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Canada

A Word from the Editor

In *Environment Update* we usually try to mix natural history with environmental policy, and this issue is a particularly varied mix. In it, we visit two natural spaces of surpassing strangeness and beauty: the high north, and a small quarry in British Columbia called the Burgess Shale. We also take a look at efforts on the part of Canadian groups and companies to make sustainable development a reality. Finally, we feature excerpts from the government's *Green Plan* discussion paper, a document that is bound to affect the future of both natural spaces and sustainable development in Canada.

Yoho National Park in British Columbia has one of the world's best collections of fossil oddities. Here you will find mollusks that are not quite mollusks, and small flecks of flesh with five eyes, and tiny amorphous wonders that once stalked the ocean floor on double-jointed spines. These are the fossils of the Burgess Shale, and many of them have been preserved with their membranes and tissues intact, like flies in amber. In his recent book on the Burgess fossils, Harvard palaeontologist Stephen Jay Gould calls them the most important fossils in the world. They give the earth scientist – and the visitor to Yoho – a glimpse back into the Cambrian seas of 500 million years ago. The shale adds a special dimension to an already stunning national park.

The Canadian Arctic also contains, in its rocks and glaciers, a rich record of its geological past. That record tells us that the climate of the Arctic has changed radically over the eons. Now it is changing again, thanks to the greenhouse effect, and the changes will undoubtedly have a profound effect on the people, the economy and the wildlife of the north. Experts tend to agree that greenhouse warming is not yet detectable in the Arctic, but add that we may well begin to see changes within a decade. The nature and extent of these changes are explored in our article on climate change in the Arctic.

The changing climate is one of the many concerns addressed in the federal government's *Green Plan*, to be released later this year. It will map out a strategy to make Canada the industrialized world's most environmentally friendly country by the year 2000. On March 29, the Minister of the Environment released a document, *A Framework for Discussion on the Environment*, that is serving as a basis for public input. It surveys the issues, maps out some projected initiatives, and raises questions for the reader's consideration. We include here several excerpts from the document.

Another concern to be addressed in the *Green Plan* will be sustainable development and how to make it work. Recently, Environment Canada's Corporate Policy Group implemented a new project on just this theme. Called the Success Stories Bank, it is a repository of ingenious ideas and determined efforts, all directed toward the goal of integrating economic activity with environmental concerns. The files of the Bank contain items on diaper-manufacturers, wildlife management boards, and arts associations among many others; we hope our readers will find the variety of stories heartening, as we did.

Jamie Findlay

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Cover photo: *Tanquary Fjord, Ellesmere Island, in Canada's Arctic*

Environment Update

Environment Canada was created by the Parliament of Canada in 1971. The Atmospheric Environment Service, the Conservation and Protection Service, and the Canadian Parks Service of Environment Canada work to preserve and enhance the quality of Canada's environment.

Environment Update publishes a variety of articles on environmental and heritage issues relating to the mandate and work of Environment Canada.

Readers may address comments and enquiries to: The Editor, *Environment Update*, Communications Directorate, Environment Canada, Hull, Quebec K1A 0H3.

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Environment News

Robert R. de Cotret Appointed Minister of the Environment

Environment Canada's new minister, Robert R. de Cotret, brings to the portfolio the expertise of a trained economist. He has taught at university and served as an adviser to the President of the United States and the Minister of Finance in Ottawa. He is also a past chairman of the Conference Board of Canada and a former senior executive of the National Bank of Canada.

Mr. de Cotret began his political career in 1978, when he was first elected to the House of Commons. In the following year he entered Cabinet as Minister of Industry and Commerce and Minister of State for Economic Development. He has also served as Minister of Regional Industrial Expansion, Minister of State for Science and Technology and President of the Treasury Board, a position he still holds. In May 1990, he was appointed Acting Minister of the Environment.

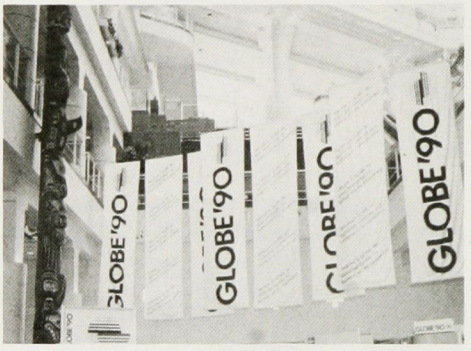
Mr. de Cotret is eminently qualified for the task of reconciling environmental and economic needs to achieve sustainable development, the goal of the *Green Plan*. On assuming the environment portfolio he declared, "Our commitment has not changed. The environment is at the top of our agenda as a government and will remain there."

Proposed Regulations Will Reduce Automotive Emissions

The federal government has announced its intention to further reduce tailpipe emissions in 1994 model-year cars. The proposed regulation is aimed at reducing smog levels in major urban areas of Canada.

The new standards would reduce nitrogen oxide emissions by 60 per cent and hydrocarbon emissions by 29 per cent. This would meet requirements for 1995 model-year cars in California, which has the most stringent emission regulations in the United States.

GLOBE '90 Attendance Surpasses Expectations



GLOBE '90

More than 3,000 delegates from across the world were in Vancouver, B.C., during March 19-23 for GLOBE '90 – the first international conference and trade fair promoting global opportunities for business and the environment.

The conference provided a unique forum for representatives from more than 70 countries and a variety of sectors to meet to discuss environmental concerns. More than 550 presentations were made, focusing on six main themes: policy and legislation, business development, technology and research, urban development, international perspectives, and industrial applications. The conference encouraged partnership and co-operation as a means of conserving the earth's natural resources.

The federal and provincial governments announced several major initiatives during the event, including the endorsement of a national protocol to reduce packaging by 50 per cent by the year 2000.

The trade fair provided momentum for Canada's environmental products, services and technology. More than 400 Canadian companies exhibited their wares and made valuable contacts with potential buyers from all over the globe.

The success of GLOBE '90 sets the stage for GLOBE '92 – the second event in the series, scheduled to be held in Vancouver during March 16-20, 1992. It is hoped that, by 1996, the GLOBE series will be a self-sustaining international event.

Canadian Parks Service to Manage Eastern Slope of Mont Saint-Bruno

The eastern slope of Mont Saint-Bruno, previously managed by the Department of National Defence, has been transferred to Environment Canada. The 85-hectare area, located less than 30 minutes from Montréal, adjoins Mont Saint-Bruno provincial park.

The Canadian Parks Service will study ways of developing the slope to ensure that as many people as possible can enjoy this green space. Possibilities include a joint project with the Quebec government.

When the study is completed, the Service's recommendations will be presented as part of a public consultation process on the area's use.

Regulatory Reforms for Pulp and Paper Industry Outlined

The federal government will impose strict regulatory reforms over the next four years to decrease pollution from pulp and paper mills.

