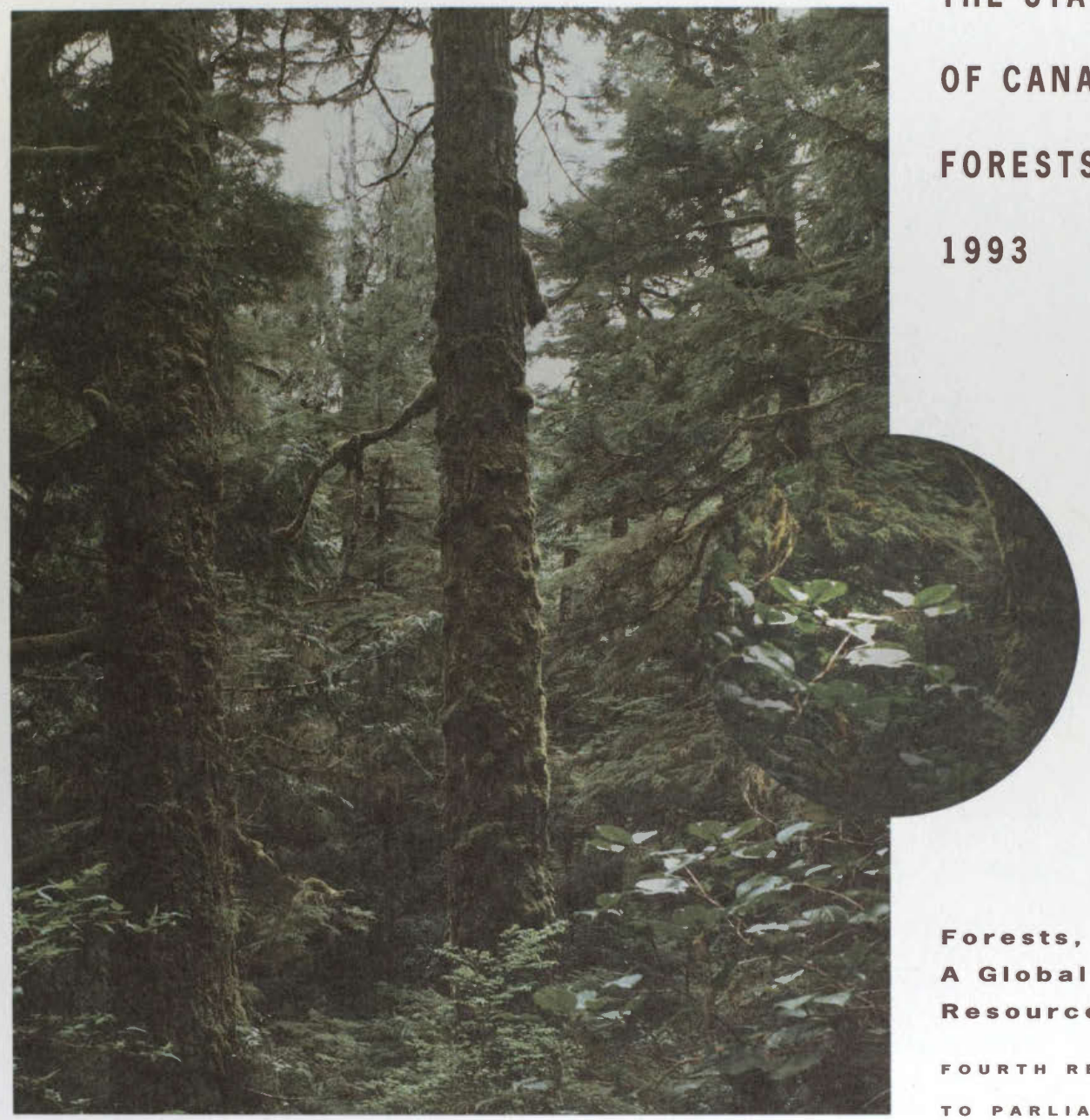
THE STATE OF CANADA'S FORESTS 1993



Forests, A Global Resource

FOURTH REPORT TO PARLIAMENT

Natural Resources Canada
Canadian Forest Service

Ressources naturelles Canada
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Canada

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Message from the Minister

I am pleased to have the honour of tabling before Parliament the fourth report on the state of Canada's forests. With the renewed interest and debate concerning environmental issues in Canada and abroad, this report will play a key role in providing information to all Canadians about the nation's forests and forestry practices.

This year's report addresses the growing links between trade and the environment. The ongoing focus on industry issues reflects the importance of the forest sector to our economy. In 1992, our forest products exports were valued at more than $23 billion and contributed $19 billion to Canada's balance of trade. By 1993, 1 in every 16 Canadians worked in our forest industries. The sector provided more than three-quarters of a million direct and indirect jobs.

ANNE McLELLAN
MINISTER OF
NATURAL RESOURCES
CANADA

But Canadians do not perceive their forests strictly in terms of employment. Indeed for many Canadians, forests are regarded as a place of recreation, a sanctuary in which to walk and observe wildlife, and a favorite spot for hunting and fishing. Given the growing recognition of the role of forests in maintaining the planet's health, this report provides a brief introduction to the importance of biological diversity.

Canada has embarked upon a new era of forest management, one that challenges our forest researchers and managers to better understand the dynamics of this intricate ecological mosaic. The model forests, established with a multitude of partners throughout Canada and abroad, are providing the opportunity to test and demonstrate sustainable forestry practices.

Work is currently underway to develop and refine a comprehensive set of criteria and indicators that will help us track Canada's progress in addressing all forest values and in managing our forests not only for the population of today, but also for the enjoyment and benefit of future generations.

I trust that the information contained in this year's report will contribute to an informed debate regarding Canada's forest heritage.

As a responsible steward, Canada is committed to safeguarding its forests' diversity, while promoting Canadian forest products around the world.

THE STATE OF CANADA'S FORESTS 1993

Forests, a Global Resource

FOURTH REPORT TO PARLIAMENT

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"I call to mind great Douglas-firs
I see tall maples waving green
and oaks like gods in autumn gold . . ."

— Al Purdy

Highlights

BEYOND NATIONAL BORDERS

Forests are important not only to our economic and physical well-being, but also to the health of the planet. Ten percent of the world's forests are found in Canada, and boreal forests, which grow over the largest portion of our lands, account for almost half the world total. We recognize that the stewardship of our forests will have an impact beyond our time and beyond our national borders.

CANADA'S FORESTS

There are 416 million hectares of forest land in Canada. A little more than half are considered capable of producing timber. Approximately 119 million hectares are currently managed for timber production. A further 156 million hectares are "open" forests that will likely be left in their natural state. They are found mostly in northern Canada and comprise muskeg, and small trees and shrubs. An estimated 50 million hectares (12%) of our forest land have been protected from harvesting by policy or legislation.

The provincial and territorial governments are responsible for managing 71% of the nation's forests, and the federal and territorial governments oversee 23%. Only 6% of Canada's forests are on private property — belonging to more than 425 000 private landowners.

PRESERVING FOREST DIVERSITY

Canadians value nature and wilderness — they recognize the importance of preserving the natural quality of their forests and of maintaining the myriad of life forms those forests contain. Although some changes in tree species composition have been noted in accessed areas, the forests in those areas have maintained their diversity. Canadians also feel it is important to protect areas of natural heritage. Protected areas now account for more than 9% of our land and freshwater, or approximately 12% of the world total.

Forests cover nearly half of the Canadian landscape and are a dominant feature of our economy, culture, traditions and history.

Canada's federal, provincial and territorial governments, as well as non-governmental organizations, are working together to draft a national strategy to address certain elements of the international convention on biological diversity, which was ratified at the United Nations' Earth Summit in 1992.

IMPROVED RESEARCH, MANAGEMENT AND MONITORING

Several steps were taken in the past year to implement initiatives outlined in Canada's National Forest Strategy. Those actions ranged from developing strategies and policies to manage old-growth forest ecosystems, to developing codes of ethics and standards of practices, and protecting wildlife habitat.

Under the Model Forests Program, in 10 sites across the country, Canada is testing innovative approaches to forest management, ranging from locating and protecting ancient Aboriginal

burial grounds, to carrying out high-tech computer analyses. The sites are being managed by partnerships that involve industry, environmental and conservation groups, Aboriginal communities, educational groups, private landowners, outdoor recreation clubs, and all levels of government.

Canada is developing a comprehensive set of criteria and indicators to monitor the management of our forests, and to measure our progress in maintaining the different values of the forest.

SUSTAINING CANADA'S FORESTS

Between 1977 and 1991, the volume of wood in Canada's commercial forests increased by 3.8% or 937 million m^3. Natural disturbances, such as fire and insects, depleted more commercial forests than harvesting.

The area regenerated naturally increased by 12.4%, while planting and seeding increased by more than 60%. The total area that did not regenerate to commercial species during the 15-year period represents less than 2% of the commercial forest land base.

The total harvest in 1992 rose to 163.8 million m^3, but was still well below the national allowable annual cut level of 247 million m^3. Clearcutting remains the most common harvesting method in Canada. In 1993, the average size of clearcuts was 61 hectares.

NEW RULES FOR TRADE

Traditional barriers to trade such as tariffs are slowing giving way, allowing Canadian producers increased access to global markets. In this era of freer trade, however, new challenges are emerging. Environmental awareness is on the rise, and the different measures that have been or will be implemented to protect the environment in many countries could impact on trade, affecting the competitiveness of Canada's forest products industries.

Given the importance of trade to our economy, Canada is deeply involved in the international debate relating to trade and the environment, particularly with respect to eco-labelling and wood products certification. Another major challenge is to develop measurable international criteria and indicators of sustainable development that recognize the ecological differences between forests in different countries.

ECONOMIC RECOVERY

In 1992, the total value of Canadian forest products exports increased by 11.1% to reach $23 billion, reversing the downward trend of 1990 and 1991. In fact, investor confidence in forest industries remains high.

In 1993, the total number of direct jobs in the forest sector increased to 311 000 from 289 000 in 1992. The opportunities for employment are shifting from lower- to higher-skilled workers as new technologies and processing equipment are brought on line.

CHAPTER ONE

Canada's forests are diverse and contribute substantially to the wealth of every Canadian. As steward of 10% of the world's forests and the largest forest-products trading nation, Canada is playing a leadership role in the debate over what constitutes sustainable forest development.

Canada's Forests

PART OF A GLOBAL RESOURCE

The eyes of the world are turning toward forest nations and are viewing more attentively the way in which forest resources are being managed. The years leading up to 1993 had seen an increasing interest in the forests of the globe, perhaps best illustrated by the media coverage of issues related to forest management and the environment, and in particular, by the focus on the 1992 Earth Summit in Rio de Janeiro, Brazil.

In many respects, the Summit brought to the forefront the international concern over the Earth's shrinking forest cover, the loss of biodiversity, and global warming. By signing the international conventions on biodiversity and climate change in Rio, and agreeing to a set of forest principles, participants from around the world declared their willingness to collaborate in efforts to maintain the Earth's forests, which are increasingly viewed as a global heritage. There is a growing recognition among all forest nations that they are responsible not only for managing the resource to meet the needs of their citizens, but also for taking into consideration the global impact of their forest management activities.

Canada is multiplying its efforts to ensure that it achieves its goal of sustainable forest management. This commitment was further strengthened in 1992 with the signing of the Canada Forest Accord by governments, industry and non-governmental groups and with a five-year National Forest Strategy that outlines some 96 areas for action. *(For details, please see pages 15 - 17.)* In addition, as part of Canada's Model Forests Program, new approaches are being tested and applied to manage forests as ecosystems for a broad range of timber and non-timber values.

Before reviewing some of the events of 1993, it is important to briefly describe Canada's forests, their management, and their environmental, social and economic importance to Canadians.

FOREST-MANAGEMENT PLANNING FRAMEWORK IN CANADA

OVERVIEW OF CANADA'S FORESTS

The Canadian public owns the vast majority of the nation's forests (94%); the remaining 6% are the property of more than 425 000 private landowners. On behalf of the public, provincial governments manage roughly 71% of our forests, while the federal and territorial governments are stewards of about 23%.

Forest management is a matter of provincial jurisdiction. Each province and territory has its own set of legislations, policies and regulations to govern the management of its forests. However, the general framework for forest management planning is detailed in the accompanying flowchart.

The federal government's role in forestry pertains to such areas as research, trade and commerce, international affairs, the environment, pesticide regulation, training, and Indian affairs.

Of the 416 million hectares of forests in Canada, 12% (an area roughly equivalent to all of France) have been protected from harvesting by legislation or policy. Although close to 57% are considered commercial forests — capable of producing both timber and non-timber products — only about 28% are currently managed for timber purposes.

Forests play a key role in moderating the climate, regulating water systems, preventing erosion, alleviating air pollution, and providing wildlife habitat. They also offer a multitude of recreational opportunities, and are enjoyed by Canadians and tourists from around the world.

CANADA'S FORESTS

		million hectares
Heritage forests[a] (protected from harvesting by legislation)		22.8
Commercial forests (capable of producing timber and non-timber products)		237.2
• managed forests[a] (currently managed for timber production)	118.9	
• unallocated forests (currently unallocated and unaccessed)	90.7	
• protection forests (unavailable for harvesting by policy)	27.5	
Open forests (small trees, shrubs and muskegs)		156.2
Total forest land		**416.2**

[a] Preliminary estimates.

Source: Canadian Forest Service

The forest land base in Canada is enormous. It is also extremely diverse. The eight major forest regions in Canada *(see map on page 33)* all have a different mix of predominant tree species. More than 60% of the forest cover is composed of softwoods, 15% is hardwoods, and 21% is mixedwoods. All told, there are 165 tree species in Canada. Most of our forests are even-aged because cyclical widespread disturbances, such as fire and insect infestations, tend to result in new forests of the same age. Roughly 70% of Canada's commercial forests are classified as mature and old, and 27% are classified as young.

THE YEAR IN REVIEW

NEW APPROACHES TO FOREST MANAGEMENT

In keeping with the Newfoundland Forest Service's new mandate, an ecosystem-based management plan was developed for the Cartwright Labrador area. It is the province's first "on-the-ground" plan that incorporates the principles of ecosystem management in a proactive forest-planning framework.

Prince Edward Island released its first state of the forests report, which offers readers an up-to-date picture of the Island's forests, and outlines several resource-development strategies. An in-depth study of the province's forest plant communities was also released, and will be used by forest managers to increase their knowledge of forest ecosystems.

New Brunswick citizens will help develop a wildlife conservation policy that the province intends to finalize by the summer of 1994. The new policy is expected to be incorporated into a broader-based fish and wildlife act. In 1994, the province plans to consult with potential partners to redefine the roles of government and non-government organizations, and to develop innovative ways to fund wildlife conservation.

By the end of the 1993 planting season, a total of almost 21 million trees had been planted under the national community tree planting program — Tree Plan Canada.

Nova Scotia established a unique process — the Coalition of Nova Scotia Forest Interests — to ensure that all stakeholders are consulted regarding forestry matters. Woodlot owners, forestry professionals, and industry associations now have a forum in which they can work together to address emerging issues.

During the summer of 1993, the Alberta Sheep and Wool Commission cooperated with Blue Ridge Lumber Ltd. and the departments of Agriculture and Environmental Protection to implement Alberta's first trial of sheep grazing as a means of vegetation control in forests. During the two-month trial, 1000 sheep grazed 290 hectares.

Quebec undertook a pilot project on integrated forest-resource management to develop models that will enable users to predict the impact of human intervention on wood supply, wildlife, forest landscapes, and communities. The study will also be used to identify the data and information that will be needed to expand the program to all public forests in Quebec.

In April 1994, Ontario released a new forest policy framework that shifts the province's management objectives from managing forests for timber, to managing for all values on an ecosystem basis. New legislation is planned that will enable the Ministry of Natural Resources to put standards in place to achieve those objectives, and to set out stronger penalties for non-compliance.

Saskatchewan has adopted principles of integrated forest-resource management and is establishing a long-term forest strategy for all of the province's forest lands. It will recognize a range of forest uses from a total ecosystem-management perspective and adopt co-management principles. The strategy involves one of the most extensive public consultation exercises ever applied in Saskatchewan.

In October 1993, Alberta's Department of Environmental Protection initiated the Alberta Forest Conservation Strategy. Over the next two years, an extensive public involvement program will assist in the development of a policy for the sustainable use of the province's forests.

In the fall of 1993, Alberta also initiated development of a provincial conservation strategy for woodland caribou. Key stakeholders form the policy-development task force, which will obtain public input through a series of regional meetings in 1994.

In British Columbia, 75 separate research projects were undertaken to evaluate different harvesting and replanting methods. Clearcutting is still used roughly 86% of the time, but other systems are being tested. For cutting permits issued in 1993, the average cut-size allowed was 31.5 hectares in the interior of the province, and 23.5 hectares on the coast. Fallers are "feathering" the edges of clearcuts by leaving some trees standing. The resulting tapered or jagged edge is more aesthetic and provides less resistance to wind, resulting in fewer trees being blown down.

In November, British Columbia unveiled a public discussion paper on a new code of practices and a draft set of provincial forest regulations. Legislation to give the code force of law is scheduled to be passed in 1994. The new code will govern all aspects of forestry practices on provincial forest land. Among other things, it will eliminate clearcutting in a number of sensitive areas, and extend the standards designed to protect scenic viewscapes. Individuals and companies that violate the new code will risk stiff penalties, including fines of up to $1 million.

By the end of 1993, the Ministry of Forests had completed its analysis of the timber supply in 11 of British Columbia's 36 timber-supply areas. The review will continue throughout 1994 and 1995, with a timber-supply analysis, a socio-economic analysis, and a public discussion paper produced for each area. Those will be followed by a determination of the allowable annual cut for each area by the province's chief forester.

The Northwest Territories, in support of the integrated resource-management plan in the Liard Valley, are developing a demonstration forest to showcase a variety of activities, ranging from timber harvesting to traditional uses. The Territories are also entering into negotiations with Native bands for a cooperative resource-sharing agreement.

Increasing Protected Areas

Nova Scotia defined approximately 30 potential sites on Crown land that are proposed to become part of a system of parks and protected areas that are representative of the province's landscapes and ecosystems. A moratorium has been placed on the development of those sites until final decisions are made. The province's proposed Parks and Protected Areas Systems Plan was recently released for review by the public.

Ontario set aside 25 000 hectares of Algonquin Park as a wilderness zone where motorboats, trapping, logging and hunting will be prohibited. This latest addition raises the total protected area in the park to 151 700 hectares. The new section represents about 3% of the park's total land mass, but contains almost 40% of the old-growth red and white pine in the 100-year-old park.

The Manitoba Parks Act was rewritten to reflect the public's opinion about how the province should address such issues as protecting endangered spaces and integrating forest resource uses.

Ontario created North America's largest urban park in the Rouge Valley area, and ended logging in Lake Superior Provincial Park. All told, some 9000 hectares were added to 14 provincial parks over the past year. Seventeen new areas are being proposed as a next step in protecting more of Ontario's natural heritage.

A 19-member international scientific panel was established in British Columbia to review the forestry standards in Clayoquot Sound, and to make any necessary recommendations for improvement.

The new Protected Areas Strategy for British Columbia sets down the processes and criteria under which areas can be recommended to the government as it moves toward its goal of protecting 12% of the province's total land area by the year 2000.

