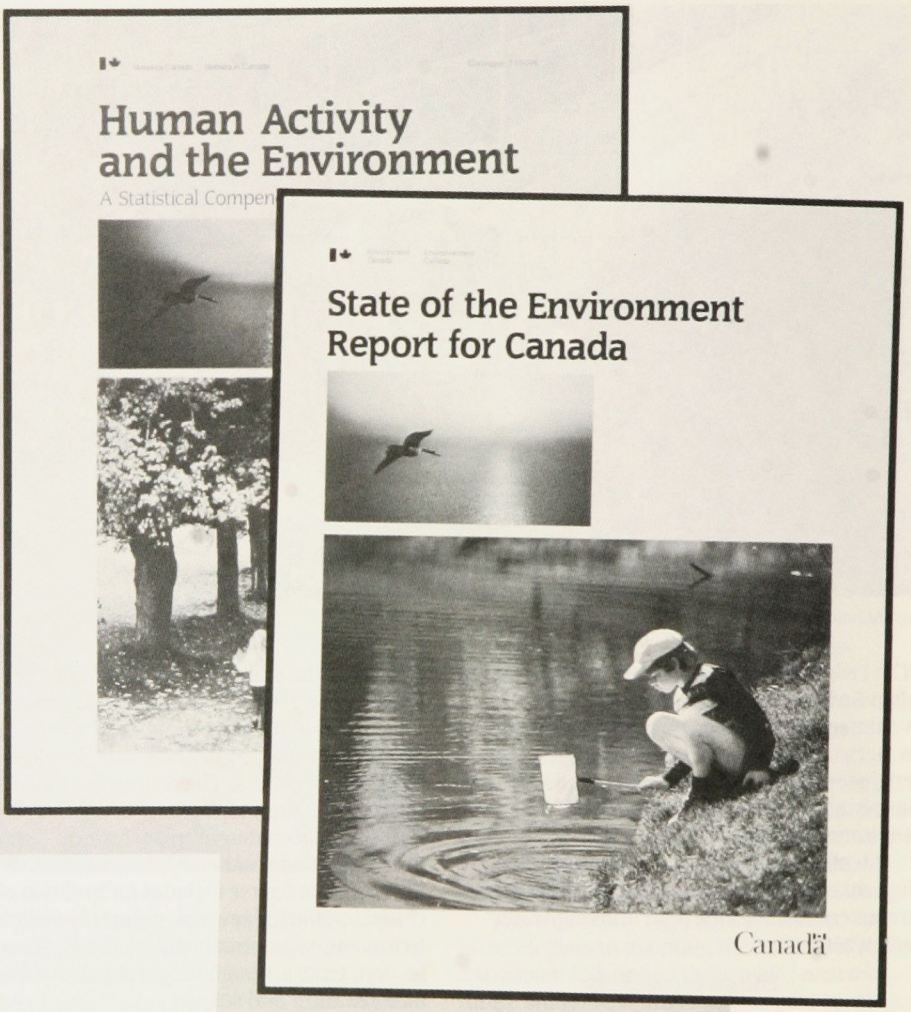
The first comprehensive assessment of the environment ever published in Canada.

The first comprehensive assessment of the environment ever published in Canada, the two reports rely on data gathered from a wide variety of government, academic and scientific sources. It provides Canadians with a synthesis of the best available information on current conditions and trends in our environment.

As public awareness continues to grow, concerned individuals and groups in all sectors of society are demanding a profile of environmental conditions that not only correlates data from many different sources, but also interprets the changes taking place in our environment.

The *State of the Environment Report* responds to that demand by pulling together pieces of information so that patterns of change can be more easily identified and understood. It sets out, as factually as possible, the conditions of the farmlands, forests, water, wildlife and the other resources that Canadians hold in common, and it identifies the major factors that will change those conditions, for better or worse.

To make this wide-ranging assessment even more accessible to Canadians, Environment Canada has published a popular version of the full report, entitled *Canada's Environment: An Overview*.This overview summarizes, in a less technical manner, the salient points contained in the longer version. It includes full-colour illustrations and graphics, and is available to the public free of charge.



By offering Canadians an overview of their environment, the government aims to generate interest beyond the current focus on issues. It also hopes to stimulate discussion among all Canadians about our place in the environment, including the interdependence of sustainable economic well-being, continuing environmental quality and human health.