The new regulations under the Canadian Environmental Protection Act will virtually eliminate dioxin and furan discharges, and tightly control discharges of organochlorines produced in the bleaching process.

Amendments to existing regulations will set new limits on effluent discharges, establish new procedures for effluent measurement, and make all mills subject to regulations governing the discharge of suspended solids, oxygen-depleting substances and acutely toxic effluents.

Windsor to Get New Air Monitoring Station

Environment Canada is establishing a new air toxics monitoring station in Windsor, Ontario, to monitor transboundary air pollution from Detroit incinerators.

The station, which begins operating this summer, is the second of its kind in Windsor, and the third in southwest Ontario. It will contain specialized equipment for measuring airborne toxic organic compounds, including PAHs, PCBs, dioxins and furans, as well as volatile organic compounds.

164 Environmental Projects Now Under Way

The federal government has spent more than $6.8 million under the Environmental Partners Fund program to help finance 164 projects across Canada. The estimated value of the projects in donated time, materials and money from all partners is $37 million.

Service and recreational clubs, community associations and environmental groups have submitted almost 700 applications in the first two rounds of the program. The projects range from river and lake clean-ups and composting campaigns to community recycling projects and wildlife habitat restoration.

The five-year, $50-million program provides matched funding up to 50 per cent of a project's total costs, to a maximum of $200,000 over three years.

More Products Granted EcoLogo

Twenty-four companies now have various products certified to carry the EcoLogo symbol of Environmental Choice.

The certified products include several brands of re-refined motor oil, recycled plastic fencing, water-based paint, cellulose insulation, cloth diapers and recycled paper. Each will bear the EcoLogo symbol – three doves intertwined in the shape of a maple leaf – identifying them as less harmful to the environment.

Products are eligible to carry the EcoLogo if they meet the standards set out by the Environmental Choice Program. Guidelines are currently available for eleven product types, ranging from recycled plastic products to zinc-air batteries.

Institute for Sustainable Development Established

The Government of Canada and the Province of Manitoba have established an International Institute for Sustainable Development in Winnipeg.

The non-profit organization is dedicated to promoting the principles of sustainable development at the national and international levels.

The Institute is chaired by Lloyd McGinnis, president of Wardrop Engineering and a member of the National Task Force on Environment and Economy. The Board of Directors will include prominent Canadians as well as international representatives from developing and newly industrialized countries.

New Environmental Assessment Legislation

In June, Environment Minister Robert R. de Cotret introduced a major package of environmental assessment reforms in the House of Commons.

The central feature of the reforms is the proposed Canadian Environmental Assessment Act, which will, for the first time, entrench in law the federal government's obligation to integrate environmental factors into its project planning and implementation.

To complement the legislation, the reform package includes new funding totalling approximately $100 million a year, which will triple federal spending on environmental assessments, and the addition of several hundred new positions in the environmental assessment field across government. It also includes a requirement that all proposed federal policy initiatives undergo an environmental assessment, culminating in a public statement of their environmental implications.

''These reforms are integral to the federal government's overall commitment to the national *Green Plan*,'' Mr. de Cotret said. ''They reflect the way we will be doing business from now on.''

This initiative fulfills a commitment by the Government of Canada to reform the environmental assessment process. It responds to recommendations for a more effective, efficient, fair and open process made during two years of extensive consultations.

The Green Plan: The Challenge Begins

Later this year, the federal government will release *The Green Plan: A National Challenge*. The Plan will describe the initiatives, programs and laws that the Government will implement in order to make Canada the industrialized world's most environmentally friendly country by the year 2000.

The *Green Plan* can succeed, however, only if it takes into account the concerns of all Canadians about the environment. Consequently, the former Minister of the Environment released a consultation document last spring, *A Framework for Discussion on the Environment*, which summarizes the issues to be addressed in the *Green Plan*.

The release of the consultation document was the first stage in the process leading up to the *Green Plan*. During the spring and early summer, the Government proceeded with the second stage: the gathering of public input to the Plan through information and consultation sessions across Canada. The third stage is the formulation of the action plan, based on the public's contribution. A wrap-up session, to be attended by representatives of the major stakeholder groups, will take place during August 19 to 21 in Ottawa. It will result in firm recommendations to the federal government on items for inclusion in the *Green Plan*. The Plan will be tabled in the House of Commons in the fall. The fourth stage – the longest and most challenging – will be the Plan's implementation.

Speaking to the Council of Europe, new Environment Minister Robert R. de Cotret declared that the *Green Plan* is one of the most ambitious efforts yet by any nation to put the principles of sustainable development into practice. "Today's environmental problems are of a scope and complexity that require. . .an unprecedented level of co-operation in developing options and taking concerted action," he added.

A Framework for Discussion on the Environment is purposely open-ended. It lays out the issues, suggests possible avenues for consideration, and addresses questions to the reader. The excerpts below give the general scope and flavour of the paper.

The Green Plan
A NATIONAL CHALLENGE

The Challenge

We face environmental challenges because we have closed our eyes on the bill to be paid for the ravages caused by pollution, the depletion of natural resources, and the destruction of our ecological heritage. If we are to achieve sustainable development, we must understand that the origins of environmental problems can be found in the way we make decisions, at all levels of society.

It is the countless day-to-day choices made by individual Canadians, acting alone or within business, government and other organizations, that shape the economy of our country. In turn, the flow of energy, materials and waste set in motion by these decisions determines the impact of our actions on the natural world . . . Our decisions must reflect the true value of our scarce environmental resources and the fragile ecosystem on which we depend for our health and well-being.

Improving Decision-Making

There are are three basic steps to correcting existing failures in decision-making. First, we must *improve the factors* that affect decision-making. Second, we must change decision-making *processes and institutions*. Third, we need to strengthen and build *partnerships*.

A. Improved Input

There are five key factors that will lead us to better decision-making.

Better science

Good science is essential for good environmental policy and sound regulation. The Government proposes to increase significantly its commitment to environmental science and technology. For example, it is considering a new program, to be administered by the three national granting councils (Natural Sciences and Engineering Research Council, Social Sciences and Humanities Research Council, Medical Research Council) to promote fundamental environmental research at Canadian universities.

Individuals and communities have the most important role to play in bringing about changes in decision-making.

More information about the environment

Environmental information must be readily accessible to all Canadians. Just as we have indicators for the health of the economy (the Consumer Price Index, the unemployment rate, etc.), we need something to measure the health of the environment. More frequent state-of-the-environment reporting, further development of National Accounts incorporating environmental concerns, and a national environmental library are among the options under consideration by the government.