The provincial government announced a 1 million-hectare park reserve in the Tatshenshini-Alsek area of northern British Columbia. When combined with the two bordering U.S. parks and one national park, this vast pristine wilderness is the largest international protected area in the world, measuring approximately 8.5 million hectares.

In April 1993, British Columbia announced the protection of an additional 48 500 hectares in Clayoquot Sound, bringing the total protected area to one-third of the entire Sound. A further 18% was placed in special management areas that allow some logging, but protect scenic landscapes and recreational values. Under restrictive conditions, harvesting will be allowed in the remaining 45% of Clayoquot Sound. No large-scale clearcuts will be allowed; more alternative logging methods, such as selective or helicopter logging, will be used; and cuts will not be visible from popular recreation areas. Harvesting will be limited to 1000 hectares per year in small dispersed blocks of no more than 40 hectares each. Although public opinion polls in British Columbia showed support for the decision, the announcement was heavily criticized by environmental groups that urged the government to protect the entire area.

The logging ban on Meares Island in British Columbia was extended until at least September 1995, while Aboriginals and loggers continue to negotiate a settlement on logging and land rights. The Island comprises 3% of the total land mass in Clayoquot Sound and is renowned for its old-growth forests.

Tougher Environmental Regulations

Since federal pulp and paper effluent regulations were put in place, dioxins and furans have been reduced by 98%, and chlorine use has declined by 72%.

Approximately half of Canada's 157 pulp and paper mills are now in compliance with the discharge regulations under the federal Fisheries Act. When the regulations came into effect December 1, 1992, some mills were unable to meet the deadline, and 92 mills were granted authorization to exceed the regulations for approximately one year — until December 31, 1993. The financial and technological circumstances of 78 of those mills were such that the ministers of Environment, and Fisheries and Oceans agreed to approve an additional extension for up to two years. Those extensions will expire December 31, 1995.

Ontario joined British Columbia, Quebec and Alberta in issuing its own regulations to reduce AOX levels to 1.5 kg per tonne by December 31, 1995. (AOX are unwanted by-products of the pulp bleaching process; they are also known as "chlorinated organics.")

There are now 22 mills producing recycled-content newsprint in Canada, compared with 1 in 1990.

The Alberta Environmental Protection and Enhancement Act came into effect September 1, 1993. The Act consolidates nine existing environmental acts and brings higher penalties for offenses (up to $1 million and two years in jail). In addition, individual corporate officers can now be held liable for environmental offenses.

Turning the Corner on the Economy

The recession seems to be over for some forest industries in Canada. Direct employment in all forest industries increased by 7.6% in 1993; employment in the solid-wood products industries increased by almost 12%. Prices of Canadian lumber products remained high in 1993, mainly as the result of additional demands for building products following severe hurricanes and earthquakes in the United States. Production rates rose 7.3% over 1992 levels.

Despite record world demand for Canada's pulp and paper products in 1993, excess capacity and competitive prices created an estimated $750-million loss for paper and allied industries. In fact, December 1993 marked the industries' thirteenth consecutive month of losses. But the losses of 1993 are down from the $1.4 billion in red ink generated in 1992. Despite those losses, direct employment in the paper and allied industries increased by 7.3%.

By 1993, the glut of used newsprint had turned into a shortage, forcing paper producers to import up to 800 000 tonnes of used paper from the USA. Consumer demand and legislation in some states are the driving forces behind the recycling movement that is transforming the paper industry.

Trade Issues Continue

Effective June 1, 1993, the European Union (EU, formerly the "European Community") issued a plant-health directive requiring all green softwood lumber shipped from Canada and the USA to be heat treated for the pinewood nematode. (The nematode is a microscopic worm, rarely found in Canada, that is believed to cause pine wilt disease in certain climates.) The EU directive affects $500 million per year of Canadian lumber shipments to Europe. The federal government believes the

directive is unwarranted and, in consultation with industry and the provinces, is developing new proposals to put before the EU Plant-Health Committee.

The long-standing dispute over Canadian softwood lumber imports into the U.S. market is continuing. In the summer of 1992, the USA imposed a 6.51% duty on Canadian softwood lumber imports, alleging that provincial stumpage and log-export policies provided a subsidy to Canadian producers. The Government of Canada appealed the decision to a binding bi-national review process under the Free Trade Agreement. As a result of that review process, the U.S. Department of Commerce reversed its position, and ruled in early 1994 that Canadian producers were not subsidized. The U.S. administration has since chosen to appeal that decision, which means that final resolution of the dispute will be delayed until the summer of 1994. If the appeal supports the review process, the U.S. government will rescind the duty and return the more than $500 million in duties collected to date.

Canada's forest products industry, led by the Canadian Pulp and Paper Association, is implementing an action plan to develop a certification system for products manufactured from the wood of sustainably managed forests.

On January 1, 1994, the North American Free Trade Agreement came into effect. The Agreement creates one of the world's largest and richest trading blocks, with more than 360 million consumers and over $7 trillion in annual output. Of direct interest to the Canadian forest sector is the reduction in the wide array of existing tariff and non-tariff barriers. All duties on forest products are to be eliminated within 10 years. Mexico's market for imported wood and paper products is about $1 billion per year, and is expected to grow at a rate of 12% annually over the next five years. Currently, Canada's share of that market is about 5%.

In December, four German publishers stated that they would not buy paper produced from clearcut forests as soon as alternative sources of paper of the same price and quality become available. That declaration and a campaign by Greenpeace, which criticizes Canada's forest management practices, have resulted in the cancellation of two contracts for Canadian pulp. All indications are that the campaign will continue to escalate, with efforts focused on discrediting clearcutting — a harvesting method practiced in Canada and throughout the world.

Roughly 163 delegates from Canada, the United States and 51 European countries attended a seminar in Montreal, where they began work on developing measurable criteria against which countries of the world can assess and monitor the Earth's forests.

National Forest Strategy

INITIAL ACCOMPLISHMENTS

Thousands of Canadians were involved in helping to develop the National Forest Strategy document that describes the values, vision and goals held for Canada's forests. *Sustainable Forests: A Canadian Commitment* targets 9 areas for action and identifies nearly 100 commitments that, by 1997, will help place Canada at the forefront of the international effort to achieve sustainable forestry. *(Details of the Strategy may be found in The State of Canada's Forests 1992.)*

Since the unveiling of the National Forest Strategy and the signing of the Canada Forest Accord in 1992, Canada's forest stakeholders have been busy using the Strategy as a blueprint for action.

One of the first activities was to establish the National Forest Strategy Coalition to oversee the implementation and monitoring of the Strategy. The Coalition is composed of 29 Canada Forest Accord signatories, including representatives from wildlife, conservation and nature organizations, Aboriginal groups, industry, professional foresters, academia, private woodlot owners, labour and governments.

The nation's progress is reported annually by the Coalition on behalf of the trustee of the Strategy — the Canadian Council of Forest Ministers. In addition, the Coalition has arranged for independent evaluations to be held at the halfway point and end of the Strategy's five-year term.

The following highlights illustrate some of the key accomplishments to date under the Strategy:

To improve the management of forest ecosystems.

Initiatives were undertaken to help Canada achieve the first strategic direction — **to improve its ability to manage forests as ecosystems**. For example, the Canadian Nature Federation — a non-profit organization dedicated to the conservation and protection of nature — mobilized and trained a large volunteer workforce to inventory the ancient forests in the Lake Temagami Region in northern Ontario. It hopes to apply the methods developed there to similar inventories elsewhere in Canada.

As Canada moves closer to its goal of protecting 12% of the nation's natural heritage as protected areas, a detailed information base that identifies and describes key areas is needed to ensure that the right forests are set aside.

Other groups, such as Wildlife Habitat Canada, worked on projects to develop indicators for wildlife habitat suitability. In addition, Wildlife Habitat Canada, the Canadian Wildlife Federation, the Canadian Pulp and Paper Association and the federal Department of Fisheries and Oceans sponsored a workshop in 1993 entitled, "Gaining Fisheries Habitat — A New Approach to Partnerships," to integrate fisheries objectives with forestry objectives.

To improve forest management practices.

Various governments, non-governmental organizations, and companies have addressed the second strategic direction — **to improve forest management practices**. Nova Scotia, for example, implemented guidelines and standards for Crown and private forest lands to ensure that the needs of wildlife are met. Guidelines were established on the "corridors" or uncut strips of forest required for wildlife to move between habitat areas. Where a clearcut will be larger than 50 hectares, the guidelines recommend that at least one corridor of forest be created, with irregular borders and a minimum width of 50 metres. Each corridor is to be connected to another corridor or uncut area.

A number of professional and industry associations, including the Canadian Institute of Forestry, the Ontario Forest Industries Association, and the Alberta Forest Products Association, undertook to improve the forest management practices of their members by developing codes of ethics, forestry principles, and standards of practice. The forestry principles and codes of practice released by the Ontario association were developed by a multi-interest task force that included members from industry, as well as the Aboriginal, academic, environmental, finance and labour communities. The Alberta association's code includes ongoing public consultation and dialogue to obtain input on forest and manufacturing operations in particular, including forest management, harvesting plans, and operating licenses for manufacturing facilities.

To expand the dialogue on sustainable forestry.

Many activities helped **to expand the dialogue on sustainable forestry**. Ontario announced that four communities had been chosen for pilot projects designed to increase their participation in local forest management decisions. The northern Ontario areas chosen from among the 22 applicants are Geraldton, Elk Lake, the Aboriginal community of the Wikwemikong First Nation, and a coalition of six communities in the

Kapuskasing area. By working together to explore different approaches to participative forest management, the communities and the provincial government will ensure that locally established goals and aspirations are met, that diversification of the local economies is encouraged, and that land-use conflicts are reduced.

To help meet the changing needs of today's workforce.

Governments, labour and industry took action **to help meet the changing needs of today's workforce** as new technologies make some forest-sector jobs obsolete, while creating a demand for people with new skills. For example, the Western Wood Products Forum — a coalition of industry and labour — completed a large-scale human-resources study of British Columbia's wood products industry to define future employment needs. The study determined that over the next 10 years, approximately 11 000 direct forestry jobs will disappear from the province. Forum members will work together to develop ways of addressing the challenges and opportunities that loss will create.

To increase First Nations' participation in forest management.

Another strategic direction is **to increase the participation of First Nations in forest land management** to ensure the recognition of Aboriginal and treaty rights, and to increase the economic opportunities that Aboriginal people can derive from forest-based activities in Canada.

One of the first initiatives undertaken to achieve those objectives occurred in eastern Saskatchewan, where a landmark agreement was signed with two local band councils to guarantee co-management of renewable resources. The bands will now be major participants in the management of a 3263-km^2 area surrounding the reserves of the Shoal Lake and Red Earth First Nations. The First Nations will be able to pursue job opportunities in resource management, will be directly involved in natural resource inventories, and will have a direct say in how the land is developed.

To make private forestry sustainable.

Six percent of Canada's forests are privately owned. Governments, landowners and organizations strengthened their cooperative efforts **to make private forestry sustainable**. In New Brunswick, for example, Woodlot Owners Ltd. — a coalition of woodlot owners — announced the opening of a plant where high-quality hardwood flooring will be manufactured from low-quality logs. Several hundred landowners will supply raw materials to this unique processing facility, which will meet a market need and enable the owners to expand their range of products.

As the Strategy's commitments are transferred from paper to action, a firm foundation is being laid for the sustainable forests of tomorrow.

CHAPTER TWO

2

Biodiversity is a safety net — the more rich and complex an ecosystem, the better it adapts to changes in the environment. Any species with high genetic diversity also is considered more resilient, standing a better chance of absorbing or recovering from stresses that result from pollution, pests and climate fluctuations.

Biodiversity

NATURE'S SAFETY NET

The world's forests are an ecological mosaic, an intricate and dynamic web of plants, animals, insects, fungi and microorganisms constituting the most complex terrestrial ecosystems on Earth.

There is no question that Canada, like other nations, should try to maintain a wide range of ecosystems, species and subspecies in its forests. A more contentious issue is to try to determine how many species are necessary to maintain diversity, whether we should try to maintain all of the species found in each of our forest regions, what must be done to help species survive, the list goes on and on. About one topic, however, there is no dispute. Keeping track of diversity, when there are between 2 million and 100 million species worldwide, is no easy task.

The term "biodiversity" comes from the latin words *bio*, meaning life, and *versitas*, meaning variety.

Today, more and more people are becoming concerned about the disappearance of species and the loss of the natural environment. The greater the diversity that can be retained, the greater the variety of situations the planet is prepared for. Whenever some or all of the genetic characteristics of a species are lost, the Earth loses some of its ability to adapt to changing conditions, e.g., global warming or new diseases. Added to those practical reasons for maintaining biodiversity are ethical considerations, namely our global obligation to maintain ecosystems to support the life of future generations and provide for their enjoyment, as well as to recognize the intrinsic value of all life forms.

Unfortunately, numbers of species tell us little about the health of the environment, which is altered daily by all manner of influences. Many people are dismayed when they learn about disappearing species, and wonder what they can do to help minimize the impact of human activities on the environment. Our raised ecological consciousness makes it easier to accept the notion of a worldwide "web of life" — that the entire planet is one vast biosphere where everything is interconnected.

Biological Diversity Occurs at Four Different Levels

- Genetic diversity describes the range of genetic traits found within a species and among different species, e.g., the variations in size and colour markings that distinguish one silver-tailed fox from another are characteristics that may be affected by genetic diversity within a species;
- Species diversity refers to the range of plant, animal and microorganism species on Earth, e.g., there are an estimated 300 000 species of animals, plants and microorganisms in Canada;
- Ecosystem diversity describes the variety of natural systems found within a region, e.g., the assemblages of plants, animals and physical features that vary from place to place within a region; and
- Landscape diversity describes the broad linkages between and among ecosystems within a landscape type, e.g., deer need mature forests for cover and young forests for food.

Paul Ehrlich, a noted ecologist, has compared Earth to an airplane and the components of biodiversity to its rivets. If one or two rivets are lost, the plane can still fly. But as more and more rivets fail, the plane loses its structural integrity and sooner or later plummets from the sky. In Ehrlich's view, the same holds true for the planet's ecosystems. A particular species may be threatened and eventually become extinct, and life goes on. The cumulative effect of past, present and future losses, however, is bound to place at risk the rich variety of life as we know it.

Rivets on an airplane are easy to see and count, and an airplane mechanic knows which rivets are essential and replaces them as required. To determine whether the Earth still has enough "rivets" of the right type, in the right place, in good condition, etc. is not so straightforward. Biodiversity is not just the number of species, it is also how the number of one species compares to the number of other species, the health and genetic composition of each species, as well as the health and diversity of the habitat that each species requires. Most of the species on Earth are insects, worms, fungi, bacteria and viruses, many of which are invisible to the naked eye. If we can't see all of the species on the planet, how are we to know they exist, let alone figure out whether they are at risk? To further complicate things, life is dynamic. The community of animals, plants and microorganisms on Earth, and the sunlight, water, soil and minerals they require are constantly in flux.

There is no status quo in nature, regardless of the impact of human activity. Trying to maintain the status quo with respect to the biodiversity of Earth would be like trying to draw a straight line in shifting sand

GENETIC DIVERSITY

On a walk through a forest, it is usually easy enough to spot trees of the same species just by their similarities in shape and colour. A closer look, however, generally reveals a number of obvious differences. Two trees of the same age and species will be of different heights and have varying amounts of foliage. One tree may be tall and straight, the other short and crooked. Those differences reflect the genetic diversity of individual trees of the same species.

Genes could be described as the raw material of biodiversity. Similar to blueprints, they contain instructions that govern form and function. When organisms reproduce, the blueprints of the parents are combined, resulting in offspring with unique characteristics.

Red crossbill

Western hemlock

Douglas-fir

Lodgepole pine

Ponderosa pine

Genetic diversity is Nature's way of fine-tuning species to enable them to thrive under changing conditions in different locations. A tree that is suited to its location is far more likely to survive and pass on its "successful" genetic combination to subsequent generations. That process of natural selection enables entire populations to adapt to local circumstances and environmental change. Ponderosa pine, for example, has developed thick bark as protection from frequent ground fires. The tiny wind-blown seeds of the white birch allow it to colonize large areas disturbed by fire. And lastly, the alpine fir's narrow conical shape enables it to shed the heavy accumulations of snow that would otherwise break its branches.

A walk through the forest also reveals the host of birds and animals that rely on trees and other plants for food and shelter. Like trees, they too have evolved in remarkable ways. Witness the red crossbill, which eats the seeds from tree cones. First, it pries open the scales that cover the outer surface of the cone, exposing the seeds within. Then it slides the seeds into a groove on the roof of its mouth, where it splits them apart using the lower portion of its beak. Over time, the crossbills in different regions of Canada have adapted to the food from different species of trees.

Pacific coast crossbills prefer the seeds from western hemlock. Slightly inland, the birds favour Douglas-fir. In the interior region, they choose ponderosa pine; and in the Rocky Mountains, their staple diet is lodgepole pine. Each of those trees has different-sized cones, containing slightly larger or smaller seeds, and covered with scales that range from hard to soft. The crossbills have adapted to that challenge by evolving into four different types or subspecies of crossbill, each with a specially adapted beak and palate groove. The survival of each highly specialized consumer would be at risk if its staple diet were suddenly interrupted. For example, a crossbill subspecies that has adapted to the small cones and seeds of hemlock would have difficulty tackling a ponderosa pine cone.

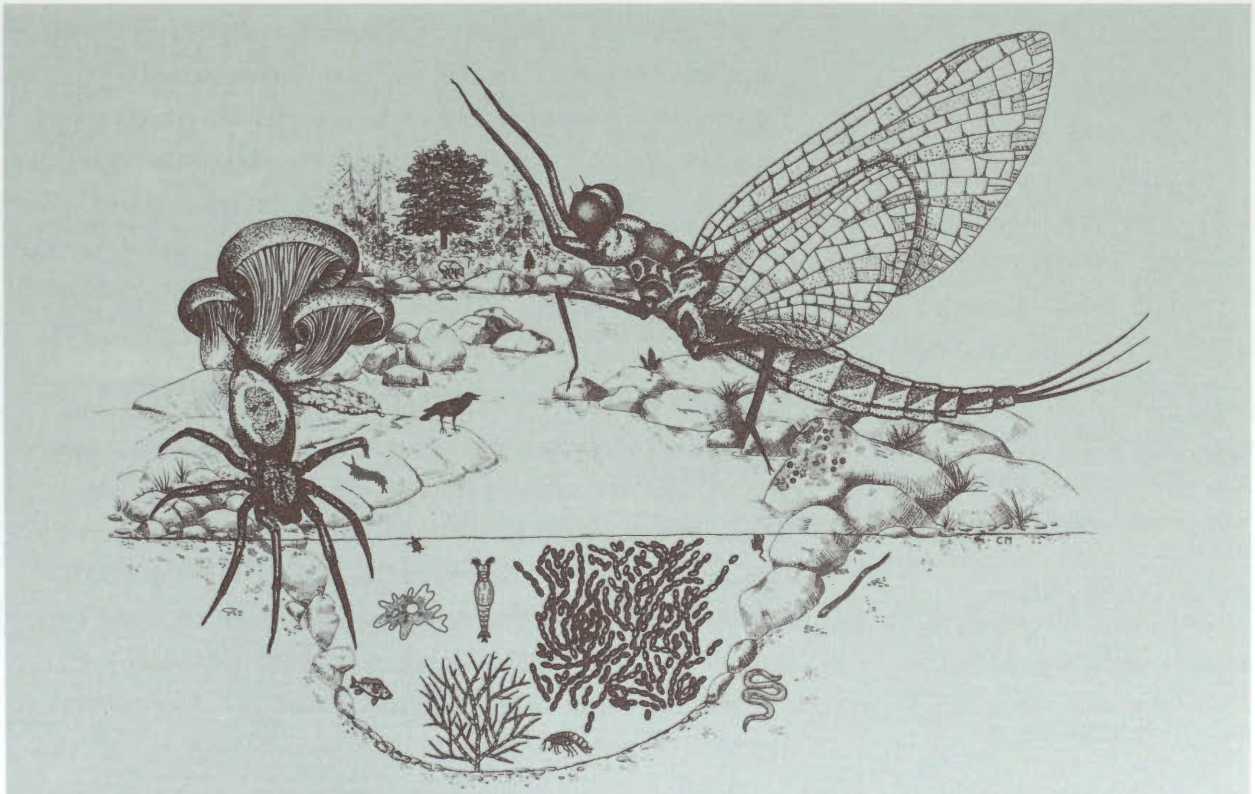
What holds true for the crossbill holds true, at least to some degree, for each and every living organism. The dynamic interaction of genes and environment occurs as Nature matches species with their surroundings in highly ingenious ways. Over time, new species have evolved, and species that were unable to cope have become extinct — which leads us to the topic of species diversity.