The *State of the Environment Report* attempts to deal with the environmental problems at a fundamental level. Using what is known as the ''stress-response'' framework, it examines the connections between stresses caused by human activity and natural forces, and the resulting responses, or changes, in the environment.

The report has used for the first time anywhere what is called an ''ecosystem approach'' to document environmental change. In order to describe Canada's vast and diverse land area, the country has been divided into 15 ecological zones, called ''ecozones'', which are each made up of areas that share similar environmental characteristics (eg., boreal, prairie, Arctic, etc.). From this unique perspective, the report looks at the Canadian environment as a system of interdependent ecosystems, rather than political jurisdictions.

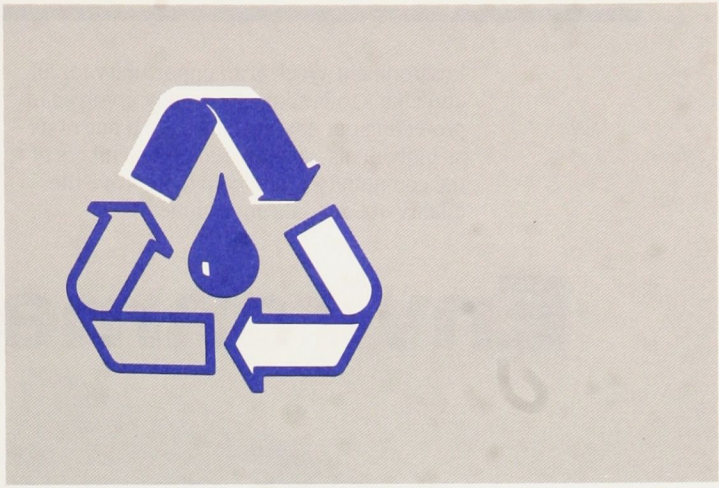
Other topics covered in the *State of the Environment Report* include the effects of contaminants on human health and the environment, and the response of organizations and institutions to environmental change in terms of legislation and expenditures. The effects of global trends and conditions, as well as the environmental perceptions of Canadians, are also examined.

Copies of the *State of the Environment Report for Canada* are available at $25 per copy through authorized bookstore agents and local book sellers, or from Canadian Government Publishing Centre, Supply and Services Canada, Ottawa, Ontario K1A 0S9.

More extensive environmental statistics are contained in *Human Activity and the Environment: A Statistical Compendium*, published by Statistics Canada. This publication is available at $45 per copy from Publication Sales and Services, Statistics Canada, Ottawa, Ontario K1A 0T6.

For a free copy of *Canada's Environment: An Overview*, or further information about all three publications, contact the Enquiries Centre, Environment Canada, Ottawa, Ontario K1A 0H3, (819) 997-2800; or your regional office of Environment Canada. ■

Oil and water don't mix



Estimates indicate that 50 million litres of waste motor oil are improperly disposed of each year by do-it-yourself oil changers in Canada. The oil is poured onto the ground, into drains and storm sewers or put out with the trash.

This waste oil can cause water and soil contamination problems and is a tremendous waste of energy. Waste oil contains a wide array of contaminants, including heavy metals, chlorinated organics and polynuclear aromatics.

But waste oil need not be wasted. There are five waste oil re-refineries across Canada equipped to remove the dirt and contaminants from waste oil, replace the additives and produce a product which is as good as virgin motor oils. The re-refined oil is then blended with virgin oils or left as is and re-sold.

Unfortunately, most do-it-yourselfers do not know what to do with their waste oil, or even that it is possible to have it re-refined. To help solve the problem, Environment Canada has started a waste oil depot program, using service stations and service centres as drop-off points for do-it-yourselfer waste oil. About 500 depots have been set up in the Golden Horseshoe area of southern Ontario. Program expansion is now underway.

This program was made possible with the cooperation of major oil companies, retailers and municipalities. Under a unique arrangement, the environmental group Pollution Probe has agreed to undertake the long term role of program coordinator, freeing Environment Canada to initiate other projects.

To promote this program, over 500,000 flyers were distributed to home owners via the water bill mailing. Paper funnels, carrying messages about the program, were also distributed at gas stations. The funnels were designed to transfer waste oil from the drain pan to a sealable container which could be returned to the depot. ■

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Environment Week

June 1 to 7 1986

Environment Week is an opportunity for all Canadians to become personally involved in protecting our environment. Each one of us – as individuals, consumers, and members of the community – can help to improve the quality of Canada's environment.

Environment

It's up to all of us!