Paul Dick, Minister of Supply and Services (left), with John Mills, Regional Director General, Conservation and Protection, Ontario Region, at the Green Plan consultation session in Ottawa

Education
A third requirement for good decision-making is better environmental education, which will make us aware that we can help protect the environment and provide us with the training to do so. The Government recognizes that it must co-operate with the provinces to establish priorities for action in environmental education.

Legislation and Regulation
The Government believes that effective laws, vigorously enforced, are needed to protect public health and environmental resources. Despite recent and ongoing federal legislative initiatives – most notably the Canadian Environmental Protection Act and the proposed Canadian Environmental Assessment Act – the government believes there are still important gaps in federal environmental legislation, particularly in regard to protecting wildlife, assuring the safety of drinking water and responding to concerns about pesticides.

Economic Instruments
Economic instruments that reflect environmental costs will encourage decision-makers to take the environmental consequences of their actions into account. Possible measures include effluent taxes, tradeable emission rights, deposit/refund systems and user charges.

B. Changing Decision-Making Processes

Existing processes must be changed to formally recognize environmental considerations as essential decision-making criteria. As part of its responsibility in this area, the Government has recently tabled a bill to strengthen application of the federal Environmental Assessment and Review Process (EARP).

Canada's environment ministers have agreed to set a national goal of reducing waste generation by 50 per cent by the year 2000.

C. Strengthening Partnerships

Better environmental decision-making will require co-operative efforts at all levels of Canadian society. Individuals and communities have the most important role to play in bringing about changes in decision-making. The success of community Blue Box programs is testimony to the willingness of Canadians to make changes. Further actions will be needed to encourage individuals and communities to act. For example, a national program similar to PARTICIPaction and other health promotion programs could be considered to encourage environmentally sound decision-making.

Action on Environmental Issues

The Government of Canada believes that action on environmental problems should be targeted at five broad areas: environmental stresses, the global commons, sustaining renewable resources, preserving ecological and heritage resources, and protecting the Arctic.

A. Environmental Stresses

The government believes that action is needed to respond to key stresses on the environment, including toxic substances, waste management and environmental emergencies.

Toxic Substances
In 1988, the Government of Canada passed sweeping legislation – the Canadian Environmental Protection Act – designed to deal with the threat of toxic substances. As part of CEPA, a priority list of 44 substances has been identified for assessment within the next four years.

Notwithstanding these measures, more needs to be done on toxic substances. Based on the assessments of substances on

Pat Delbridge, Chair, Environmental Choice Board, at the Green Plan consultation session in Ottawa

the priority substances list, the Government will move toward national standards under CEPA for other major industries such as metal mines and mills, smelters, power generation plants, hazardous waste facilities, textile factories, petroleum refineries, chemical production plants and steel plants.

Waste Management

Canada's environment ministers have agreed to set a national goal of reducing waste generation by 50 per cent by the year 2000. Canadians need to explore the ways governments, industry and individuals can best contribute to a 50-per-cent reduction in waste. One mechanism is an Office of Waste Management to expand the national waste exchange program and to promote waste reduction and recycling. National regulations to control packaging and to require recycling are an option for addressing the waste issue. Alternatively, emphasis could be placed on educational measures, voluntary action, and pricing to reduce waste.

Emergencies

The first response to man-made catastrophes must be prevention and preparedness. The Government of Canada plans to introduce a comprehensive environmental emergency program to cover the production, transportation and disposal of oil, chemicals and other potentially hazardous substances.

B. The Global Commons

The issues of global warming, ozone depletion, acid rain, and air and water quality all have economic implications and pose threats to human health and the health of the environment.

Global Warming

Responding to global warming will be a formidable challenge, given the international scope of the problem, the serious gaps in our scientific knowledge and the potentially enormous costs of controlling greenhouse gas emissions. The government believes that, while efforts to control greenhouse gas emissions by individual countries are needed, co-operative and co-ordinated international action is required for a lasting solution. Beyond this, however, there are many questions to answer about Canada's response to the problem. Should Canada commit itself to greenhouse gas emission targets in the absence of an international agreement for co-operative action? How far should Canada go? What mechanisms should be used to achieve the appropriate reductions?

Good science is essential for good environmental policy and sound regulation.

Air Quality

To address some of the more serious air quality problems such as ground-level ozone, federal and provincial environment ministers announced last October that they intend to reduce emissions resulting from the use of transportation fuels. The Government of Canada has proposed to establish California emission standards for 1994 model-year cars.

Water

Despite efforts to control the degradation of our water resources through actions such as the adoption of a Federal Water Policy and the development of regulations under the Canadian Environmental Protection Act and the Fisheries Act, much remains to be done.

Some options the Government is considering include increased research and monitoring, establishing a Drinking Water Safety Act, and embarking on a project to clean up the Fraser River. To help conserve our water resources, the Government also wishes to encourage sound water management through realistic water pricing.

C. Sustaining our Renewable Resources

Agriculture

Increasingly, farmers and governments recognize the necessity of taking into account the impact of agriculture on the natural environment. This concept is at the core of sustainable development, which is one of the pillars of the new agriculture policy being developed by Agriculture Canada. To apply sustainability to their farming practices, farmers need to be encouraged to adopt practices that promote soil conservation, reduce degradation of surface and ground water, and preserve wildlife habitat.

The issues of global warming, ozone depletion, acid rain, and air and water quality all have economic implications and pose threats to human health and the health of the environment.

Forests

Properly managed, Canada's forests contribute to a variety of environmental and economic objectives. To encourage the sustainable development of our forests, the Government has created a new Department of Forestry that includes the concept of sustainable development in its enabling legislation. In what ways can the federal government best contribute to sustainable forest management while respecting the jurisdictional prerogatives of the provinces?

Fisheries

Fish stocks are now threatened by excessive harvesting in marine fisheries both inside and outside Canada's exclusive fishing zone. In the freshwater fisheries, the major problem is the destruction or pollution of the habitat on which the stocks depend. Managing these threats to sustainable development of the resource will require a variety of responses: regulatory and enforcement action; international diplomacy; a greater science effort; innovations in fisheries management; and development of environmentally sustainable economic opportunities.

D. Preserving Ecological and Heritage Resources

Our national parks and historic sites are seen as models of environmental quality and are an important legacy for future generations. The Government proposes to establish at least five new parks by 1995, and will continue planning to meet its commitment to complete the national parks system by the year 2000; to establish three new marine parks by 1995; and to commemorate seven key historic themes by 1995.

Wildlife is integral to the Canadian heritage and is an essential element in ensuring the continued productivity and diversity of ecosystems. In order to achieve its goals of preserving wildlife, the Government is considering a number of options, including a program to protect wildlife populations and their habitats, increasing wildlife research and monitoring, and developing new legislation to protect native endangered species and control international traffic in endangered wildlife.