SPECIES DIVERSITY

This level of biodiversity is easier to measure. However, the number of species in the world is estimated at somewhere between 2 million and 100 million. Microorganisms account for most of the species suspected to exist.

Canada is home to approximately 300 000 species. An estimated 200 000 are found in our forests, or are dependent on a forest habitat. That vast web of living organisms has enabled our forests to evolve over thousands of years, and to adapt to such disturbances as fires, insects and disease.

Sound forest management activities respect and preserve the diversity of natural ecosystems, and ensure that our forests continue to benefit from the resiliency that diversity creates. Occasionally, however, something happens to disturb the balance between previously viable populations of different species, triggering a ripple effect in the forest ecosystem and putting even established species at risk.



This illustration shows the relative number of species within different groups of organisms in Canada's forest ecosystems. For example, there are many more species of insects than mammals, and more species of deciduous trees than coniferous trees.

Sheep laurel
(Kalmia angustifolia)

In Newfoundland's boreal forests, forest managers have had to contend with *Kalmia* or "sheep laurel." The sheep laurel population is usually rather sparse and scattered, and has tended to coexist well with black spruce. The dense foliage or "canopy" of the spruce limits the amount of sunlight the laurel receives, and prevents its extensive root system from enabling the shrub to dominate. The sheep laurel usually invades an area after a disturbance such as fire, only to die back when the spruce has grown enough to shade it out.

In the 1950s, however, in spruce groves where the soil was especially poor, researchers discovered that the sheep laurel was gaining the upper hand. Spruce seedlings that were planted in harvested areas did not grow as well as expected. By the 1960s, it had become obvious that the thick, infertile humus produced by the laurel was degrading the spruce sites. Worse yet, the laurel's leaves were found to produce chemicals that are toxic to spruce seeds. Although the problem was most acute in Newfoundland, it was also reported to a lesser degree in Nova Scotia and New Brunswick, and in parts of both Quebec and the northeastern United States.

By the 1980s, forest ecologists had developed several measures to restore the balance between the two species. Areas that had burned or been harvested were reforested immediately, so that the sheep laurel could not get established. The spruce seedlings were planted close together to ensure that a dense canopy formed quickly, inhibiting the growth of the laurel. Consideration is now being given to replanting a mix of coniferous trees, along with the shrub alder, which has the ability to return valuable plant nutrients to the soil.

ECOSYSTEM DIVERSITY

The third tier of biodiversity relates to individual ecosystems. Ecosystems are functional units of nature that comprise every living organism in an area, as well as the broader physical environment of the area itself. One ecosystem can be distinguished from another by its topography, soil, climate and predominate form of natural disturbance. *(*Some are more commonly affected by fire, others by insects and disease.*)* Together, those factors determine the type, mixture and age of the species in the area.

The diversity of ecosystems in this country is unusually high. Canada's 8 principal forest regions are subdivided into 90 sections. *(See map on page 33.)* By using landform, climate and vegetation as the main criteria,

A healthy, naturally functioning ecosystem can serve as a blueprint for restoring the ecosystems judged to be at risk. It can also serve as a benchmark or baseline against which to monitor long-term changes in managed ecosystems.

the country has been divided into 15 ecozones; and the ecozones have been split into 45 ecoprovinces, 177 ecoregions and 5428 ecodistricts. An ecodistrict may contain hundreds of ecosystems, including the balsam fir forests of the Maritimes, the jack pine and spruce forests of the Boreal region, and the Douglas-fir and western hemlock found in the temperate rainforests on the west coast. Local variations, such as those noted in the transition between a valley floor and alpine tundra, or an ocean shoreline and inland forest, further subdivide those regional designations.

Trees compete for light and soil nutrients, and some die when deprived of those requirements. The individual organisms within an ecosystem all eventually die, but their diversity ensures the survival of the ecosystem as a whole.

The way in which ecosystems cycle from death to renewal varies widely, both in the location of the forests and the stage of growth of the trees. For example, unmanaged portions of the boreal forest, which stretches

Each forest ecosystem comprises a unique combination of organisms, each functioning differently. Some trees are prone to destruction by wildfire; others are more susceptible to insects and disease.

The Carolinian Forest

The Carolinian forest is found mainly in the United States, but it also reaches up into the southernmost part of Ontario, on the fertile plain lying north of Lake Erie. Originally contained within the Deciduous forest region, the Carolinian forest now consists of scattered remnants of the dense softwood and hardwood forests that once covered that part of Canada. European settlers took advantage of the high productivity of the land to build thriving farms and communities. Today less than 10% of the land has any forest cover. More than 95% of the Carolinian forest is privately owned. A small amount of the forest, less than 1%, is contained within 1 national park and 16 provincial parks. Under the auspices of the Ontario Heritage League, conservation agencies in Ontario have conserved most of the residual sites through a stewardship program involving landowners.

The Carolinian forest area is home to 20% of Canada's population, and a profusion of plants, birds, reptiles and mammals. More than half of Canada's bird species are found in the area. Sixteen endangered species of plants and animals are native to the Carolinian, and at least a third of our rare, threatened and endangered species are dependent on the natural habitats in the area.

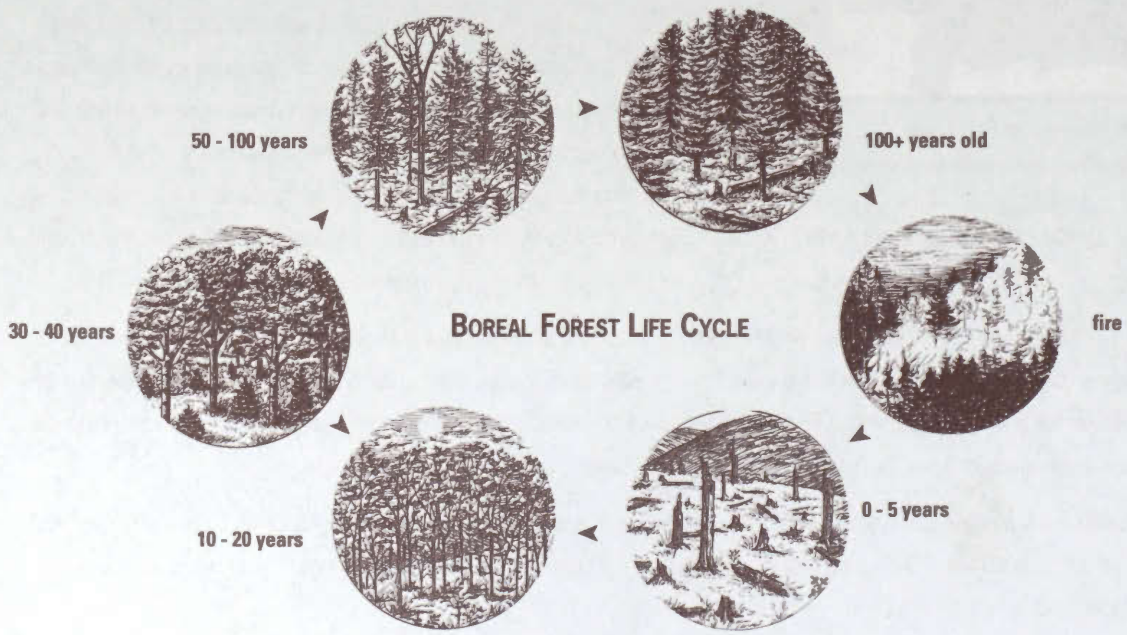
The Carolinian forest area is one of the few places in North America where the American chestnut has not been totally eradicated by chestnut blight. Other Carolinian species include the tulip tree, black gum, sycamore and sassafras.

Forest ecosystems have evolved over thousands of years and are highly resilient to fire, insects, disease and climate change. The genes, species and physical surroundings of an ecosystem constantly interact, evolving over time. Even the boundaries of the ecosystem are constantly changing.

across all of northern Canada, experience massive disturbances on a regular basis. Insects attack the boreal forest, and fires burn large areas every 50 to 100 years. Entire forests may be affected by those disturbances and then recover rapidly, because the so-called "pioneer" species of boreal forests are uniquely adapted to cyclical disturbances such as fire. (The pioneer species of the boreal forest include jack pine, black spruce, trembling aspen and white birch.) Often, only one or two species will regenerate in an area devastated by fire. As a result, the boreal forest is not particularly diverse in terms of tree species. For example, you may find a forest hundreds of thousands of hectares in size that is comprised entirely of jack pine. However, as a forest develops, tree species that are more tolerant of shade, such as spruce and balsam fir, thrive in the shaded areas created by the earlier-established pioneer species.

LANDSCAPE DIVERSITY

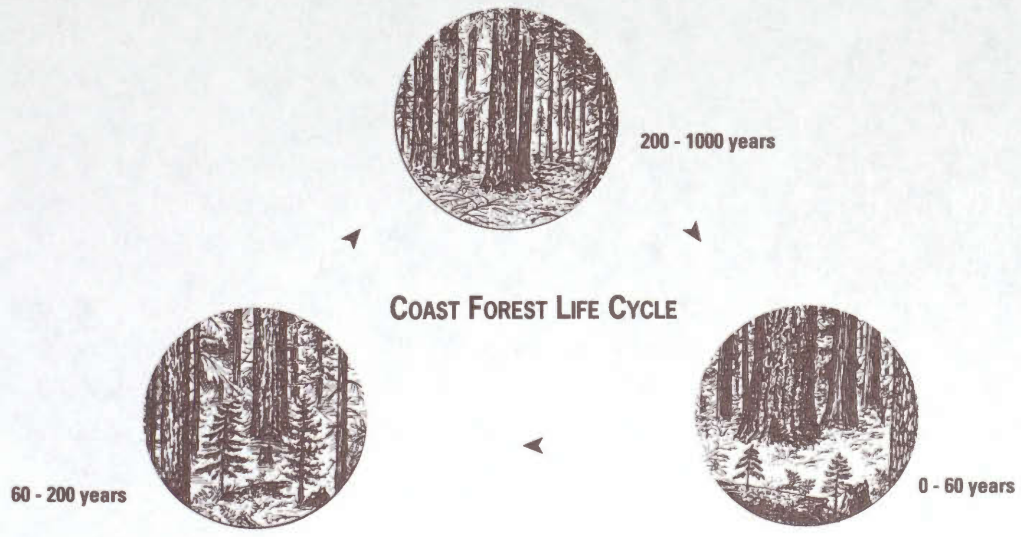
The average cycle of a boreal forest is between 50 and 100 years, and because wildfires occur frequently, the boreal forest landscape often resembles a giant patchwork quilt — including open areas where last season's fires raged, patches of young forest where a fire occurred 20 years ago, and patches of old forest where a fire hasn't burned for many years. That patch-work effect illustrates the concept of landscape diversity — the pattern of ecosystem differences in an area where the forests are at various stages of the life cycle.



BOREAL FOREST LIFE CYCLE

The coastal rainforest of British Columbia renews itself very differently from the boreal forest. Its climate is considerably more benign, and fires are relatively infrequent. Most of its tree species, left undisturbed by pests and fire, will reach a great age and size. The trees that fall down or are blown over, or are killed by root rot or ground fires will be replaced by individual trees or groups of trees from the understorey, or from seeding by the remaining trees. To grow beneath the taller pioneer trees, the new generation of tree species must be able to thrive in little sunlight. Cycling in the coastal rainforest is highly localized — one tree may be 800 years old, another may have just fallen over, and another may be a seedling that has just broken through the soil. Unlike the boreal forest, which has large areas of forest with trees of the same age and species, a small patch of coastal rainforest is structurally diverse, comprising trees of many different ages, heights, sizes and species, as well as a greater amount of dead and decaying wood. At a landscape level, however, the diversity of coastal rainforest ecosystems is comparatively low, because they tend to comprise fairly uniform and extensive tracts of old-growth forests.

Human intervention, such as logging or clearing land for agriculture, creates a more uneven landscape pattern and can affect the species that inhabit an ecosystem. The fragmentation of the old-growth forest landscape puts at risk not only the spotted owl, but also the rich diversity of an entire ecosystem and the livelihood of many people. The challenge for forest managers is to protect both the biodiversity of the temperate rainforest and the future of the spotted owl, while using the forest to generate the employment and products needed by society.



WHY IS BIODIVERSITY AN ISSUE?

Forests cover nearly half of Canada's land area and are likely home to two-thirds of all species of plants, animals and microorganisms estimated to exist in Canada. As such, forests are a key element in Canada's efforts to conserve its biodiversity.

The life of all species, including humans, depends on the health and vitality of other organisms in the web of life. There is growing concern that the loss of diversity may have significant ecological and economic ramifications, because each species fulfills an important function in the global ecosystem. Trees are part of the water cycle of the planet; for many people, they are also important for fuel and shelter.

The trouble is that even the experts seem unable to agree on what is happening to diversity and how to measure changes. Some estimates suggest that more species will be lost in the next quarter-century than were eliminated by nature itself over the past 100 million years. The clearance of rainforests in the tropics for agricultural purposes may be resulting in the extinction of 6000 species a year. Some scientists feel that the current estimates of habitat and species losses are too high. Others question the predicted rates of extinction, claiming that it is difficult to accurately measure losses when the total number of species in the world is still unknown.

The fact that so many species are not yet known is another reason for biodiversity being an issue. In addition to their ecological role, many of

SPOTTED OWL

In the Pacific northwestern region of the United States, the northern spotted owl has lived for thousands of years in the temperate rainforest, nesting in the lightning-sheared tops of live Douglas-fir, western hemlock and western red cedar. The dense, multi-layered old-growth canopy provides the owl with shelter from the cold of winter. In summer, when the thick plumage of the owl limits its ability to dissipate body heat, the same vegetation offers cool shade. Also, the forest cover shields the owl from its predators, while providing the low-light conditions favoured by its rodent prey. Through evolution, the spotted owl has come to depend on the characteristics of the Pacific Northwest's large uninterrupted areas of old-growth forest.

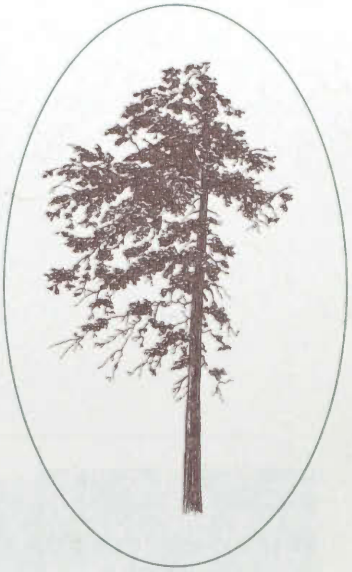
Over many decades, logging has increased the landscape diversity of the Pacific Northwest. The old-growth forests that were once characteristic of the region are now interspersed with open spaces and younger forests. The isolated patches of old growth are not nearly as effective at providing the shelter and food required by the northern spotted owl.

those unknown species may have important benefits for humans, particularly as medicine. Not so long ago, nearly all medicines came from plant and animal species, and even today, traditional medicines remain vital. More than 5100 species are used in Chinese medicine alone. In the United States, about 25% of prescription drugs contain active ingredients extracted from plants, and over 3000 antibiotics, including penicillin, are derived from microorganisms.

Consider the western yew, a small tree that grows in British Columbia's coastal and interior "wet-belt" forests. For many years it was thought to have no commercial value — until American researchers discovered that its bark contains taxol, a chemical that shows great promise in the treatment of cancer. If we protect only the species that we currently use, we may close the door on future assets.

Maintaining diversity in our natural systems is our best means of ensuring that the planet's ecological systems are strong and healthy enough to withstand the stresses and changes from human intervention and nature. That form of insurance policy is in keeping with the objectives of the World Conservation Strategy — to "meet the needs of the present without compromising the ability of future generations to meet their own needs."

Western yew



Vancouver Island Marmot

The Vancouver Island marmot is an endangered species that lives in burrows among the rocks on lush, steeply sloping, isolated subalpine meadows. Suitable habitat is not only scarce, but widely scattered. Encroachment by human activities such as logging and recreation may disrupt the delicate ecosystem. Loss of this important habitat could have a disastrous effect on resident marmots. Frequent disturbances by hikers and sightseers could disturb crucial breeding and feeding cycles, or lead to the abandonment of the site. Since specific protective measures were established, field surveys have confirmed the existence of more than 25 active marmot colonies, with an estimated population of 300 animals. An encouraging discovery is that the colonies have sprung up in areas cleared by logging, apparently confirming the hypothesis that cutting might temporarily extend the marmot's habitat.

A healthy, naturally functioning ecosystem can serve as a blueprint for restoring other ecosystems judged to be at risk. It can also serve as a benchmark or base against which to monitor long-term changes in managed ecosystems.

CANADA'S RESPONSE TO THE CONCERN ABOUT BIODIVERSITY

At the 1992 Earth Summit — a meeting organized by the United Nations to encourage the responsible use of natural resources — countries reached an agreement on the conservation and sustainable use of the world's biodiversity. Canada was the first industrialized nation to ratify this international treaty, known as the "Convention on Biological Diversity." The treaty took effect on December 29, 1993, after it was ratified by the minimum 30 countries required.

Signatories to the document formalized their commitment to conserving biological diversity, using its components sustainably, and sharing fairly and equitably in the benefits that arise from utilizing genetic resources. Each country pledged to develop national strategies, to establish suitable research programs, and to identify and monitor the components of biodiversity and the ecological processes critical to its conservation.

The agreement also requires countries to inventory the plants and animals within their borders, and to draft plans to protect endangered species. Meanwhile, a network of conservation data centres is being set up across Canada with computer links to a similar network in the United States. The initial purpose of the network is to find out where the rarest and most threatened species and ecosystems are located.

One important element in conserving biodiversity is the need to expand networks of protected areas around the world. The World Commission on Environment and Development has urged that 12% of the world's ecosystems be left to function naturally. Canada's federal, provincial and territorial governments have committed themselves to protecting 12% of the nation's natural areas as parks or reserves. To date, approximately 12% of Canada's forest land has been designated as either "heritage" or "protection" forests, and is reserved from harvesting by either legislation or policy. The protected areas vary greatly in size, from narrow buffer zones along waterways, to more extensive wildlife sanctuaries and parks. Provincial governments are developing strategies to complete their own networks of protected areas within their provincial boundaries.