E. Protecting the Arctic

The fragile Arctic ecosystem is under stress from a wide range of human activities. The Government intends to pursue a strategy and research program to:

- identify and deal with pollution sources and their effect on the Arctic environment and northern people;
- monitor Arctic ecosystems; and
- develop a systematic approach to defining protected areas.

Hazardous and solid wastes have been abandoned at a number of locations throughout the Arctic. This situation is unacceptable and the Government is determined to launch a full-scale clean-up operation.

Postscript

Sustainable development is not an issue for, or a responsibility of, the federal government alone. It demands a commitment on the part of all Canadians acting individually and collectively. Canadians may wish to go beyond commenting on specific questions raised in the *Framework* to deal with broad and fundamental questions. Among them:

- Are the priorities that emerge – better decision-making through better inputs, processes and partnerships – the most useful ones?
- Given the reality of budget constraints, how can we achieve our environmental objectives?

The views of Canadians on these and other issues raised in this paper will help transform the Government's *Framework for Discussion on the Environment* into *The Green Plan: A National Challenge*. ■

Environment Minister Robert de Cotret at the Green Plan consultation session in Ottawa

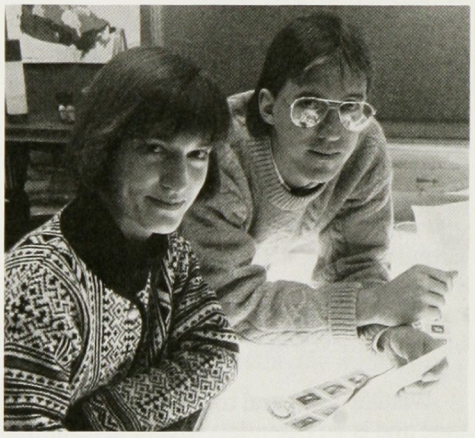
The Success Stories Bank: Practical Steps Toward Sustainable Development

What do a cloth diaper producer in Burnaby, B.C., a Vancouver arts and recycling association called the Imagination Market, and the Beverly-Kaminuriak Caribou Management Board have in common?

They have all come up with a way to make sustainable development a reality, and consequently all have won a place in Environment Canada's Success Stories Bank.

The Success Stories Bank collects and publicizes examples of how the public and private sectors have wedded environmental concerns with economic activity. Contributors to the bank include companies, government organizations, environmental groups and community associations. Success stories run the gamut from a new method of treating wastewater using aquatic plants pioneered by the Royal Botanical Gardens of Montréal, to an innovative composting program being carried out by the Peel Region Boy Scouts.

The bank is constantly on the lookout for "deposits" – examples of innovation and ingenuity in the realm of sustainable development. To qualify, an initiative must show economic as well as environmental benefits. Initiatives can vary widely in the screening, the Bank works with the contributor to describe in detail the environmental, economic, social and health benefits of the initiative. Eventually the stories are approved by a review and advisory board and become part of the Bank's holdings.



Denise Onysko and Michel Tatlock, the Success Stories Bank's research team

A glance through the files of the Bank can be heartening.

A glance through the files of the Bank can be heartening. It shows that, for many groups, sustainable development is not just a catch-phrase but a principle of action. Consider, for example, the efforts of the Imagination Market, a non-profit community organization in Vancouver that recycles waste materials for use in arts projects and play.

Each week the Imagination Market collects bits and pieces left over from various manufacturing processes – cast-offs that would normally go to landfill sites. These bits of wire, plastic, vinyl, leather, wood and so on fill the bins at the association's store and provide a ready supply of raw material for the imagination. Customers can purchase an empty bag and then help

The "indisposable" diaper is gaining ground.

At the Imagination Market in Vancouver, waste materials are given new life.

type of action involved (conservation, protection, enhancement, information transfer) and the methods used (new equipment, new practices or programs, preventative action), but all projects must be currently in operation. If a story passes preliminary themselves to whatever they want. The Market also conducts workshops at schools, shopping malls and community events to increase environmental awareness and show how these cast-offs can be transformed into space-ships, masks, costumes, and other playthings. The Imagination Market even has a mail-order service, called ''Junque Mail,'' for customers outside of Vancouver.

The Canadian Waste Materials Exchange (CWME) is another organization that makes creative use of waste and saves companies money. A joint effort of government and industry, it runs on the principle that the waste from one industrial process can serve as raw material for another. For example, through the CWME, a popcorn manufacturer arranged to supply a local pig farmer with up to six cubic metres of waste per week. In another transaction, an oil refinery gave 2,000 barrels of phenol by-product to a manufacturer of hard plastics. The CWME publishes a bi-monthly bulletin that lists industrial wastes being sought or offered. Distributed nationally to over 4,000 companies, the bulletin lists materials available for exchange under 11 categories, ranging from acids and alkalis to wood and paper products.

On the northern front, the Beverly-Kaminuriak Caribou Management Board looks after the caribou herds that feed the people in the Keewatin and Great Slave Lake area of the Northwest Territories and in northern Saskatchewan and Manitoba. Of the board's 13 members, eight represent traditional hunters of the caribou (Treaty and Non-Treaty Indians, Métis and Inuit) and five represent the territorial, provincial and federal governments. Since its formation, the board has concerned itself with the protection of caribou and their habitat, collection of data on the caribou harvest, and public education on caribou management.

The Bank's success stories provide others with the inspiration to take similar kinds of actions.

Finally, a company in Burnaby, B.C., has come up with a new ''indisposable'' diaper that combines the practical advantages of the disposable with the environmental advantages of cloth diapers. For some time we have been hearing about the evils of disposable diapers – they tend to fill up landfill sites, and most are manufactured using chlorine bleach, which leaves trace amounts of dioxins in the diapers. In many ways, however, disposables are much more efficient than cloth diapers; they have a more contoured fit and better absorbency. Now Calvin Cosens of Burnaby has started a company that produces cloth diapers with velcro fasteners and inserts for better absorbency. The new ''cloth indisposable'' is virtually as leak-proof and convenient as the disposable – and much easier on the environment.

Naturally the Bank wants to publicize its success stories. Their examples provide others with the inspiration to take similar kinds of actions. To this end, it has established information networks within Environment Canada, with other federal departments, and with non-governmental organizations. It also publishes its best success stories in Environment Canada's *Sustainable Development* newsletter.

Of course, the bank is always seeking submissions. If your organization or company has implemented a scheme to make sustainable development a reality, the Bank would like to hear about it. Please contact: Success Stories Bank, Corporate Policy Group, Environment Canada, Ottawa, Ontario K1A 0H3; fax: (819) 953-3972, or tel.: (819) 953-1440. ■

Peel Region Scouts get their composting project rolling.

The Warming of the North? Climate Change and the Arctic

The climate of the Arctic has always been variable. Deep inside the northern landscape are fossil traces of redwood forests, swamps and cyprus groves – the remnants of an earlier and warmer world.

Over countless millennia, as the climate has changed, the tropical forests have given way to tundra, ice and snow. In the next few decades the climate of the Arctic, along with that of the rest of the world, may undergo another major alteration – this time a man-made one. Now scientists are starting to think about how this change will affect the people and the wildlife of the high north.

The Arctic is a place of low temperatures, little moisture, and ground that remains frozen even in the summer. Therefore, there are fewer animals and plants than in the temperate regions. Recently, scientists have begun to map out a rough scenario of changes that are likely to occur in the physical environment of the Arctic – changes that could have an effect on local wildlife.

We know that air pollution, deforestation and the burning of fossil fuels have increased the ''greenhouse gases'' in the earth's atmosphere. These gases act as a blanket to keep in the earth's heat. Over the next 50 years, the ''greenhouse effect'' is expected to raise the average global temperature by 1.5 to 4.5 degrees Celsius. In the Arctic, summer temperatures will change little as a result, but winter temperatures could increase by as much as 8 to 10 degrees Celsius.

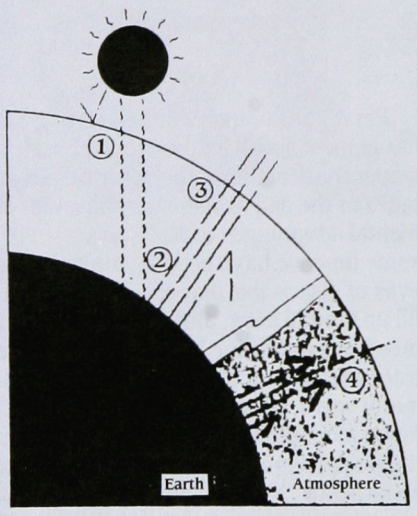
Why will surface temperatures in the Arctic change so drastically? Barrie Maxwell, head of the Arctic Climatology Section of the Atmospheric Environment Service, gives several reasons. First of all, with the melting of ice and snow due to climate warming, the sun's heat will be absorbed by the uncovered ground and radiated back into the atmosphere. This will initiate a feedback effect – as the temperature rises, more snow and ice will melt, resulting in more heat radiated back from the ground, which will in turn raise temperatures.

Secondly, the arctic climate is frequently characterized by a temperature inversion, which inhibits the mixing of air in the near-surface portion of the atmosphere. Thus the heat radiated by the earth will stay close at hand, contributing to the warming of the atmosphere.

We can expect a number of consequences from this temperature rise. First of all, there could be widespread melting of arctic permafrost, long a bulwark of the arctic topography. As a result, roads could heave, pipelines sink or shift, and houses settle and tilt. In addition, the season of snow-cover will shrink – possibly by about 30 days at 70 degrees north latitude.

The winters may be shorter, but they will also be snowier. Today the Arctic is a dry place – a frozen desert, essentially. But an increase in temperature would bring more moisture into the air, resulting in greater precipitation. We might expect greater snowfall during the winter and, concomitantly, an increase in glacier activity. The glaciers would grow during the snowy winters and melt more during the summers, resulting in more spring run-off. Also, we would probably see more icebergs in the ocean – the higher temperatures would result in a three-fold increase of iceberg ''calving'' from the glaciers.

The ''Greenhouse Effect''



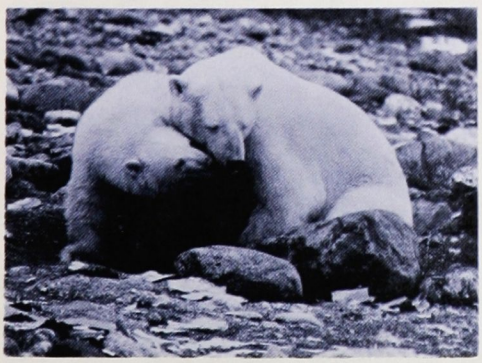
1. Solar energy enters atmosphere unaffected by greenhouse gases.
2. Solar light is absorbed by the earth and reradiated back to space at longer heat wavelengths.
3. Greenhouse gases absorb heat radiation and re-radiate much of it back to the surface, much like an insulating blanket.
4. Higher concentrations of greenhouse gases trap more reradiated heat, causing temperatures in the lower atmosphere and at the surface to rise. This affects weather and climate.

Over the next 50 years, the ''greenhouse effect'' is expected to raise the average global temperature by 1.5 to 4.5 degrees Celsius.

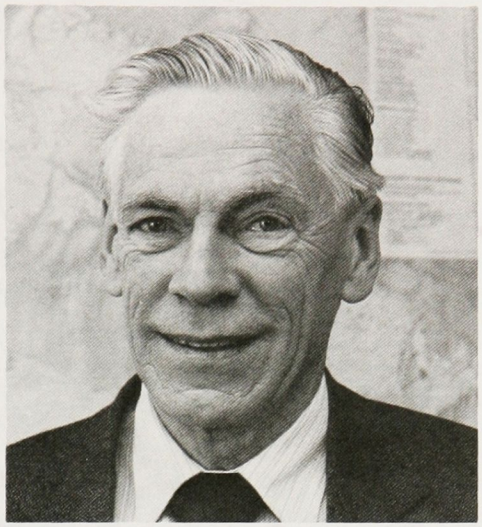
Some of these changes could be beneficial. Warmer temperatures and greater precipitation tend to favour vegetation, and the Arctic may witness something like a blooming. Much has been said about the shift in the tree-line as a result of climate warming; it is estimated that it could move northward by 200-300 kilometres.

However, Dr. Fred Roots, a long-time student of the Arctic and now Science Advisor (Emeritus) to Environment Canada, has pointed out that higher temperatures and greater precipitation will not automatically result in a shift of the tree-line northward. Plants need more than precipitation and warmth; they need soil nutrients. Climate warming may provide the former, but not the latter.

The effects of climate warming on arctic wildlife could be similarly ambivalent. On the one hand, certain species could benefit. Warmer temperatures could increase food supply in the ocean and freshwater bodies, thereby augmenting fish populations. Whales, walruses and seals could flourish and spread northward. Certain species of migratory birds may also benefit from the shorter winter. But greater precipitation will almost certainly have negative effects, especially for browsers like caribou and musk ox. Heavier snowfall could bury the sparse tundra vegetation these animals need to survive. Scientists have found in the past that warm, wet winters can decimate herds of caribou and musk ox.



Polar bears, Ellesmere Island



Fred Roots

This raises the question of how the people of the North – especially the native people – will be affected by climate warming. Here the predictions are even less certain than those concerning the natural world. Again, the best we can say is that climate change will undoubtedly be a two-edged sword. Shorter winters and less ocean ice could facilitate shipping and oil exploration – a mixed blessing in itself. On the other hand, the alteration of migration patterns of caribou and seals could mean that the native people will have to move to be close to their traditional sources of food.