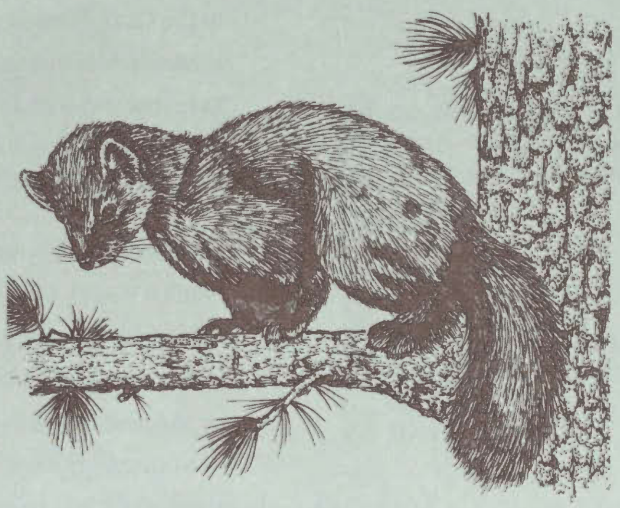
Canada's federal, provincial and territorial governments, with the advice of non-governmental organizations, are working together to draft a biodiversity strategy for Canada in response to the Convention on Biological Diversity. The federal-provincial-territorial working group is expected to release the first draft of the strategy for public review in the summer of 1994.

However, even if we reach our goal of 12%, more than 80% of Canada's land will be outside of those protected areas, as forests, farms, settlements, prairie and tundra. Realistically, we cannot hope to conserve biodiversity just by protecting 12% of our natural areas. The greater challenge is to ensure that forests, farms and other lands are managed in such a way that they can continue to contribute to biodiversity.

The international biodiversity convention is compatible with the objectives of Canada's National Forest Strategy and with the Canada Forest Accord, which commit Canadians to "strengthening the foundations for conserving the natural diversity of our forests, and putting in place the fundamental reporting systems to say where we stand."

Newfoundland Pine Marten

Over the past half century, the pine marten population in Newfoundland has declined considerably, to the point where the species is now listed nationally as being "threatened." Less than 300 martens inhabit the area south of Little Grand Lake in western Newfoundland.



The island's declining population of pine marten is attributed primarily to the loss of habitat that has resulted from logging and insect damage, but it is also related to overtrapping, disease, accidental snarings in hare snares, and a chronically poor food base. Work is underway in the Newfoundland model forest to clearly define the current status of the marten — how the animal uses its habitat, such as its willingness to cross open areas; the capability of second-growth forests to support marten populations; and the need to perhaps increase the marten's food supply by not permitting hare snaring in areas it inhabits. Over time, once the population has been stabilized, the task of forest managers will be to maintain sufficient habitat to ensure that the marten does not again become threatened.

In May 1993, a special laboratory was opened in Chalk River, Ontario, to store selected tree seed and other valuable genetic material at cryogenic temperatures as low as -196° C.

The long-term storage laboratory is the only one of its kind in Canada that is dedicated to forest research.

Forest Management Challenges

Today, foresters must be sensitive to the role of every component in an ecosystem. For example, a thriving community of shrubs, herbs, lichens and mosses on the forest floor provides habitat for nesting birds and small mammals, food for moose and deer, and a breeding ground for useful bacteria. Alder trees — once viewed as weeds that choke out Douglas-fir seedlings — are now valued for the nutrients they return to the soil, which are vital to the productivity of forests. In the past, trees that were dead but still standing (known as "snags") were routinely knocked down to prevent them from toppling over onto loggers. Now, however, those snags are recognized for their role in providing habitat for cavity-nesting species, such as owls, woodpeckers, ducks and bats. In certain cases, forest managers will ensure that the needs of wildlife are met by girdling some trees in patches of mature forest to create new snags. Better knowledge and information are enabling forest managers to design management systems that mimic and work well with nature.

In the Coast forest region, large plantations of Sitka spruce are particularly vulnerable to spruce weevil infestation. Forest managers have discovered that when spruce is interspersed with western red cedar, western hemlock and amabilis fir, it seems to be more capable of resisting attack.

Many forests are natural monocultures. Forest managers must be careful when it comes to mixing and matching. Natural disturbances, such as fires, pests, frost and drought, have often led to single-species domination of a particular site. In British Columbia, for example, a third of all forests are composed almost entirely of either spruce, pine or fir. In most cases, after harvesting, forest managers replant an area with the species that had been selected by nature.

What Seeds Should Go Where?

Managing biodiversity includes deciding what seeds to use in regeneration programs. A general rule of thumb is that seeds should come from nearby areas, but that is not always possible. For example, sometimes trees are not producing seeds at the time they are harvested. Researchers in Ontario are helping to refine seed zones to help planners make informed decisions about moving seeds within the province. Collecting information on climate, temperature, the growing season, and summer precipitation will help forest managers answer such questions as: "What seedlots can be used at this site?" and "Where can I collect seeds to plant at this site?"

That is not to say that you can't improve the resiliency of the forest. Tree improvement programs enable forest managers to regenerate a site with healthy seedlings that have been selected for certain desirable characteristics, such as rapid growth or resistance to insects and disease. A small proportion of the seedlings planted by forest managers are from "improved" stock. To ensure that those cultivated seedlings do not diminish the genetic diversity of future forests, most seed orchards are left to pollinate naturally, by the wind, which results in "wild" genes being crossed with pre-selected genes. To ensure the long-term preservation of species diversity and genetic diversity in Canada's forests, wild seed is also being stored in gene conservation banks.

Just as nature is continually adapting to new circumstances, our knowledge of forest ecosystems, species and genes is continually expanding, enabling us to better meet new challenges.

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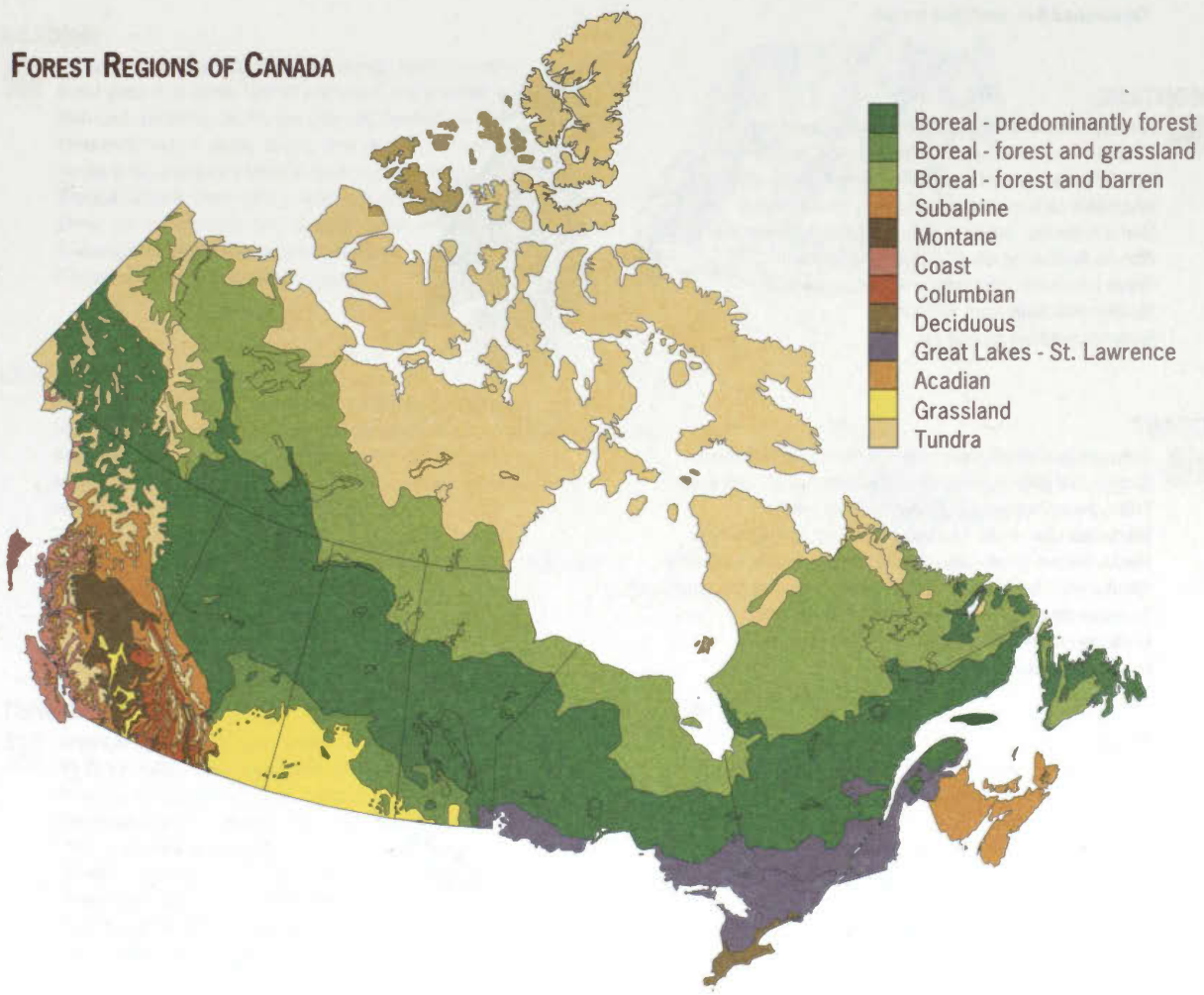
Forest Regions of Canada



SPECIES FOUND IN CANADA'S FOREST REGIONS

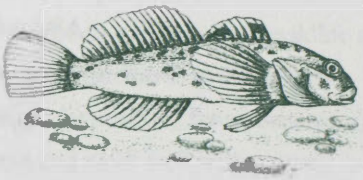
(A Few Threatened and Endangered Species are Illustrated Below)

BOREAL

Arthropods spruce budworm, mosquito, blackfly, spider mite, bark beetles
Bird black duck, hairy woodpecker, cedar waxwing
Fish northern pike, perch, lake trout, burbot, smallmouth bass
Mammals caribou, white-tailed deer, moose, wolf, beaver
Herbs twin-flower, goldthread, leather-leaf, bunchberry
Shrubs shrubby cinqfoil, buffalo-berry, bush-honeysuckle
Trees black spruce, white spruce, white birch, trembling aspen
Threatened plant Tyrell's willow
Threatened mammal Newfoundland pine marten

SUBALPINE

Arthropods Rock Mountain wood tick, California checker-spot butterfly, eyed-hawk moth
Birds red-tailed hawk, mountain chickadee, red crossbill
Fish rainbow trout, prickly sculpin, redside shiner
Mammals moose, coyote, lynx, hoary marmot, bighorn sheep
Herbs rattlesnake plantain, mountain daisy, leptarrhena, fringed grass-of-Parnassus
Shrubs black-berry elder, black mountain huckleberry
Trees Englemann spruce, alpine fir, mountain hemlock
Threatened plant mosquito fern
Threatened fish shorthead sculpin



MONTANE

Arthropods moose tick, no-see-um, wood borer beetle
Birds mallard, white-tailed ptarmigan, raven, blue grouse
Fish Dolly Varden trout, mountain whitefish, Arctic grayling
Mammals caribou, grizzly bear, rocky mountain goat
Herbs bitter-root, perennial gilia, balsamroot, desert pink
Shrubs Antelope-brush, sagebrush, rabbit-brush
Trees Douglas-fir, lodgepole pine, ponderosa pine
Threatened plant giant helleborine
Endangered bird spotted owl

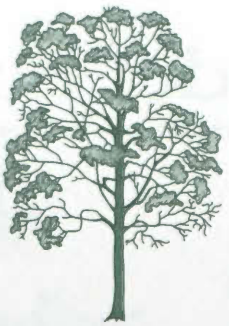
COAST

Arthropods western blackheaded budworm, spruce aphid
Birds tufted puffin, Canada goose, mountain quail, bald eagle
Fish coho salmon, chum salmon, sockeye salmon
Mammals killer whale, sea lion, coast deer, long-eared bat
Herbs western skunk-cabbage, western wake-robin, vanilla-leaf
Shrubs red-flower currant, salmon-berry, Oregon grape, devil's club
Trees western red cedar, Sitka spruce, amabilis fir
Endangered mammal Vancouver Island marmot
Endangered plant maidenhair fern

COLUMBIA

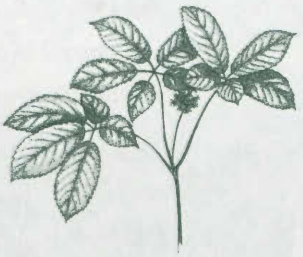
Arthropods mountain pine beetle, western spruce budworm
Birds chestnut-backed chickadee, gray jay, Steller's jay
Fish cut-throat trout, Dolly Varden trout, rainbow trout
Mammals mule deer, Columbia ground squirrel, grizzly bear
Herbs Queen's cup, twisted stalk, meadow rue
Shrubs white rhododendron, thimbleberry, hardhack
Trees western hemlock, western red cedar, western white pine
Endangered bird peregrine falcon
Threatened plant mosquito fern

DECIDUOUS



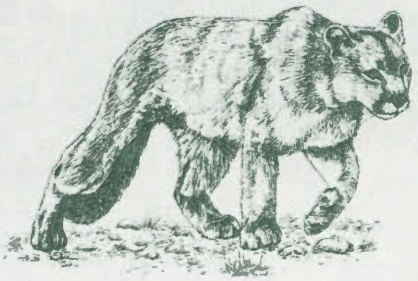
Arthropods wolf spider, swallowtail butterfly, green darner dragonfly
Birds great blue heron, black tern, kingbird, spotted sandpiper
Fish large-mouth bass, rock bass, bullhead catfish
Mammals eastern fox-squirrel, muskrat, opossum, raccoon
Herbs whorled pogonia, nodding pogonia, wild hyacinth
Shrubs spicebush, burning-bush, greenbrier, trumpet-creeper
Trees flowering dogwood, sassafras, sycamore, pawpaw
Rare mammal grey fox
Threatened tree Kentucky coffee tree

GREAT LAKES - ST. LAWRENCE



Arthropods viceroy butterfly, ladybird beetle, June beetle
Birds loon, black-capped chickadee, bluejay, goldeneye
Fish muskellunge, American eel, walleye, Atlantic salmon
Mammals white-tailed deer, otter, red fox, snowshoe hare
Herbs wild ginger, bloodroot, foamflower, fawn lily
Shrubs beaked hazel, leatherwood, Canada yew
Trees eastern white pine, eastern hemlock, basswood
Threatened bird loggerhead shrike
Threatened plant American gingseng

ACADIAN

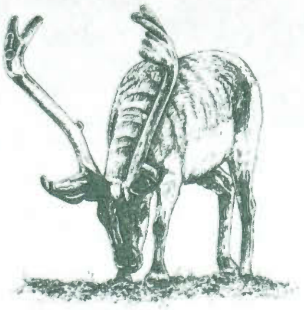


Arthropods damsel bug, European earwig, birch leaf miner
Birds great blue heron, Lincoln's sparrow, bay-breasted warbler
Fish cod, mackerel, bluefin tuna, herring, haddock, halibut
Mammals striped skunk, moose, deer mouse, porcupine, deer
Herbs pink coreopsis, plymouth gentian, golden-crest
Shrubs rhodora, black cherry, American mountain-ash
Trees red spruce, white spruce, sugar maple, beech, red oak
Endangered plant eastern mountain avens
Endangered mammal eastern cougar

GRASSLANDS

Arthropods Packard's grasshopper, red-legged grasshopper
Birds ruby-throated hummingbird, greater prairie chicken, sharp-tailed grouse
Fish perch, goldeye, lake sturgeon, sucker, rainbow trout
Mammals fox, pronghorn antelope, badger, weasel, prairie vole
Herbs horsetail, cotton-grass, cattail, nettle, wild mustard
Shrubs low juniper, twinning honeysuckle, lowbush-cranberry
Trees river birch, hoary willow, Douglas hawthorn, western cottonwood
Threatened mammal long-tailed weasel
Endangered bird mountain plover

TUNDRA



Arthropods mosquito, crab spider, sand fly, caddis fly
Birds trumpeter swan, snowy owl, red-throated loon
Fish lake trout, arctic grayling, arctic char, Greenland shark
Mammals caribou, bighorn sheep, polar bear, ringed seal, arctic hare
Herbs wood-sorrel, painted trilium, primrose violet
Shrubs bayberry, winterberry, blueberry
Trees black spruce, tamarack, ironwood
Threatened bird Arctic peregrine falcon
Threatened mammal Peary caribou

Model Forests

NEW PARTNERS, NEW DYNAMICS

A COMMITMENT TO SUSTAINABLE DEVELOPMENT

Canada's Model Forests Program is well on its way to fulfilling the promise of integrating social, environmental and economic values into sustainable forest management practices. Since the program was announced in September 1991, numerous innovative approaches to sustainable forest management have been developed and tested.

This ground-breaking program grew out of a national competition. The result was a network of 10 model forest sites, ranging in size from 100 000 to 1 500 000 hectares, with strikingly different physical, social, environmental and economic conditions. Nine model forests have been operating for at least a year. The tenth is planned to be located in the Clayoquot Sound area of British Columbia. Financial and in-kind support are provided by the federal government and model forest partners.

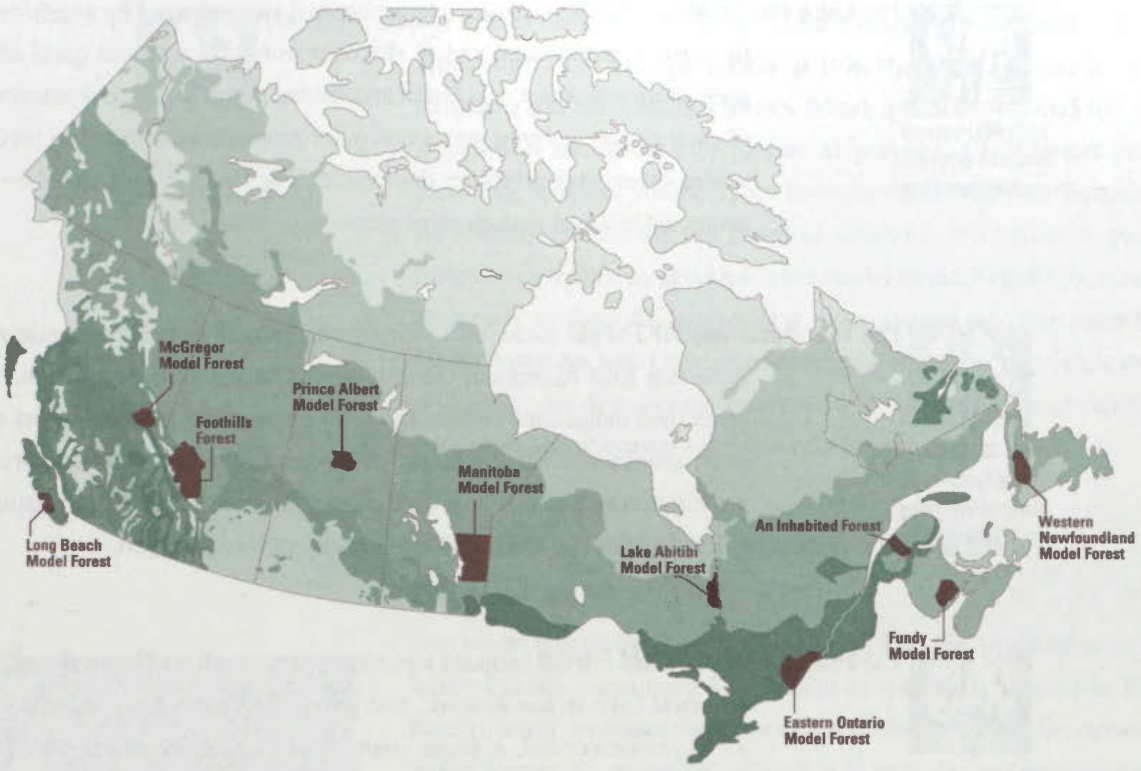
OWLS, SOFTWARE AND CULTURAL IDENTITIES

The sites are managed by partnerships involving industry, environmental and conservation groups, Aboriginal communities, educational groups, private landowners, outdoor recreation clubs, and all levels of government.