At environmental conferences and colloquia, the first question reporters ask is whether the greenhouse effect has actually begun. Since the Arctic is particularly sensitive to climate change, global warming may well make its presence known there first. Are we seeing any hard evidence of climate warming in the Arctic?

According to Barrie Maxwell, ''there is nothing there that we can point to and say, 'this is the greenhouse effect.' The record is just too mixed.'' Fred Roots agrees. ''I don't think the changes we are seeing now are evidence of the greenhouse effect,'' he says. ''I believe we're still within the ordinary fluctuations. Of course, people are

Since the Arctic is particularly sensitive to climate change, global warming may well make its presence known there first.

biased by their models, but I don't think we will see it for at least a decade or so.''

There has been some media attention lately to the minority opinion among scientists that the greenhouse effect has been overstated. Maxwell says it is undoubtedly true that there are large uncertainties involved in predicting the range and extent of the greenhouse effect. One of the imponderables, says Maxwell, is the role of the oceans in distributing and absorbing the heat produced by climate warming. But he, like Roots, places himself firmly in the camp of the majority of scientists, who say that climate warming is coming and that we had better prepare for it. ''I don't think we should allow these uncertainties to prevent us from making decisions,'' he says. ''We just can't afford to.''

A significant step toward understanding and dealing with the issue of global warming has been the formation of the Intergovernmental Panel on Climate Change (IPCC). The IPCC was conceived by the World Meteorological Organization and the United Nations Environment Programme

Summer creates a brief but rich display of flowers on the tundra.

to develop international consensus on the science, impacts and response strategies of climate change. The IPCC is scheduled to release its authoritative report on international scientific conclusions regarding climate change and global warming this August. One of the most important items likely to be contained in the report will deal with the development of a framework convention on climate change. The formation of the IPCC is widely recognized as a milestone in global co-operation on the environmental protection front. ■

Ward Hunt ice shelf, Ellesmere Island

Climate Change and Arctic Haze: The Connection

When we think of the Arctic, we think of brilliantly clear air – white vistas stretching into the distance, mountains visible over a hundred kilometres away, the world bright and unobscured by the hazes of industrial civilization. But lately we have come to learn that the air here is not as clear as it once was.

In the late forties and early fifties, airplane pilots and weather observers first began to notice the presence of a brownish haze in the arctic skies. Originally researchers thought that this haze was nothing more than airborne dust particles. During the seventies and eighties, however, scientists from Canada and other polar nations discovered that it was actually composed of droplets of sulphuric acid, soot particles, and other by-products of human activity in the south.

Arctic haze forms as a result of the special weather conditions of the northern hemisphere. During the winter, the regions of the high north get virtually no sunlight. Temperatures plunge as a result, and the land is enveloped in a pool of cold air known as the arctic air mass. This mass contains little moisture, and when pollution enters it there is little precipitation to remove it. The pollutants can thus stay in the atmosphere for weeks or months. In the spring, when the sun re-emerges, these suspended particles deflect the sun's rays and reduce visibility to create a phenomenon known as arctic haze.

Len Barrie, an atmospheric chemist and senior research scientist with the Atmospheric Environment Service (AES), notes that tracing back the path of this pollution is an immense task. "It's only now after intensive study for ten years that we've been able to say that most of it comes out of Eurasia," says Barrie. "And this is due to massive efforts in both Eurasia and North America to gather information on how much is emitted and where. Once you have those numbers, you can put them into an atmospheric chemical-transport model and calculate where the pollution comes from."

From their calculations, scientists have found that most of the pollution originates in Europe and the USSR. Only small amounts come from North America, China and Japan. The pollution from these three latter sources is blown over stormy oceans, where a good part of the pollutants are washed out before they reach the Arctic. In contrast, pollution from the USSR and Europe blows northward over the land and is not removed as effectively.

Apart from its sheer ugliness, the chief ill-effect of arctic haze lies in its role as an enhancement of climate warming. The dark particles in the haze act as a heat-trapping barrier, absorbing sunlight. Pioneering work by Dr. J.P. Blanchet of AES shows that this could increase the average temperature in the North by as much as two degrees above the warming due to greenhouse gases during the months of March, April and May. The Arctic is thus being tarred by the brush of an industrial civilization that works many thousands of kilometres away.

Arctic haze is also an indicator of the presence, in the North, of potentially toxic synthetic chemicals released elsewhere on the globe. These are of concern for their effects on human health and northern diets.

A Window on the Cambrian: The Fossils of the Burgess Shale

Yoho National Park in British Columbia has become famous for its trove of small, petrified monsters.

The creatures are found in the Burgess Shale, a priceless fossil bed and one of UNESCO's World Heritage Sites. The shale is not only a wonderful geological archive; it gives scientists a sense of the many layers of life that underlie the current one.

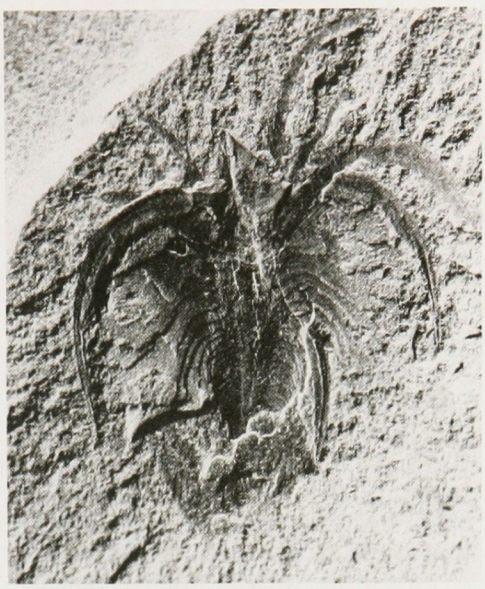
The fossils of the Burgess Shale date from the mid-Cambrian period, about 530 million years ago. At that time the Yoho region lay under a warm sub-tropical sea. A prominent feature of the area was a large algal reef, now part of the Cathedral formation in the park. At the base of this reef lived a complex community of ocean dwellers, many of them no more than a few centimetres in length. Armoured trilobites – distant ancestors of modern shrimps and lobsters – crept through the mud, caterpillar-like creatures called *Aysheaia* crawled among the sponges, and in the silty waters above swam larger oddities like *Anomalocaris*.

Occasionally patches of mud would slide off the reef, and the creatures would be swept into a basin at the reef's foot. Buried there in the stagnant waters, with little oxygen and no scavengers to hasten their decay, the animals became part of a perfect natural tomb. Generally the earth preserves only the hard parts of animals – shells and bones – but under the special conditions of the Burgess bed even soft tissues and membranes were preserved. Some 140 species of animals have been identified in the Burgess rocks, and only about a third of these have parts that are usually preserved as fossils. Some of the animals have been captured as perfectly as flies in amber – in one specimen the alimentary canal, complete with the remains of a recently consumed meal, can be seen.