The partners in each site are involved in numerous activities, ranging from habitat studies to high-tech computer analyses. The scope is so wide and the initiatives so numerous that only one example from each site can be provided in this year's report.

707 060 hectares
Boreal forest region
in western Newfoundland

The **Western Newfoundland Model Forest** is important for many reasons: firewood and hunting, industrial wood, water for the city of Corner Brook, and habitat for the threatened Newfoundland pine marten (a member of the weasel family). To help the public understand the interrelatedness of those different forest values, the partners constructed a walking trail leading from the pulp and paper mill (the economy), along the Humber River (the watershed), and through Corner Brook (the community), to the forest (the ecosystem) on the outskirts of the city.



419 266 hectares
Acadian forest region
in southern New Brunswick

The **Fundy Model Forest** includes a large number of private woodlots, as well as provincial Crown land, the Fundy National Park, and forest land owned by the J.D. Irving Company. The northern flying squirrels and pileated woodpeckers in the area are being studied to determine if they would be useful as indicator species whose numbers could signal the health of old-growth forest ecosystems.

112 634 hectares
Great Lakes-St. Lawrence forest region
in Temiscouata-Restigouche
in the east-central part of Quebec

An Inhabited Forest is managed by a partnership involving Abitibi-Price Inc., the Wood Producers Cooperative of the Lower St. Lawrence, Laval University, and the Forestry Group of Eastern Lake Temiscouata Inc. An innovative approach is being tried on the land owned by Abitibi-Price Inc. — 31 individuals with wide-ranging forestry experience were chosen from among hundreds of applicants to manage 1000-hectare plots of forest land in an integrated manner on a profit-share basis with the company.

1 534 115 hectares
Great Lakes-St. Lawrence forest region
in eastern Ontario, north
of the St. Lawrence River

The **Eastern Ontario Model Forest**, which is home to more than a million people, is the most densely populated model forest in Canada. The First Nations community at the Akwesasne reserve, Domtar Inc. and the Ontario government are key partners in this site. The First Nations are participating in a project to reestablish and sustainably manage the black ash forests that were the foundation of their traditional basket-making industry.

1 094 690 hectares
Boreal forest region
in northeastern Ontario

The **Lake Abitibi Model Forest** includes a large forested area managed by Abitibi-Price Inc. that is being surveyed to discover potential archaeological sites, such as ancient Aboriginal burial and fishing grounds. The characteristics of each site are entered into a computer program that is used to predict where other sites might be discovered. The historic sites can then be protected in forest management plans.

1 047 069 hectares
Boreal forest region
north of Winnipeg,
east of Lake Winnipeg

The **Manitoba Model Forest** includes a vibrant mix of communities and cultures, including four Aboriginal communities, a large Métis population, and other, non-indigenous communities. To explore the spiritual values that some groups hold for the forest, the "Sacred Forest" project researchers are collecting legends and oral history from the area's First Nations' elders on how the forest was traditionally viewed and used.

314 649 hectares
Boreal forest region
in central Saskatchewan,
70 km north of Prince Albert

The **Prince Albert Model Forest** includes a portion of Prince Albert National Park, the Montreal Lake Indian Reserve, and provincial Crown land under license to Weyerhaeuser Ltd. A major study on the habitat requirements of the barred owl is being undertaken in the park to help managers plan forestry operations that will conserve critical habitat.

1 218 014 hectares
Boreal, Subalpine and
Montane forest regions
on the eastern slopes of the
Rocky Mountains in
west-central Alberta

The **Foothills Forest**, adjacent to Jasper National Park, is overseen by a diverse partnership that includes more than 70 organizations. The largest section of the forest is located on government-owned land under license to Weldwood of Canada Ltd. The use of radio collars has enabled researchers to study the seasonal habitat requirements of the site's elk and caribou. Computerized forest models are now being developed to establish the timing and location of logging operations, and to ensure that the animals have enough habitat for their needs throughout the year.

181 000 hectares
Montane and Subalpine
forest regions
in north-central British Columbia,
northeast of Prince George

The **McGregor Model Forest** is on provincial Crown land under license to Northwood Pulp and Timber Ltd. The partners in the model forest are using state-of-the-art computer software to develop an integrated resource-management system that will enable forest managers to forecast the possible impact of various management scenarios, and to consider the needs of all forest users as they plan new forestry operations.

400 000 hectares
Coast forest region
on the west coast of
Vancouver Island

The **Long Beach Model Forest**, which includes the Clayoquot Sound area, is the only model forest not yet operational. It is in the heart of Canada's coastal rainforest and encompasses Meares Island, a well-known example of the west coast rainforest ecosystem. At present, 14 different groups, including tourism, youth, major manufacturers and First Nations, are represented on the interim board of directors. More than 80 partners have been involved in developing the model forest. Negotiations are now underway to formally incorporate those groups into the Long Beach Model Forest Society. Once operational, the research programs at the site will focus on developing systems to ensure the conservation and understanding of coastal rainforest ecosystems.

INTERNATIONAL MODEL FORESTS

Expanding the Network

The Model Forests Program began moving onto the world stage in 1992, when Canada committed $10 million at the Earth Summit in Rio de Janeiro, Brazil, to create three international sites to add to the network of model forests. An expanded network will provide the Canadian forestry community with an opportunity to learn from its foreign partners while sharing its own expertise.

The first international sites were announced in Mexico in August 1993 following a national competition. Partners in the Calakmul Model Forest, which is located in the tropical forest region of the Yucatan Peninsula, will focus on diversifying the use of the land to support both wood and food products. The second site is located in the temperate forest region in the state of Chihuahua, in the Sierra Madre Mountains. There, the forest-dependent indigenous peoples will be helped to restore the site's environmental balance. To foster cooperative activities and the exchange of information, the Eastern Ontario Model Forest has been twinned with the Calakmul site, and the Foothills Model Forest partners will work with the Chihuahua partners.

Russia is the second country to join the international network of model forests. A 400 000-hectare model forest site will be developed in the far east state of Khabarovsk. Among the various activities proposed are plantations of Korean pine, Manchurian nut, Manchurian ash and Ayan spruce to help rehabilitate the existing low-value forest stands.

Malaysia is the third country to have been invited by Canada to become involved in the network.

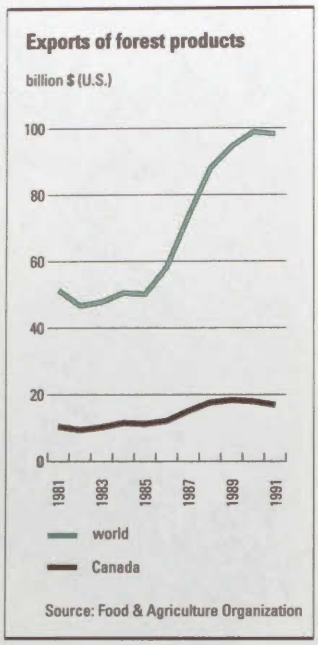
CHAPTER THREE

The link between trade and the environment is a relatively recent phenomenon that has become a significant factor in an increasingly globalized marketplace during an era of burgeoning international trade. Given the importance of trade to our economy, Canada is deeply involved in the international debate related to trade and the environment.

Trade and the Environment

NEW BARRIERS, NEW CHALLENGES

Concern about the environment has increased dramatically over the past decade. Environmental awareness is on the rise in many countries, and is reflected in local recycling campaigns, government legislation, and industry-generated environmental standards of practice. Many of the measures that have been implemented to protect the environment, for example to reduce air pollution, effluent emissions and waste, have had both intentional and unintentional impacts that have extended beyond national borders and affected trade. As traditional barriers such as tariffs and quotas are dismantled and global trade expands, the potential impact of those measures is even more significant. Canada is a trading nation and depends on exports for economic growth. In 1992, Canada's forest products exports totalled $23 billion and contributed $19.2 billion to our balance of trade.



GENERAL ENVIRONMENTAL ISSUES AFFECTING TRADE

Increasingly, certain questions are being heard, such as, "When is it legitimate and appropriate to use trade measures to address environmental problems?" and "Are environmental measures being applied for legitimate environmental reasons?" The uncertainty of the evolution of future trade laws; the range of issues; the vast number of environmental programs and solutions being developed in various countries; and the significant differences between countries is confusing for producers, consumers and policy-makers alike.

Countries' views on environmental issues may differ because of their unique set of circumstances: social values, customs, stage of economic development, resource base, adsorption capacities, or scientific assessments. Those unique conditions can result in conflicting environmental priorities and objectives that challenge nations trying to resolve ongoing international disputes related to trade and the environment.

Competitiveness may become an issue as a result of environmental measures. For example, competitiveness is affected if national environmental standards differ from country to country, or if the costs of complying with environmental standards and regulations differ. As well, firms located in one country may perceive themselves as being at a competitive disadvantage compared to firms in countries where the standards are lower. However, environmental considerations are only

Key Trade and Environment Issues

- policies that are established to achieve national environmental objectives, but that may unnecessarily restrict trade;
- environmental regulations that are used to erect unnecessary trade barriers at a time when traditional barriers are falling;
- environmental laws, regulations or programs that affect competitiveness when they are implemented by the importing country, but are not part of the exporting country's laws or policies;
- efforts to change existing trade laws to permit trade actions against countries whose environmental practices are viewed as inappropriate; and
- concerns about the environmental impacts of expanding trade and resource consumption.

some of the many factors that may affect competitiveness. Labour costs, tax structures and interest rates are just a few of the other factors that may have an impact.

In addition, environmentalists may feel that a government is refraining from raising or enforcing standards because of the possible negative effects on competitiveness. That perception may lead to pressure to implement countervailing duties or other trade restrictions against countries with lower standards. However, existing trade laws do not permit that type of action. Because there are legitimate reasons for countries to have their own sets of standards, it is difficult to harmonize standards internationally.

Canada has 10% of the world's forests and is the largest exporter of forest products.

Domestic producers and exporters of the same product may be affected differently by domestic environmental regulations. For example, as discussed in last year's state of the forests report, various state regulations in the USA require newspapers to be printed on newsprint containing a minimum amount of recycled fibre. Although those regulations do not explicitly discriminate against Canadian newsprint producers, they may increase the comparative advantage of American producers, who are located near cities that are large enough to supply the vast quantities of old newspapers and magazines required to make recycled newsprint.

Sustainable management practices, biodiversity, global warming, deforestation, air and water pollution, and excessive packaging and waste are some of the major environmental issues related to forestry.

The tariffs traditionally used to restrict access to world markets may be replaced by environmental regulations, quotas and bans. For example, standards specifying that pulp and paper products be totally chlorine-free may challenge Canadian producers who have not yet converted their operations. In some instances, there may be valid environmental reasons for the regulations; in other cases, the objective may be to protect domestic markets. If the product standards differ widely in too many international markets, however, companies may not be able to create products that can meet that range of standards.

ENVIRONMENTAL AND TRADE ISSUES AFFECTING FORESTRY

In an era of growing international attention on forests, Canada's exports of forest products are bound to be affected by environmental issues that impact on trade. In fact, some of the most controversial subjects on the environmental agenda are those related to the management and use of forest resources. Canada has been participating fully in international discussions on those issues.

What is not always understood or recognized, however, is that Canada's forest products originate from forests that are unique in terms of their extent and diversity. In addition, the composition of Canada's forests and their management is significantly different from many other countries. If those differences are not recognized — the fact that most are natural forests as opposed to plantations, the amount of biodiversity and wilderness they contain, the forest management techniques they require, and the recreational opportunities they provide — any discussions with other countries on trade and environment issues will be difficult.

In this chapter we will look at the primary means of addressing major environmental concerns, particularly as they relate to trade in forest products — international environmental agreements; criteria and indicators to define sustainable forest management; eco-labelling; product certification; and domestic environmental regulations on production and process methods and packaging waste.

International Agreements

Environmental problems often cross international boundaries. For example, the acid rain that falls in one country may result from the air pollution in another. The effluent that is released into a lake or river from a mill located in one nation may eventually flow into another country. Coordinated action and cooperation among nations is required to address problems that move across international boundaries. Although differences in resource endowments, environmental conditions

International Environmental Agreements

An IEA is an agreement among a group of countries to abide by a common set of rules, regulations or policies related to the environment. International agreements ratified by signatory nations may stipulate certain standards and conditions, agreed-upon policies or actions, or penalties for non-compliance. Examples of IEAs include the Convention on International Trade in Endangered Species of Flora and Fauna (known as "CITES"), which restricts international trade in endangered species; the Montreal Protocol on Substances that Deplete the Ozone Layer, which limits the use and trade of goods containing chlorofluorocarbons (CFCs); the Basel Convention, which regulates the movement of hazardous waste across international boundaries; and the Wellington Convention, which restricts the use of drift nets in fishing.

and priorities, and social and economic conditions make them difficult to achieve, agreements between governments — known as "International Environmental Agreements" (IEAs) — are an attempt to arrive at a consensus and plan of coordinated action on issues of common concern.

Although IEAs address some important environmental issues, difficulties can and do arise in implementing, monitoring and enforcing the agreements. For example, a fish caught in a drift net looks the same as one caught by any other means. Despite those difficulties, many environmental problems can only be addressed through international cooperation and agreements.

There is no legally binding international agreement governing the management or use of forests, or restricting the trade of forest products. However, the 1992 United Nations Conference on Environment and Development (UNCED) in Brazil led to four international initiatives, summarized below, that are affecting and will continue to affect how nations manage their forests.

International Initiatives that will Affect Forests

- Agenda 21 represents a global environmental action plan for the 21st century, and includes a chapter on forestry that is aimed at combatting global deforestation. It outlines four program areas that are intended to encourage the rehabilitation of forest lands, and to strengthen the institutions, knowledge, data and scientific capabilities of countries so that they can manage their forests for a range of values;
- A Statement of Forestry Principles (entitled *The Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests*) is a non-binding statement that was agreed to at UNCED to promote the sustainable management of forests worldwide;
- The United Nations Framework Convention on Climate Change addresses the need for countries to limit their emissions of greenhouse gases, and in particular, to restrict CO_2 emissions to 1990 levels by the year 2000. Countries are also to maintain major sinks or storehouses of carbon such as forests; and,
- The United Nations Convention on Biological Diversity commits countries to maintaining and protecting their natural biological diversity at the genetic, species and ecosystem levels.

Sustainable Forests

Consumers, retailers and nations are seeking assurances that their forest products purchases originate from sustainably managed forests. For example, the Netherlands announced that, beginning in 1995, they will only import products that are from sustainably managed tropical forests. Austria has introduced a voluntary scheme to ensure that all forest products imports are from sustainably managed forests. In the United Kingdom, some 24 retailers, importers and producers of forest products have joined a program established by the World Wildlife Fund to phase out wood and wood products that do not come from "well-managed" forests by the end of 1995. Initiatives in other countries are also underway.

Of all the emerging issues that affect world trade in forest products, one of the most important is the sustainable management of forests.

The ingredient that is missing in all of those measures, however, is a meaningful definition of what constitutes sustainable forest management. Without an internationally accepted definition and the criteria by which to measure compliance, restricting forest products trade on the basis of sustainable forest management could become a subjective exercise. Thus, the danger for exporting nations such as Canada is that trade in forest products will be subject to an arbitrary and inconsistent set of rules.

In the absence of any agreed-upon standards or definitions for sustainable forest management, the focus can shift to the acceptability of certain management practices, such as clearcutting. In 1993, for example, four German publishers announced that they would phase out purchases of pulp and paper products derived from clearcut forests as other alternatives become available. A British forest products retailer, B&Q, has indicated in its environmental policy that it, too, will phase out products from clearcut natural forests. Thus, the use of a particular forestry practice has become the basis for defining sustainable forest management.

The positions outlined above have been taken despite the fact that, for much of Canada's forests, clearcutting is a scientifically acceptable and ecologically appropriate forestry practice, when done properly. However, Canadian forest conditions and practices are not well understood, and the new trend in Europe may significantly affect trade in Canadian forest products.

One of the major challenges is to develop an internationally acceptable and measurable definition of sustainable forest management — one that recognizes the ecological differences between forests in different regions and countries — because the practices in one region may not be suitable for all regions. Without that recognition, there will always be disagreements about particular practices, and a subjective mix of science, statistics and emotion may be used to restrict the trade of forest products from countries such as Canada.

Criteria and Indicators

To help resolve the controversy over what practices are "sustainable," two things are urgently needed: an internationally accepted definition, and criteria for sustainable forest management. The principles of sustainable management agreed to at UNCED were a first step. The goal now is to build on that initial consensus, to develop international criteria for sustainable forest management and indicators that can be used to measure sustainability in any nation. Several initiatives are underway throughout the world to develop those criteria and indicators.

The Canadian Council of Forest Ministers, as part of its commitment under the National Forest Strategy, is sponsoring an 18-month-long effort to develop criteria and indicators that can be applied to the forests of Canada. Representatives from a range of groups are involved in this exercise, including governments, industry, environmental groups, social and church agencies, Aboriginal people, and scientific and technical experts. The goal is to determine the environmental, social and economic criteria that define sustainable forest management; to develop a series of measurable indicators; and to determine what changes to Canada's information- and data-collection efforts are required to be able to report on the indicators. The aim is to complete a proposal in time for a June 1995 meeting of the United Nations Commission on Sustainable Development at which forest issues will be discussed.

Work on internationally acceptable criteria and indicators is also continuing. The effort to develop criteria and indicators for tropical forests has been carried out under the auspices of the International Tropical Timber Organization (ITTO), a United Nations organization dedicated to the conservation and wise use of tropical forests. Timber producer and consumer nations that are members of the ITTO have

TERMINOLOGY GUIDE FOR CRITERIA AND INDICATORS

Goal
an object of action
e.g.
sustainable forest management

↓

Principle
a fundamental guide to action
e.g.
the ecological processes of forests are essential to life and must be maintained

↓

Criterion
a distinguishing characteristic that provides a framework for policy
e.g.
to maintain the productive capacity of forest ecosystems

↓

Indicator
a measurable element
e.g.
the impact of fire on ecosystems,
the population levels of selected species, or the status of soil nutrients

adopted Target 2000 — a commitment to trade in tropical timber produced from sustainably managed forests by the year 2000. With its members facing a bewildering number of definitions of sustainable forestry practices, the ITTO set out to develop a single definition in simple, practical terms linked to operational criteria. The ITTO criteria are focused on the institutional, legislative, policy and forest management activities required to practice sustainable forestry.

In 1993, during the renegotiation of the agreement governing trade in tropical timber (the International Tropical Timber Agreement), boreal and temperate forest nations, such as Canada and the USA, made a similar commitment to trade in products from sustainably managed forests by the year 2000. That commitment raises once again the need for more precise and operational criteria and indicators.

A number of different initiatives are underway throughout the world to try and develop measurable definitions of sustainable forest management. Progress has been made on environmental or ecological indicators, but the diverse social, cultural and political values around the world have made an agreement on social and economic indicators far more elusive.

In the fall of 1993, Canada hosted some 40 countries and international environmental organizations to develop criteria and indicators for boreal and temperate (northern) forests. Participants at the meeting, which was hosted under the auspices of the Commission on Security and Cooperation in Europe (CSCE), made significant progress toward defining environmental, social and economic criteria. In contrast to the ITTO criteria, which deal with the activities or inputs required, the criteria developed at the CSCE-sponsored meeting are oriented more toward the results or values of the forest that must be maintained if sustainable development is to be achieved.

A third initiative is being undertaken by the Forest Stewardship Council, whose aim is to promote the certification of forest products. The Council's first step is to develop criteria and indicators for natural and plantation forests to certify products from sustainably managed forests. Unlike the efforts of the ITTO and CSCE, which were led primarily by governments, the Forest Stewardship Council initiative was led by a non-governmental organization — the World Wildlife Fund — and includes economic, social and environmental interests from around the world. The Council had its founding assembly in Toronto, Ontario in 1993, but will be headquartered in Mexico.

Eco-Labelling

Eco-labelling programs are innovative initiatives that are intended to assess a wide range of product criteria related to production and processing, consumption and disposal. These recent, but very popular

programs may impact on trade as consumers alter their buying habits in favour of products that are certified as environmentally sound and identified by eco-labels or "green labels." A variety of labels may be used. Environment Canada's Environmental Choice Program is a voluntary program that awards the EcoLogo to applicant products that are produced in a more environmentally benign manner than other products of the same type. It was one of the first such programs in the world and continues to serve as a model for other countries designing their own eco-labelling programs.

Often, both importers and domestic producers may apply for eco-labels and submit their products for testing and verification. Most programs are voluntary. Many of them evaluate the environmental impact of a product through a "life-cycle" approach that studies the product from extraction to production, use and disposal.

Agencies generally weigh many factors before setting the verifiable criteria that will apply to each product, but the criteria often reflect the environmental priorities and concerns of the labelling country. For example, the European Union's proposed eco-labelling scheme will use energy consumption as one criterion. Products will be rated on the quantity of electrical energy used during production, irrespective of the other energy sources used. While Canada uses primarily a renewable resource — hydroelectricity — most European countries use fossil fuels.

In theory, eco-labels could add a layer of externally imposed regulations and costs on exports, especially if the concerns of the labelling country are not shared by the exporting country.

Product Certification

Product certification is carried out by independent parties that verify whether a product meets specified criteria or requirements. Certification may deal with several issues or only one. For example, paper products may be certified on the basis of the amount of recycled fibre they contain. Certification may or may not result in the awarding of an eco-label, but an eco-label is more likely to be awarded when several aspects of a product or product's life cycle have been evaluated.

Around the world, there is growing interest in certifying products on the basis of whether they originate from sustainably managed forests. Unlike government legislation or regulations, certification is aimed at protecting the environment by raising consumer awareness about the effects of

ECO-LABELS

Canada

Germany

Japan

European Union

United States

Producers and consumers of forest products throughout the world are developing certification systems. For example, Finland has introduced its "Plus Forest" signature to certify products from sustainable forests. As a consumer nation, Austria has implemented a voluntary label for timber and for products, including furniture, that originate from sustainably managed forests.

forestry activities. Because it is market oriented, certification can be compatible with free trade, provided that participation is voluntary and that the certification does not discriminate between suppliers, or establish binding requirements or bans. The goal is to raise the environmental standards of all nations, although this may in result in higher consumer prices.

In 1993, the Canadian Pulp and Paper Association announced its intention to develop a certification system for Canadian forest products. An effective certification program, however, must be transparent and independent of any direct commercial interest. The Canadian certification system will be developed by the Canadian Standards Association (CSA) — an independent organization mandated to develop product standards — and will be compatible with the International Standards Organization. An independent certification organization, such as the CSA's Quality Management Institute, would be accredited to register and award certificates based on a successful audit by an approved auditing organization.

A growing number of private, independent companies are offering to certify whether a manufacturer's products are derived from sustainably managed forests. However, the systems used by those certifiers can be subjective, and as yet, the business is unregulated. One of the goals of the Forest Stewardship Council is to become an international body that would certify forest product certifiers. Certifiers whose systems are demonstrated to meet the criteria and principles being developed by the Council would be able to use its product mark or logo.

There are other significant problems to resolve regarding forest products certification. For example, the social and economic criteria that are the basis of a definition of sustainable development are highly subjective, and reflect differing values and cultures. Also, it is sometimes difficult to determine the source of a product and to know whether it has been certified. For example, it would be hard to track the wood chips and other residues used in Canada's pulp and paper mills because they come from a variety of sawmills and wood sources.

Another issue is determining at what level the certification should occur. It may not be appropriate for individual companies to protect all of the forest values on their property if some of the values are adequately protected elsewhere in the province. However, certifying at the provincial level is likely too broad because some of the companies may meet the standards, while others may not.

Production and Process Methods

The widening debate on the necessity for production and process method (PPM) regulations is also related to the issue of an acceptable definition of sustainable forest management. It centres on whether it is legal for governments to restrict market access based on a product's production methods. For example, PPM regulations could specify the amount of organochlorides permitted in pulp effluent, even if the pulp (and therefore the effluent) is produced in another country. Thus, access to a foreign market could be restricted if the environmental effects of the exporter's product do not fall within the domestic levels regulated in the importing country.

Various countries are discussing the need for and practicality of PPM regulations on two fronts: to protect their own environment, and to protect the environment of other countries. In general, the GATT allows PPM regulations to be applied on domestic production, but does not allow their application on imported products because the regulations would then be extraterritorial (i.e., applying to a production process that occurs beyond the country's jurisdiction).

Packaging and Packaging Waste

Increasingly, government initiatives are helping to reduce the amount of packaging waste by reducing consumption, or by encouraging the reuse and recycling of packaging materials. Some initiatives call for voluntary compliance, but many are mandatory.

Efforts to reduce packaging will have a significant impact on the forest products industry, not only because the shipments of packaged forest products will be affected, but because the demand for the packaging materials (paper products and pallets) produced by the forest industry is expected to decline.

Packaging requirements can have broad trade implications because exporters must adapt to market standards, and industry may be required to pay packaging taxes, which can raise costs. Furthermore, standards will tend to favour local environmental conditions and concerns, which may be different from those experienced by the exporters.

For example, Germany has established the most stringent waste packaging law in the world. By July 1995, 80% of all packaging waste must be collected. Of that amount, 90% of glass and metals and 80% of paper, cardboard, plastics and laminates must be recycled. The volume of collected materials is so large that the availability of domestic recycled

Countries vary in their approach to managing packaging waste. There are debates, for example, about whether reusing is preferable to recycling, or whether incineration with energy recovery should be a preferred option. Some countries have established reuse and recycling requirements, and others levy charges on certain packaging materials to discourage their use.

Canada has instituted a voluntary national packaging protocol that is intended to reduce waste by 50% (from 1988 levels) by the year 2000.

alternatives is expected to reduce demand for Canadian packaging. As well, Canadian and other exporters may find it expensive and difficult to comply with the legislation because it requires producers to be responsible for collecting and recycling all packaging materials.

CANADA'S TRADE AND ENVIRONMENT AGENDA IN FORESTRY

There is an urgent need to respond to valid environmental concerns and to be a good forest steward. At the same time, however, we must work to protect our trade interests — the basis of our wealth and prosperity. The challenges outlined in this chapter are largely related to the lack of internationally agreed-upon rules, including those for sustainable forest management.

Canada's industry would like to create a level playing field for all forest products producers throughout the world. Ideally, environmental regulations and programs that are based on sound science should be applied equally and fairly throughout the global marketplace.

Canada's trade and environment agenda in forestry can be categorized into three main areas. The first is directing efforts to improve Canada's domestic environmental performance, and communicating those improvements more successfully to the rest of the world. Initiatives include drawing up provincial forest-management codes of practices, putting into action the National Forest Strategy, educating the public, and communicating to Canadians and others our improved environmental performance.

The second general area is that of negotiating and defining internationally acceptable rules for integrating trade and the environment. Those negotiations will define what changes to international trading rules will be allowed or disallowed, and will take place primarily in the context of the trade-and-environment working groups of various organizations, such as the GATT and the Organization for Economic Cooperation and Development (OECD). In particular, rules related to PPMs and packaging and labelling will be addressed in that arena.

A third area on the Canadian trade and environment agenda is criteria and certification development. For example, when defined, science-based, measurable criteria for sustainable forest management will pave the way toward an international convention on forests. Similarly, multilateral and bilateral negotiations on acceptable international standards, environmental-impact assessment methods, and certification schemes will be ongoing.

Points of View

OPINIONS FROM ABROAD

A EUROPEAN PERSPECTIVE ON CANADIAN FOREST MANAGEMENT PRACTICES

In keeping with the theme of this year's report — the growing view that forests are a global resource — and the discussion in Chapter 3 on the trade implications of the heightened international focus on forestry, it seems appropriate to present an outside perspective of Canada's forests and forestry practices.

The report provides the views of four Europeans involved in the debate on forestry. Europe is an important market for Canadian forest products and, in 1992, represented 14% of our forest products exports, or $3.2 billion in annual sales. In Europe, the debate is focused on a number of issues involving forests and the environment, including the cutting of tropical and temperate rainforests and old growth, clearcutting, the use of chlorine in paper, paper consumption, and recycling.

The four individuals interviewed have each visited Canada recently, and were able to provide a first-hand account of their observations: Mr. Joe Wilson is a Member of the European Parliament; the other three persons are buyers and consumers of forest products. Mr. David Hale, of Mirror Colour Print, supplies newsprint to the second largest newspaper publisher in the United Kingdom; Dr. Alan Knight, of B&Q, is a retailer of lumber and wood products in the United Kingdom; and Dr. Manfred Kuehn is a Director of the German Pulp and Paper Association.

Each of these individuals provides an interesting and different perspective on forestry in Canada. It is hoped that their views will provide an insight for Canadians on how others, including those who buy our products, view forest management in this country.

AN INTERVIEW WITH

Joe Wilson

Member of the European Parliament for North Wales
Member of the Labour Party and Socialist Group in the European Parliament

Joe Wilson has visited Canada on a number of occasions, most recently as a member of an inter-parliamentary delegation in February 1994. His latest trip included tours of several different forests, all on Vancouver Island.

Prior to the February trip, Mr. Wilson had only a general knowledge of forestry in Canada — he knew that Canada's forests were vast and natural. He felt that the government's information during the visit, particularly the description of forestry practices, was excellent. He believes that a very good case was made. The delegation was given total freedom to question and to visit sites, and while they may not have had enough time to see everything they might have wished, he did not feel that any restrictions had been placed on them. After his visit, his impression was that Canadian forestry practices are better than he expected.

According to Mr. Wilson, Canada has a good reputation throughout the world because it is involved in the international debate on environmental matters.

However, some Canadian practices are coming into question. Members of the European Parliament, for example, have tabled resolutions asking that Canadian lumber products be banned because of logging practices and human-rights issues involving indigenous peoples.

Prior to his visit to Canada, Mr. Wilson had been heavily lobbied by environmental associations on the subject of forestry practices. Some of the general criticisms that Mr. Wilson had heard involved single-species plantations, and the impact of forestry activities on plants, animals and waterways. His overall impression, though, was that much of the public concern centred on rainforests.

The European Parliament regularly discusses the forestry practices of other countries, and there has been some debate about the possibility and practicality of banning lumber products from countries with inappropriate practices. Currently, though, no legislation is pending.

European constituents are concerned about forestry practices, but not specifically those of Canada. In Germany, however, where Greenpeace has highlighted the forestry practices in Clayoquot Sound, Canadian practices are of great concern. After seeing for himself what is happening on Vancouver Island, his advice to the European Parliament would be that no action should be taken against Canada.

According to Mr. Wilson, sound forest management must retain good examples of original-growth forest. As far as possible, the most appropriate harvesting methods for the specific area should be employed in order to preserve ecosystems and the environment in general. He acknowledged that clearcutting may be the easiest method of logging, but believes it can take away the forest cover needed by wildlife, and cause soil erosion and water pollution. He is concerned that too much forestry in the world is done solely for profits, at the expense of the environment and the livelihood of indigenous peoples.

At the last inter-parliamentary meeting, it was agreed that Canadian members would propose to the Canadian government, and the European members likewise to their Parliament, that an international standing conference be organized to compile a list of the best forestry practices around the globe.

The United States and 11 of the 12 member countries of the European Union (the exception being the United Kingdom) feel that pressure should be brought to bear on all countries to include the social and environmental costs of forestry practices. Such a move would not only raise the quality of life and protect the environment, it would also put all competing nations on an even footing.

In Europe, there is no general education on forestry practices, and the public's opinions are not based on first-hand knowledge, but rather on the views of environmentalists passed on through the media. Mr. Wilson pointed out, for example, that the information available within the European Parliament from Canadian forestry authorities is not generally spread throughout Europe.

In his view, Canada is improving its forestry practices, and is setting aside a proportion of natural-growth forests that is probably higher than anywhere else in the world. However, environmentalists argue that simply preserving a given area is not good enough — if you are going to conserve a forest, you must preserve the whole forest because it is an integrated system. They are also firmly against the concept of clearcutting. Joe Wilson concurs with those views.

By anticipating potential accusations and doing research, Canada could have information available when criticisms arise. He cautioned, however, that all points of view must be taken into consideration, as the debate over forestry practices is often quite emotional. With fuller information available, opinions could be modified.

When asked what he would do if environmentalists continued their protests despite scientific evidence that Canadian forestry practices were, on balance, appropriate to Canadian conditions and did no real harm to ecological processes, Mr. Wilson replied, "... I would respond by refusing to accede to the requests of environmentalists."

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AN INTERVIEW WITH

David Hale

Group Newsprint Controller
Mirror Colour Print

David Hale is responsible for the supply of newsprint and magazine grades for Mirror Group, the second largest newspaper publisher in the United Kingdom. He became aware of environmental issues through the press and because of the professional requirements of his job. As a controller, he has visited paper mills in Quebec and was asked about his perception of Canadian forest management practices.

European forestry practices, he feels, have been more responsible in the past. Only recently has Canada made a concerted effort to alter its forestry practices and to inform not only its own population and the interested parties within Canada, but also the purchasing companies and public abroad. That effort, he said, is not yet extensive enough, and should be considered part of a long-term program.

"There is an awful lot of misinformation," he commented. For example, the well-publicized South American rainforest devastation is thought to exist in Canada. That misinformation is not only misleading, it is untrue and shows a complete lack of education on these matters.

Publicity on environmental issues is not paramount within the United Kingdom. The press is not yet sufficiently well informed to make judgements on what are often complicated and technical matters. There is a plan to invite individual journalists to Scandinavia to enable them to view forestry practices and to provide them with broad information. After that, the industry feels it would get a fairer hearing.

MCP'S NEWSPRINT SUPPLIERS	
United Kingdom	30%
Sweden	30%
Canada	25%
Finland	10%
Norway	5%

Newsprint accounts for the bulk of the purchases at Mirror Colour Print (MCP). In the past three years, Canadian producers have made a considerable investment and now sell a product that is comparable in all respects to supplies from Scandinavia. In 1993, MCP purchased 50 000 tonnes (22%) of newsprint from Canada. Quality is very important, but a reliable regular supply is vital.

Mr. Hale approves of plantation forests and considers thinning and selective cutting to be good practices in certain environments. He believes that when it is well managed, clearcutting is acceptable and best from an economic stance; however, considerable care must be taken to minimize any harm to the environment, and replanting must be done as quickly as possible.

By the year 2000, 40% of newsprint will be recycled. Mr. Hale feels that recycling is acceptable, but the increased levels need to be introduced over a reasonable time frame, and the quality must be maintained. The experiences in Germany with respect to total recycling are considered both alarming and misguided. The quality of paper made solely from repeatedly recycled materials is unacceptable to MCP. Furthermore, the mountains of waste from a concerted campaign in Germany have resulted in waste being exported to other countries, which soon reach their saturation point. Then the surplus is sent to landfills, which totally defeats the purpose of the exercise.

The emotional element in the whole environmental debate is considerable. Education is seen as the key to solving at least some of the criticisms — people must be shown what is being done and why. In the past, very little information was forthcoming from Canada, but Mr. Hale is now being provided with information from many sources, both from Canada and elsewhere.

In the general European view, the Clayoquot Sound issue has left a poor image of forestry, and because of the considerable influence of Greenpeace, it will likely have an impact on Canada and other nations reliant on forests for their economy.

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AN INTERVIEW WITH

Dr. Alan Knight

Environmental Policy Controller
B&Q

B&Q is one of the largest "do-it-yourself" retail stores in the United Kingdom. It believes that independent certification is the fairest and most pragmatic way of assuring its customers that the timber and timber products sold by B&Q originate from well-managed forest sources.

In December 1992, B&Q issued the following policy statement: "B&Q will only buy timber whose harvesting has not caused the destruction of, or severe damage to, a natural forest anywhere in the world. Indigenous people and forest inhabitants must not be harmed and ideally should benefit from forest management. Timber from clear-felled natural forests, regardless of the reasons why they were felled, will not be acceptable."

All of the suppliers of timber to B&Q are being asked to examine their forestry practices with a view to independent certification. By 1995, B&Q will only buy timber from well-managed sources, and independent certification is seen as the way to achieve this policy objective.

B&Q's Environmental Policy Controller, Dr. Alan Knight, visited Canada in October 1993. According to Dr. Knight, the opportunity to see the forests and meet the local environmentalists, foresters and inhabitants was a most valuable experience. In his view, it was the very best form of promotion Canada could provide. He noted the candor and honesty of everyone he met and felt that they were clearly committed to sustainability. He was impressed with their level of knowledge, openness to criticism, and willingness to show both the less- and more-favourable operations. That openness contrasted well with other countries he has visited. He remarked that leading environmentalists and journalists could be invited to Canada with probably greater impact and at considerably less cost than advertisements, brochures, etc. As well, he suggested that Canada target opinion makers, since customers also listen to them.

B&Q'S TIMBER SUPPLIERS	
United Kingdom	52%
Finland	16.45%
South Africa	4.78%
Sweden	4.29%
Malaysia	2.81%
Brazil	2.68%
Germany	1.69%
Canada	1.14%
Russia	1.14%
Thailand	0.98%
USA	0.95%

He was quite impressed by the fact that local conditions are considered when forest management decisions are made. Even the arguments that clearcutting is justifiable for safety, environmental and other reasons were appreciated, although Dr. Knight found it difficult to condone the practice. Using the scale of Canada's forests to justify clearcutting also was only partly accepted.

B&Q is focused on preserving natural forests, but that does not mean that timber cannot be taken from those forests. In fact, the company prefers timber from natural forests when it is obtained by indigenous people using small-scale selective felling. The company views that type of activity as economic justification for preserving natural forests. According to Dr. Knight, theoretically, the most desirable methods of forest management are small-scale community forestry, followed by selective cutting of natural forests, and lastly plantation forestry.