Long after the animals' entombment, the oceans receded and the earth raised up the mountains that dominate the park today. The algal reef, however, acted as a shield for the compacted fossils at its foot. It was in 1909 that the eminent American palaeontologist Charles Walcott discovered the fossil cache. According to the favourite story, he was hunting for fossils near Burgess Pass with his family when he came across a piece of rock on the path. Dismounting from his horse to remove the obstacle, he found inside it the shape of a soft-bodied creature. The following summer he returned to collect more fossils, and by 1917 he had shipped tens of thousands of specimens to his Washington laboratories.

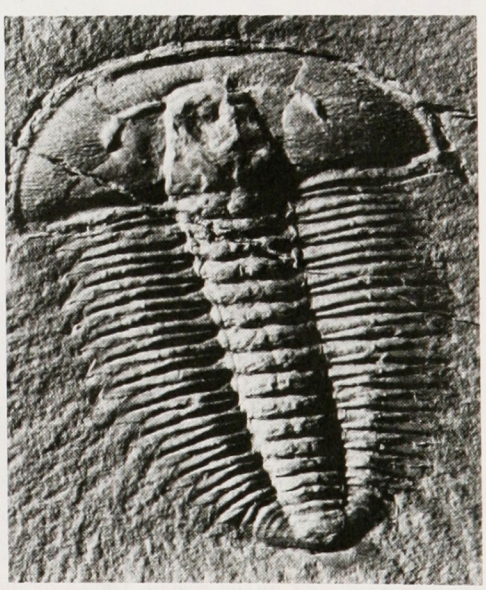
For 50 years, earth scientists pored over Walcott's collection. Little digging was done in the Burgess quarry itself, as most researchers assumed that Walcott had more or less cleared it out. The re-examination of Walcott's original collection revealed a host of finds that had been misidentified, incompletely catalogued or insufficiently studied. Then in 1966, thanks in good part to the enthusiasm of Harvard geologist Harry B. Whittington, the Geological Survey of Canada got permission from Parks Canada to reopen the Burgess quarries. Since then a number of new fossil animals have been discovered,

Some 140 species of animals have been identified in the Burgess rocks.



A beautifully preserved Marrella splendens *fossil from the Burgess Shale, showing antennae, legs and gills.* •

Trilobites from Mount Stephen, Yoho National Park



A Cambrian trilobite from Mount Stephen, Yoho National Park. Unusually, this specimen preserves part of the "soft" anatomy – two antennae on the head. •

• Photo: Department of Invertebrate Palaeontology, Royal Ontario Museum

some of them completely unrelated to modern forms of life.

The third wave of discovery took place after 1975 and has been led by Desmond Collins, curator of palaeontology at the Royal Ontario Museum in Toronto. Collins and his colleagues have found soft-bodied fossils at more than a dozen different sites along the Cathedral escarpment.

For the ordinary park visitor, the Burgess creatures are fascinating simply because they are so bizarre. Many of them look like hodge-podge animals, haphazardly assembled out of a store of nature's extra parts. Consider the aptly-named *Hallucigenia*. It had an elongate body, about two centimetres in length, with two rows of sharp spines on the bottom and tentacles on top. It probably walked the ocean floor on its spines, grasping food with its tentacles; but how it actually ate is a mystery – the creature had no mouth. One extraordinary fossil seems to show several specimens of *Hallucigenia* clustered around a decaying corpse, suggesting that it lived as a scavenger in the Cambrian seas.

For the ordinary park visitor, the Burgess creatures are fascinating simply because they are so bizarre.

Another well-known Burgess eccentric is *Anomalocaris*. Reaching lengths of half a metre, *Anomalocaris* was the giant predator of the Cambrian world, equipped with a long agile body, grasping appendages and large jaws. (It may even have used its jaws on trilobites; several of the armoured creatures found in the quarries bear bite marks on their shells.) We can imagine *Anomalocaris* swimming through the murky Cambrian seas like a cuttlefish, gliding over smaller mysteries on the ocean floor – *Wiwaxia*, a vaguely mollusk-like character covered with both spines and scales; *Opabinia*, which had five eyes and a small trunk at the end of a segmented body; and *Dinomischus*, with its cuplike body that swayed in the currents.

All these creatures have no analogues today. Their peculiar anatomies render them unsuitable for any of the taxonomic categories, called phyla, into which biologists place both ancient and modern forms of life. Like other Cambrian animals, they had their day and then vanished from the face of the earth.

That is one of the geological challenges posed by the Burgess Shale – to explain why certain of the creatures became extinct while others evolved into modern forms of life. For park authorities, however, the Shale poses another problem. They must ensure access to this fascinating slice of vanished time while guarding the fossil beds against souvenir pickers.

During the summer, park staff lead five hikes to fossil sites each week; but to learn about the fossils it is not necessary to tackle the steep climb. The petrified eccentrics of the Burgess Shale are featured in displays at the park information centre, the new Lake Louise Visitor Reception Centre in Banff National Park, and at an outdoor exhibit at the foot of Mount Field in Yoho National Park. ■

Burgess Shale area, Mount Wapta, Yoho National Park

An Environmental Writing Contest

For the third consecutive year, Environment Canada's Quebec Communications Office and the Montréal newspaper *Le Devoir* have jointly organized a writing contest for young people.

The purpose is to encourage contestants, aged 21 and under, to reflect on their individual and collective responsibility for the environment and also to put their thoughts about the subject on paper.

The original idea for the contest came from *Le Devoir*. This year, 30 prize-winners were named in two categories: juniors (students in elementary school through second-year high school) and seniors (third-year high school and up). The three top contestants in each category were awarded scholarships. The seniors also received subscriptions to *Le Devoir*, which published their entries to highlight Canadian Environment Week. The other winners were given various prizes, including Environment Canada publications.

Étienne Gagnon, a student at the University of Quebec at Rimouski, won the third prize for seniors. In his article entitled "I Am Exhausted and Dehydrated," he gives the Earth a voice. "People want me not to be happy but instead to produce more," it says. "To increase my productivity, they have built many factories that cause pollution and that, at the same time, create huge amounts of waste. I have never felt so threatened." Having placed the problem before us, the Earth asks, "And what do you do with your garbage?" Speaking of the St. Lawrence River, it adds, "Could you try to pressure factories in your neighbourhood and the authorities in your town to cut the volume of toxic emissions that have clogged my most important artery?" Lastly the Earth offers some advice, from introducing alternative technology such as wind or solar energy to using recycled paper.

In an article entitled "Environmentalism and the Role of the Media," Steve Gagnon, a student at Laval University, notes that business people can turn the current public interest in the environment to their advantage. Winner of the second prize for seniors, Gagnon writes, "When a company announces that it has replanted a million trees in the last five years, it is careful not to let slip that it has cut two million annually during the same period. Nevertheless that company wins the admiration of many people who conclude from the published facts that it is in the forefront of reforestation efforts." According to Gagnon, "The media manipulate as much as they inform their audience. We must be critical in our evaluation of what we are told."

The purpose is to encourage contestants, aged 21 and under, to reflect on their individual and collective responsibility for the environment and also to put their thoughts about the subject on paper.

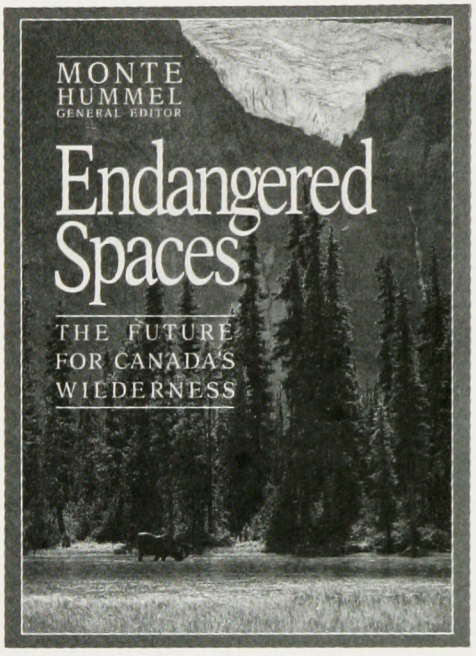
Guillaume Malenfant-Brouillard, a student at the Granby Cégep, won first prize for his entry, "Our Common Future: It's in our hands." This article focuses on the wastefulness of which we are guilty, and the need to put an end to it. "Our wastefulness starts at birth," he writes. "It is hard to understand that people who have washing machines use disposable diapers just as much." Noting that we are throwing away money by neglecting to recycle household waste, the author concludes with an exhortation to vigilance: "We must get rid of the moral polluters — the ads that act insidiously by planting in us the suggestion that we buy goods responsible for wasting our resources and polluting the environment."

Contest entries were evaluated by a jury composed of two journalists — Louis-Gilles Francoeur of *Le Devoir* and Louis-Guy Lemieux of the Quebec City daily, *Le Soleil* — along with Michel de Courval of Environment Canada. The names of the winners were published in *Le Devoir*. ■

Update Review

Fighting for a Few Blank Spots

Endangered Spaces: The Future for Canada's Wilderness, ed. Monte Hummel (Toronto: Key Porter Books, 1989, $39.95)



The American writer and naturalist Aldo Leopold seems to be one of the guiding spirits behind this collection of essays. Several contributors to the volume quote him regularly, and I hadn't gone very far into the book when I began to hanker for the voice of the man himself. So I got out his *A Sand County Almanac* and browsed through it once again. You can certainly understand his appeal as a guiding spirit. No other writer of this century has stated the conservation ethic with such power and grace.

"Man always kills the thing he loves," he wrote, "and so we the pioneers have killed our wilderness. Some say we had to. Be that as it may, I am glad I shall never be young without wild country to be young in. Of what avail are forty freedoms without a blank spot on the map?"

A blank spot on the map of Canada – or more precisely, a blank spot for each of the country's natural regions – is the motivating aim behind this collection of essays, edited by Monte Hummel of World Wildlife Fund Canada. "The underlying assumption of this book," writes Hummel, "is that we have ten years or less left to protect at least 12 per cent of Canada in a wild state." The figure of 12 per cent is based on guidelines laid down in the Brundtland Report. Currently, says Hummel, only 2.6 per cent of Canada's land is protected as true wilderness – that is, free from resource extraction.

Endangered Spaces is a wide-ranging collection of essays on the Canadian wilderness – its influence on our history, its current state, and what we must do to preserve it. The book is embellished with dozens of magical photographs, but as with all eclectic collections the essays vary in their punch. Some of them tell us nothing new. A few tend to drag a bit. But a number of the pieces are vigorous and sharp, the sorts of essays that would have brought a smile to Aldo Leopold. John Broadhead's excellent treatment of the South Moresby saga, for example, makes your blood boil all over again. And environmentalist Elizabeth May gives a lucid and salty view of the Ottawa power game.

Both Broadhead and May give a sound piece of advice to environmental groups: respect your opponents. Treat them as people, not as corporate robber-barons or sycophantic politicians. And try not to be sanctimonious, for if you do your rhetoric is bound to grate on the public ear. "Extend the courtesy of allowing your audience to arrive at their own moral judgements about the situation," advises Broadhead. May offers a similar bit of good sense when she says:

> Of course, environmental issues are too urgent to wait for slow education of the least enlightened. We must always act *now*. The environmental movement must attack, criticize, hold politicians accountable. We have a role in shaking society and government awake, by its shoulders. But that waking must be done with love. You can't change somebody you alienate.

The main thrust of the book, however, is an assessment of our wilderness and what must be done to preserve it. Canadians like to think that we are one of the world's leaders in this regard, but actually we are not doing that well. The national parks system is only 54 per cent complete, with 21 of 39 natural regions represented. We have only two marine parks. Four of the 12 provinces and territories – Newfoundland, New Brunswick, Prince Edward Island and the Northwest Territories – have yet to establish park system plans, i.e., "finishable wilderness agendas." In terms of the percentage of total land protected as wilderness, Canada barely makes the top 20 countries in the world.

The problem is not just government inertia. In certain areas of Canada, such as the North, wilderness preservation is complicated by such issues as native land claims and jurisdictional feuding between federal and territorial governments. And of course, the mining and forestry industries are determined to keep their slice of the pie.

But with the political will we can overcome these difficulties. In the concluding piece, "The Upshot," Monte Hummel considers the steps we must take to preserve our vanishing wilderness. The first thing, he says, is to make sure that all the various governments in Canada – federal, provincial, territorial – have a clear parks and wilderness plan. This means an agenda with stated goals and time limits. The next thing we have to do is keep an eye on these agendas, monitoring the progress and raising a ruckus when we see none. It's up to us to make governments hew to the line.

"We are the last generation, in one of the last countries on the planet, that still has any choice in [this] matter," says Hummel. With luck this book will galvanize people into action. All of us, with the exception of the real hurricane-driven crusaders, tend to get caught up in the everyday demands of living and occasionally drift away from the cause. We need to be spurred on. As for *why* we must preserve the wilderness, no argument is necessary. "Either you know it in your bones," said Aldo Leopold in a related context, "or you are very, very old." ■