After his visit to Canada, Dr. Knight observed, " ... one thing which made me a bit nervous was how close the government and the forestry authorities seemed to be to the trade. For example, [...] some of the forestry authorities seemed to be dependent on the trade to provide them with figures about how much timber was in the forest. You know, that clearly isn't acceptable."

He would like to see government foresters collect the data rather than company foresters, as well as a clearer division between government and the forest industry. Furthermore, he has doubts about the power of the provincial resource departments and the ability of forestry authorities to challenge companies on such issues as allowable cut levels.

Dr. Knight described as 'brilliant' the fact that Canada is setting up its own independent certification scheme. If Canada's products are independently certified, customers throughout the world will be certain that their Canadian purchases are from well-managed forests.

Ensuring that products are 'environmentally friendly' is a basic necessity in the United Kingdom's market. B&Q would like to be able to promote products that have originated from well-managed sources, but only if they have been independently certified. However, with more than 40 supplying countries, B&Q wants to see a universal label — a proliferation of certification systems, however good an individual scheme may be, is just not viable.

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AN INTERVIEW WITH

Dr. Manfred Kuehn

Director
German Pulp and Paper Association

At the invitation of the Canadian Pulp and Paper Association, a Director of the German Pulp and Paper Association, Dr. Manfred Kuehn, visited Canada in June 1993 to tour forest areas in Quebec and British Columbia, and to see a newsprint mill in Quebec and a pulp mill in Hinton, Alberta.

Before the visit, Dr. Kuehn had little knowledge of Canadian forestry practices. After, he said that he had been impressed by the size of Canada's forests and their regional differences, and by the knowledge and skills displayed by Canadian foresters. He feels that Canadian forestry practices are much better now than they were four or five years ago, and said that we have made considerable progress in terms of control and regulation, although perhaps not enough in the eyes of some European consumers.

Germany purchases much of its newsprint and chemical pulp from Canada. In 1992, for example, it purchased 140 000 tonnes of Canadian newsprint; by 1993, 65 000 tonnes were being imported. That reduction can be attributed partly to pricing and partly to Canadian export policy.

Germany's paper industry is the second largest importer of chemical pulp. In 1993, Canadian imports decreased by 18%, primarily because of the number of suppliers and the strong trend toward TCF (totally chlorine-free) bleached pulp, which is imported mainly from Sweden. Although the quality of Canadian pulp is good, the trend in Germany and in Europe in general is toward using TCF pulp, despite the fact that it costs 5 to 10% more.

GERMANY'S PULP SUPPLIERS	
Sweden	28%
Canada	20%
Finland	17%
USA	11%
Portugal & Spain	10%

In Germany, Greenpeace has been successful in attacking paper containing chlorine and is maintaining the pressure. The public, which is very knowledgeable about environmental issues, now refuses to buy papers and magazines produced from pulp that contains harmful chemicals. However, it is not necessarily prepared to pay more for cleaner publications. Consumers also favour paper products that have been manufactured from tree thinnings and sawmill waste. Recycling too is keenly practiced by the German public.

Europeans believe that thinning and replanting are the best ways of managing a forest because the visual and ecological impact is much less dramatic. Generally, Germans plant mixed species in many small areas of forest — a process referred to as "plantation forestry." Small-scale planting is considered much less noticeable and is more acceptable. On the other hand, the practice of large-scale clearcutting followed by natural regeneration and planting is considered unacceptable, as is planting very large areas with a single species. Unlike Canada, Europe and Scandinavia have extensive road systems that make it much easier to practice selective cutting and thinning. When necessary, clearcutting is practiced on a very small scale, usually in areas of less than 1 hectare.

When all factors are taken into consideration, Dr. Kuehn would put European and Scandinavian forestry practices at the top of a scale of one to five and would rank Canada at two. He said, however, that pressure from the Green movement is very tough, and even German forestry practices are criticized for insufficient species diversity, a factor that is now being addressed.

In Europe, the press and media are considered influential and effective information sources. Most of their information comes from environmentalists. According to Dr. Kuehn, the German public, which is well aware of the need for sound environmental practices, will respond to rational debate if good information is available. He warned, however, "... you cannot convince the real tough guys of the environment movement ... so you have to inform the public."

The accusations against Canadian forestry practices are recent, and he acknowledged there has not been enough time to provide much factual information to the German public. If such information were supplied on an on-going basis, outlining Canada's justification for its forestry practices, he feels the public would eventually listen. And if factual information were provided on the forests' benefits to communities and the nation as a whole, environmentalists would find it much more difficult to justify their criticisms of Canadian forestry practices.

There is a great deal of emotion involved in the debate on environmental issues. Tropical rainforests and Canada's virgin forests are the main areas targeted by the Green movement, which is fighting against clearcutting in general and the cutting of old-growth forests in particular. Dr. Kuehn believes that it may not be possible to justify cutting old-growth forests, especially on Vancouver Island.

Greenpeace, on the other hand, focuses on the high consumption of paper per capita. On the Continent, pulp and paper are now referred to as residual products produced from thinnings and sawmill waste. He suggested that the agencies responsible for providing information on Canada's forestry practices should emphasize that the primary need and use for timber is building materials, not pulp and paper.

Dr. Kuehn warned that Greenpeace is mounting a worldwide campaign in favour of sustainable forestry. Canada, he said, is one of the countries that will likely be selected for attack because of its practices of clearcutting and cutting old-growth forests.

4 CHAPTER FOUR

Many of the issues regarding Canada's forests relate to the search for a balance among the preservation of environmental quality, the generation of economic wealth, and the enhancement of social benefits. A comprehensive set of criteria and indicators are being developed to monitor the management of Canada's forests.

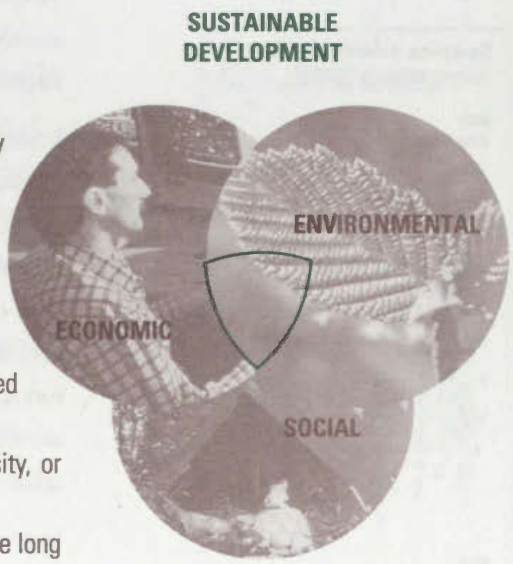
Environmental, Economic and Social Indicators

MEASURING OUR PROGRESS

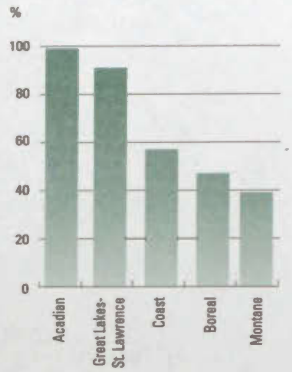
Two years ago, we set out to develop reference points or indicators to help track Canada's progress in achieving sustainable development. Preliminary indicators were presented in *The State of Canada's Forests 1991*.

The environmental, social and economic values measured by those indicators were based on the extensive consultations held to develop Canada's National Forest Strategy.

Sustainable forest development enables current needs to be satisfied without prejudice to the forests' future productivity, ecological diversity, or capacity for regeneration. For development to be truly sustainable in the long term, it must recognize and balance environmental, social and economic values. For example, development that is economically viable and socially acceptable, but does irreparable damage to the environment cannot be sustained. Similarly, development that is environmentally and socially acceptable, but not economically viable will also prove unsustainable over the long term.



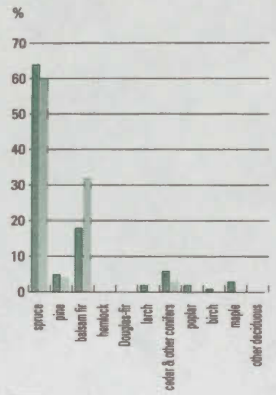
4.1.1
Access by forest region (1991)



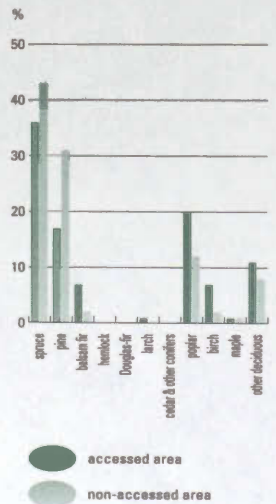
Source: Canadian Forest Service

Species distribution by forest region (1991)

4.1.2
Acadian



4.1.3
Boreal



Source: Canadian Forest Service

1 THE DIVERSITY OF CANADA'S FORESTS

"Has human intervention changed the diversity of Canada's forests?"

Canada is one of the few developed nations still richly endowed with large areas of natural forests. More than 200 000 species of animals, plants and microorganisms are dependent on our forests. Above the ground, Canada's northern forests are somewhat less diverse than tropical forests, but the soil of our forests is extremely diverse.

As discussed in Chapter 2, biodiversity is a complex, multi-faceted issue, and measuring changes in diversity is no easy task. Nevertheless, because biodiversity is essential to the resilience and long-term productive capacity of Canada's forest ecosystems, it is important to assess the impact of human activities on those ecosystems.

Under the National Forest Strategy, the Canadian Council of Forest Ministers is working to develop a national system of indicators to report on biodiversity. As an interim measure, earlier state of the forests reports compared major tree species in accessed and non-accessed forest areas. That comparison was based on the assumption that areas without access are indicative of what might be called the "natural state" of the forest, and areas with access (by road, railway line or major waterway) are representative of forests in which human activities have likely taken place.

Last year's report presented new data for the boreal forest. This year we are able to present the latest national inventory data for five major forest regions. For the purposes of this report, a forest is considered "accessed" if there is a road, railway line or in some cases, a river system within 10 km of the area.

Canada's eastern and southern forests are in the most heavily accessed regions. The graph on access *(graph 4.1.1)* shows that 99% of the Acadian forest and 91% of the Great Lakes-St. Lawrence forest are accessed. The Montane region, with 12 million hectares of forest, has a population of only 290 702 and is the least-accessed forest region.

The predominant tree species groups in Canada's five major forest regions are illustrated in the other bar charts. It would appear that tree species groups are not necessarily reduced in accessed forests. In many

regions there seems to be more diversity. In the Acadian forest region (*graph 4.1.2*), for example, there are more tree species groups in the accessed areas. More effective fire protection in accessed areas may explain the increased presence of shade-tolerant maples.

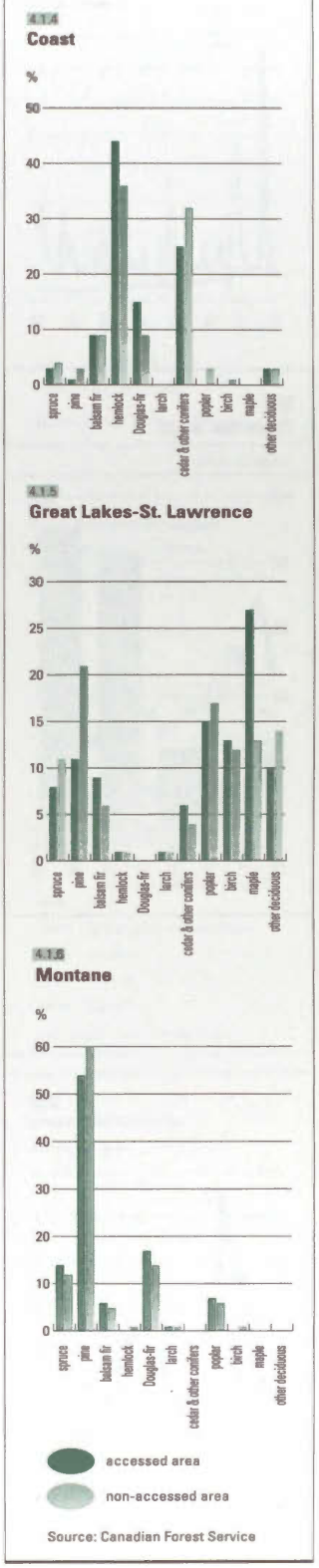
In the Boreal forest region (*graph 4.1.3*), the proportion of poplar, birch and balsam fir is higher in accessed areas, and the proportion of pine and spruce is lower. That change largely reflects the impact of harvesting, which only occurs in the accessed forest, compared to fire, which is the dominant type of disturbance in the non-accessed forest. Fire in a pine forest is usually followed by regrowth of pine trees, whereas harvesting results in greater frequency of poplar and birch. Geographic differences may also explain the lower proportion of spruce and the increase in balsam fir. The accessed forest is located primarily in the southern and eastern areas of the boreal forest, where stands of fir are more common.

In the Coast forest region (*graph 4.1.4*), poplar and birch are present in non-accessed areas; whereas less than 1% of accessed areas include those species. That difference may be attributable to the planting of softwoods in accessed areas following harvesting. Climax species such as cedar are more prominent in non-accessed coastal forests, whereas less shade-tolerant species such as Douglas-fir are more common in accessed areas. Western hemlock, although tolerant of shade, also regenerates successfully in full sunlight and is often the dominant species in areas previously clearcut.

In the Great Lakes-St. Lawrence forest region (*graph 4.1.5*), smaller amounts of pine are found in accessed forests, probably because commercially valuable white and red pine stands have been harvested for the past 100 years. Also, improved fire protection in accessed areas has reduced the size of forest fires and encouraged the growth of shade-tolerant species such as maple. In fact, maple has replaced pine as the dominant species group in the Great Lakes-St. Lawrence forest region.

Although some differences in species composition are evident, forests in accessed areas have maintained their diversity of tree species. Even areas that have been subjected to harvesting for extended periods, such as the Great Lakes-St. Lawrence forest region, have maintained their full range of tree species groups.

Species distribution by forest region (1991)



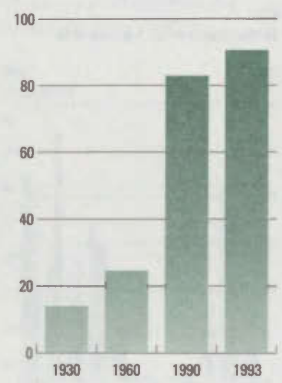
Source: Canadian Forest Service

2 THE PRESERVATION OF WILDERNESS AREAS

"Are representative areas of Canada's major ecoregions being preserved for future generations?"

Canadians value nature and wilderness and are committed to protecting areas of natural heritage. Federal and provincial governments have pledged to set aside 12% of the country's land base. The National Forest Strategy commits the federal, provincial and territorial governments to working toward completing a network of protected areas that are representative of Canada's forests by the year 2000.

4.2.1
Protected areas



Source: Statistics Canada

Over the past three decades, the protected area in Canada has almost quadrupled — from 25 million hectares in 1960, to the current figure of 90 million hectares *(graph 4.2.1)*. Protected areas now account for more than 9% of Canada's total land and freshwater, or approximately 12% of the world total. However, it is important to remember that not all protected areas are forested.

The Canadian Forest Service is currently working with Environment Canada and the provinces to determine the exact number, location and size of protected forested areas. We hope to present new statistics in next year's report. Based on the National Conservation Areas Database and the 1991 Canada Forest Inventory, there are an estimated 22.8 million hectares of land within the forested regions of Canada where, by law, no timber harvesting is permitted.

In addition, many of the forests found on shallow or rocky soil, on steep slopes, or along lakes and waterways are excluded from harvesting by provincial policy. The total area of "protection forests" within Canada's commercial forests is estimated to be 27.5 million hectares.

In summary, more than 50.3 million hectares of forest land in Canada (12%) are protected by either policy or legislation. In addition, it is unlikely that commercial harvesting will ever take place in Canada's open forests (156.6 million hectares), which are composed mainly of small trees and shrubs located primarily in northern Canada.

3 FUNCTIONING OF NATURAL ECOSYSTEMS

"To what extent are human activities changing the natural dynamics of Canada's forest lands?"

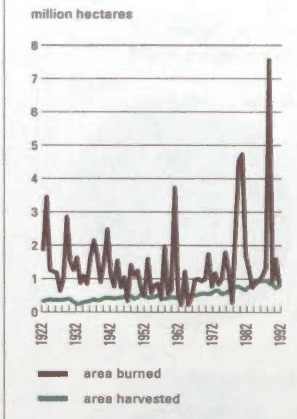
Wildfires and insect outbreaks are natural and often cyclical components of Canada's forest ecosystems. The 1992 state of the forests report indicated that over the past 10 years, fires and insects — not harvesting — were the dominant forms of disturbance in Canada's forests. However, there were significant regional variations. For example, insects and fire were the major disturbances in eastern Canada, whereas harvesting was the major disturbance in British Columbia's coastal forest. This year's report examines major forest-disturbance trends over the past seven decades. Significant deviations from natural cyclical patterns may indicate that changes are taking place in natural ecosystems.

The area burned each year varies greatly. The average area burned (*graph 4.3.1*) declined between 1922 and 1970, but increased in the 1980s to an average of 2.5 million hectares per year. More than 7.5 million hectares burned in 1989 alone. Possible explanations for that increase include higher than average temperatures, dry hot summers, and a change in fire management policy allowing more remote fires to burn. Since 1990, forest fires have burned between 1 million and 1.5 million hectares annually.

The area harvested by forest region (*graph 4.3.2*) has increased since 1922. However, there is much less variation in the annual rate of harvest than in natural disturbances. Overall, the annual area harvested in eastern Canada has been relatively constant. However, there has been a significant increase in harvested areas in western Canada (i.e., the western Boreal region and British Columbia Interior). It should be noted that the harvest statistics include "salvage logging" in areas damaged by insects or fire.

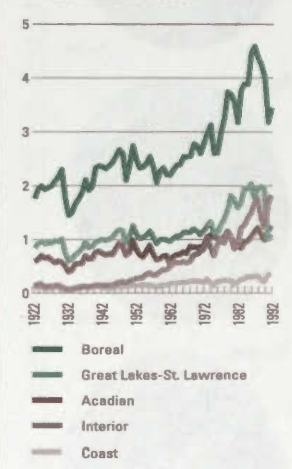
The predominant insect pests in Canada's forests are the spruce budworm, jack pine budworm, hemlock looper, mountain pine beetle, gypsy moth, and forest tent caterpillar. The population dynamics of those species varies, as does the extent and nature of their impact on forests. The insect defoliation graph (*graph 4.3.3*) shows the area defoliated by the species that are most widespread — spruce budworm and forest tent caterpillar.

4.3.1
Disturbances by fire & harvesting



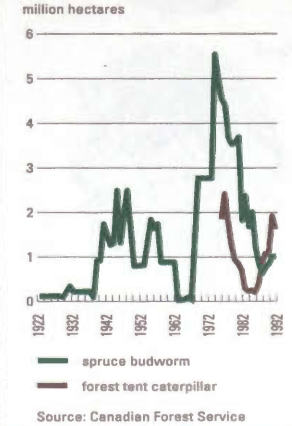
Source: Canadian Forest Service

4.3.2
Total harvest by region



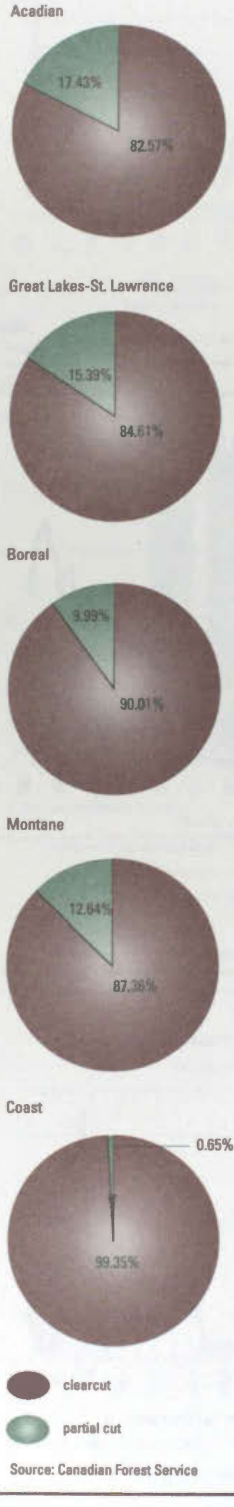
Source: Canadian Forest Service

4.3.3
Insect defoliation



Source: Canadian Forest Service

Harvest pattern by forest region (1991)



Source: Canadian Forest Service

Since 1922, two major outbreaks of spruce budworm have occurred — during the 1940s and 50s, and during the 1970s. Since 1975, national population levels of the pest have been declining. (However, in eastern Quebec and the Maritimes, the outbreak continued into the 1980s.) Spruce budworm has damaged many stands of balsam fir and spruce in eastern Canada. The insect larvae affect the growth of a tree by feeding on its foliage. Four or five consecutive years of severe defoliation can kill entire stands of trees.

The forest tent caterpillar is more common in the hardwood stands of the boreal forest. The caterpillar may defoliate trees a number of times during a growing season, but rarely causes tree mortality. Its population levels peaked in 1976 and again in 1991.

Natural disturbances are highly cyclical and regional. At the national level, fires and insects continue to be the dominant disturbances. However, harvesting has increased significantly in the western Boreal forest region and in the Interior of British Columbia. Over the long term, there do not appear to be significant deviations from the cyclical patterns of disturbances, albeit with some exceptions — the large number of forest fires that occurred in 1989.

4 ENVIRONMENTAL QUALITY

"What steps are Canadians taking in forest management to protect the environment?"

In previous state of the forests reports we presented data on the declining use of chemical pesticides in forest management and on the huge reduction of pollutants from pulp and paper mills. Current data on the declining levels of pulp effluent are presented on page 107. In this year's report, the environmental-quality indicator addresses the issue of the impact of harvesting practices on forests. Many people perceive the most common harvesting method — "clearcutting" or cutting large blocks of forests — as being damaging to Canada's forests.

Clearcutting remains the most common harvesting method in Canada *(graph 4.4.1)*, particularly to cut softwood trees to produce pulp. Selection cutting is used more commonly to obtain lumber and specialty wood. It is important to note that clearcutting can be done in a number of ways, such as cutting blocks of forests in multiple stages over an extended period of time; cutting long strips of forests; removing all of the trees from an area except for a small number of seed-bearing trees;

or leaving older trees standing to protect the new generation of trees, a technique known as "shelterwood cutting." In 1991, more than 90% of harvesting was done by clearcutting in the Boreal, Great Lakes-St. Lawrence and Coast forest regions; it was also used 87% of the time in the Montane forest region, and 82% in the Acadian forest region. The size of the clearcuts varies widely, from approximately 15 hectares to 250 hectares. (The Canadian Pulp and Paper Association estimates that the average size of clearcuts in Canada is 61 hectares.)

Long-term studies in hydrology have shown that the changes in water quality and quantity associated with clearcut harvesting are usually short-lived. Water quality returns to pre-harvest levels within 2 to 5 years, and water flows and patterns return within 5 to 15 years. Changes in water quality may also occur in adjacent waterways if they are affected by sediment from surface runoff, leached nutrients, or changes in water temperature.

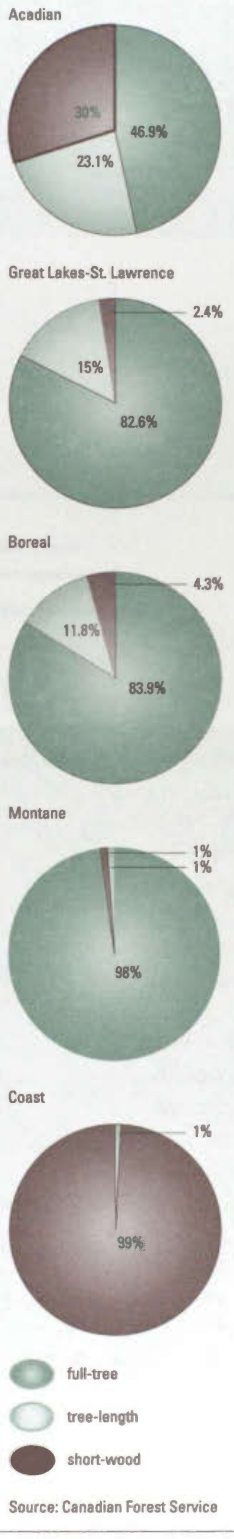
Generally, provincial regulations require that strips of forest be left as buffer zones along streams and lakes. In areas with buffer zones, the water temperatures and quality show few changes. In the absence of those protection forests, water temperatures often rise after clearcutting, and water levels fluctuate, leading to changes in aquatic habitats.

Moderate-to-large clearcuts may modify site conditions to a greater extent than partial-cut systems (a method by which only a portion of the stand is harvested). The changes vary with the site conditions and may include soil compaction, erosion, stream turbidity, changes to water levels, and less-moderated soil temperatures. Changes may also occur in the stream beds within the harvested area.

Different harvesting systems (*graph 4.4.2*) result in the removal of varying amounts of site nutrients in the tree trunks, branches and leaves. Full-tree harvesting, which entails the removal of the trunk and branches from a site, has the greatest impact on the harvested area. Tree-length and short-wood harvesting systems (the trunk is removed, and the tree top and branches are left to decompose on the forest site) remove the fewest nutrients. Past studies have shown that on most sites, harvesting cycles are long enough (ranging from 60 to 120 years, or more) for the site's nutrient reserves to be restored between harvests.

Currently, more than half of the harvesting in Canada is done with full-tree systems; tree-length systems are used less than 20% of the time. Short-wood systems (usually 2.44-m lengths) are common in the Acadian

4.4.2
Harvest system by forest region (1991)



Source: Canadian Forest Service

forest region (30%), but less common in the Boreal (4.3%) and Great Lakes-St. Lawrence (2.4%) forest regions.

Soil compaction caused by harvesting equipment may restrict or redirect the movement and supply of air and water within the soil, particularly on steep slopes, wet sites, and very dry, sandy soils. Steps are being taken to minimize the damage to the forests' protective ground cover. For example, harvesting machinery with wide and flexible tires minimizes ground damage by "floating" on the surface of the soil. On wetter sites, harvesting is done during the winter, when the ground is frozen.

CARBON INVENTORY

	billion tonnes
Forest biomass	12.0
Forest soils	76.4
Forest products	0.6
Total forest sector	**89.0**
Peatlands	135.0
Total accumulation	**224.0**

Source: Canadian Forest Service

5 GLOBAL ECOSYSTEMS

"What contribution do Canada's forests make to the global environment?"

Over the past decade, many scientists have been trying to develop better ways to predict and monitor the response of forests to global warming and to understand the essential role of forests in climate change.

Carbon dioxide, methane, nitrous oxide and CFCs (chlorofluorocarbons) are some of the greenhouse gases building up in the atmosphere. Scientists believe that because those gases trap heat, changes in their concentrations in the atmosphere are a primary cause of climate change.

Forests remove carbon dioxide from the atmosphere as they grow. Later they release that stored carbon through such natural processes as wildfire or decay, or through forestry activities such as harvesting or the burning of slash. Therefore, forests can play an important role in the context of global warming and climate change.

As part of the global carbon balance, forests represent a huge store of carbon. Currently, the amount of carbon stored in Canada's forests is estimated at 224 billion tonnes. That contribution is being enhanced through reforestation programs, improved fire-suppression techniques, reduced slashburning, increased recycling of forest products, and the use of silvicultural practices that improve forest growth.

Over the past 15 years, the forest sector has turned increasingly to bioenergy. Between 1984 and 1991, for example, the use of biomass fuels by the forest sector — excluding energy from electricity — increased from 63% to 74%. During that period, fossil fuel consumption declined from 4.8 to 3.7 tonnes, and the use of biomass fuels increased from 8.2 to 10.5 tonnes.

CARBON BUDGET (1986)

	million tonnes
RELEASE	
Forest biomass	119.9
Forest soils	15.2
Forest products	23.1
Fossil-fuel energy use[a]	4.8
Total release	**163.0**
ACCUMULATION	
Forest biomass	92.0
Forest soils	72.7
Forest products	44.2
Peatlands	26.2
Total accumulation	**235.1**
NET SINK	**72.1**

[a] Does not include energy derived from bioenergy (biomass).

Source: Canadian Forest Service

6 SUSTAINABLE ECONOMIC BENEFIT

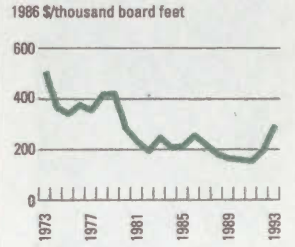
"Are Canada's forests being managed to sustain the long-term economic needs of Canadians?"

Canadians want to ensure that their forests will meet the needs of current and future generations. In previous reports, we assessed the allowable annual cut levels and the harvest levels as a means of determining the forests' ability to generate and sustain long-term wealth from timber-based forest industries. *(See pages 92 - 99 and page 101 for current AAC figures.)*

The scarcity of some of our natural resources, whether perceived or real, has become a subject of public discussion. When wildlife species become endangered, or there are local shortages of timber, questions arise about the adequacy of the resource and its management.

Because our forests provide diverse benefits, identifying which values or components are scarce can present a challenge. From an economic perspective, scarcity is indicated by increasing prices. In the case of forest products, the real price of lumber, less inflation *(graph 4.6.1)*, has been constant over time and may even be decreasing. Recent increases in lumber prices are a result of reduced harvest levels in the USA, the economic recovery, and the increased demands for lumber that followed recent natural disasters in the USA. The increased prices do not necessarily signal a change in long-term trends; in fact, after adjusting for inflation, lumber prices are now lower than they were in the early 1970s. Prices suggest that, currently, there is no economic scarcity of forest products, nor is there a scarcity of the forest resources required to make those products.

4.6.1
Lumber price
(Western spruce-pine-fir)

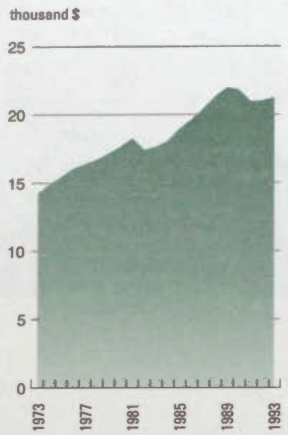


Sources: Random Lengths/
Statistics Canada/
Canadian Forest Service

That conclusion is contrary to popular belief and may be explained by two factors — technology, and the sustained-yield policies used in resource management. Technological innovation has resulted in reduced costs and the more complete use of each log. Furthermore, producers are now able to extract more products from each hectare of forest harvested. The sustained-yield policies of provincial forest management agencies, aimed at maintaining an even flow of forest products over time, has encouraged the managed development of forests.

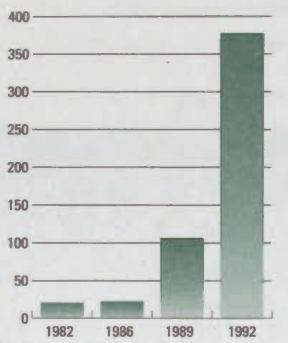
Most non-timber benefits, such as recreation and wilderness, are not bought and sold, so it is more useful to examine the availability of non-timber benefits rather than the price. Because the area of forests set aside as parks and wilderness has increased over time, as have

4.6.2
Per capita GDP (1986 $)



Source: Canadian Forest Service

4.6.3
Environmental-group memberships



Sources: Canadian Almanac Directory/ Directory of Associations in Canada

recreational activities such as hiking, hunting and bird-watching, any scarcity must be the result of increased demand. In other words, forests are not becoming less abundant; rather, there is an increased demand for the non-timber benefits they provide.

As the affluence of society increases, there tends to be a rise in the demand for non-timber benefits, which leads to the perception of a scarcity of non-timber resources (e.g., insufficient opportunities for wilderness experiences or a lack of wildlife habitat). That perceived scarcity is a concern frequently expressed by the public, and is leading to changes in how decisions are made about land use and forest management.

National indicators such as the Gross Domestic Product (GDP) provide a measure of national income *(graph 4.6.2)*; measuring the increased demand for non-timber benefits is more difficult. However, there are indirect indicators of demand, such as the number of memberships in environmental organizations *(graph 4.6.3)*, and the increase in protected areas *(graph 4.2.1, page 64)*. In both cases, a sharply increasing trend suggests that the non-timber aspects of forests are increasing in value.

7 COMPETITIVENESS OF CANADA'S FOREST PRODUCTS SECTOR

"Can Canada's forest industries continue to compete in the global marketplace?"

According to recent estimates, Canada's forest industries lost $1.4 billion in 1992. That followed a loss of $2.5 billion in 1991. Moreover, in terms of return on assets between 1990 and 1993, Canada ranked last of the seven countries with firms in the world's 50 largest public forest products companies. Given our reliance on trade, the ability of Canada's forest industries to continue to compete in global markets is important to our prosperity.

In previous reports we provided various indices of competitiveness, such as productivity levels and production costs. In this year's report, the stock market's performance provides a useful indication of the expectations of investors with respect to the forest sector's ability to remain profitable. Trends in forest products exports also help illustrate Canada's competitiveness.

The first graph *(graph 4.7.1)* shows the performance of the paper and forest products sub-index compared to the overall performance of the Toronto Stock Exchange (TSE 300). Between 1990 and 1992, forest industry stocks were generally on par with the general stock exchange index, and in 1993, the forest sub-index even outperformed the general index. In summary, although the overall profitability of Canada's forest industries has been eroded in recent years, the investment community appears confident that our industries will return to profitability in the near future and will continue to be competitive in the global marketplace.

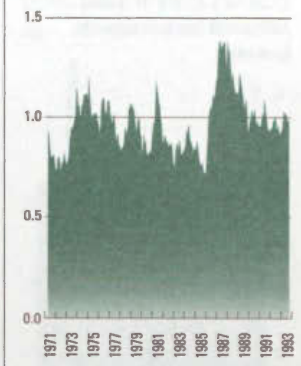
Market share trends provide an additional indication of the international competitiveness of forest products producers over time. Between 1971 and 1991, Canada's share of world trade in pulp (*graph 4.7.2*) remained relatively constant. Our traditional advantages, such as low fibre and energy costs and a high-quality product, have helped Canada's pulp producers maintain their access to foreign markets. The pulp produced from Canada's softwood trees has a high level of brightness and is among the strongest in the world, with long and strong fibres manufactured from northern coniferous forests. However, that traditional advantage may disappear as technological advances continue, and as performance characteristics improve for the pulp made from faster-growing hardwood species.

The situation with respect to newsprint (*graph 4.7.3*) is decidedly different. Canada is the main supplier of newsprint to the world market. However, our share of world trade has declined from almost 70% in the early 1970s, to slightly more than 55% in the early 1990s.

Compared to the mills of many of our foreign competitors, some of Canada's newsprint mills are older, smaller and less productive, and require more fibre input. However, our newsprint industry has been undergoing significant restructuring. Since 1989, 33 small newsprint machines were shut down, and 8 larger modern machines with the combined capacity of the smaller machines were brought into production.

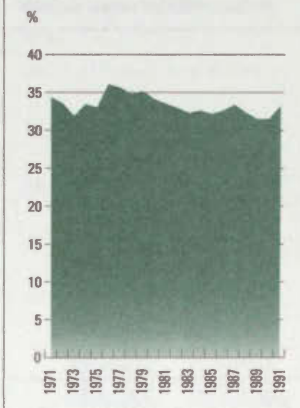
The recycling requirements for newsprint in many U.S. states pose an additional competitive challenge to Canadian exporters. The competitiveness of mills producing recycled-content newsprint depends mainly on their proximity to the supply of old newspapers and their

4.7.1
Paper & forest products sub-index
relative strength to TSE 300



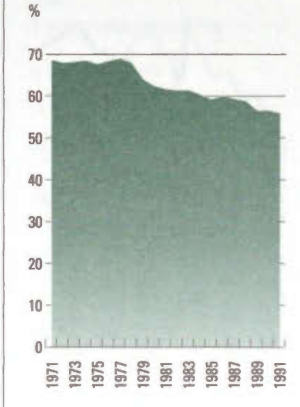
Sources: Toronto Stock Exchange/ Canadian Forest Service

4.7.2
Canada's share of world pulp exports (volume)



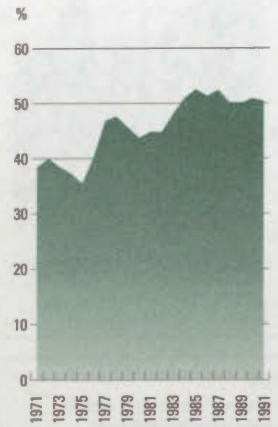
Source: Food & Agriculture Organization

4.7.3
Canada's share of world newsprint exports (volume)



Source: Food & Agriculture Organization

4.7.4
Canada's share of world softwood lumber exports (volume)



Source: Food & Agriculture Organization

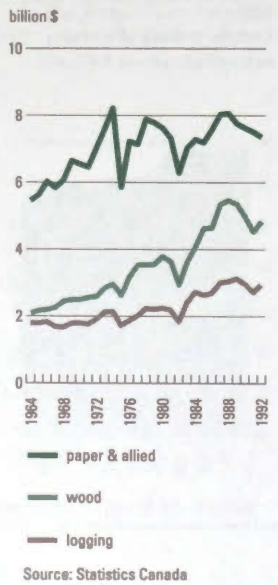
ability to obtain that wastepaper at a reasonable cost. In spite of being far from the sources of wastepaper, a number of de-inking facilities have begun production in Canada.

Canadian producers of softwood lumber (*graph 4.7.4*) were very successful in accessing foreign markets during the '70s and '80s. Canada's share of world trade in softwood lumber increased from approximately 37% in 1971, to roughly 50% in 1991.

That upward trend can be attributed to the increased exports of spruce-pine-fir (SPF) dimension lumber to the U.S. market. Its unique characteristics make SPF a preferred product for light framing in home construction. A number of western Canadian mills are now tooled specifically to produce softwood lumber in dimensions suitable for Japanese builders, and as a result, Canadian exports to Japan have increased. In addition, the technologies developed in the late '70s that enabled mills to use smaller logs have provided a significant boost to the efficiency and productivity of some Canadian mills. The depreciation of the Canadian dollar relative to the U.S. dollar between 1976 and 1986, and again in the 1990s, provided a further advantage to Canadian producers.

Despite some financial losses in recent years, investor confidence in the forest sector remains high, and Canada continues to be a major supplier of quality forest products around the world.

4.8.1
GDP contribution by industry (1986 $)



Source: Statistics Canada

8 CONTRIBUTION TO THE CANADIAN ECONOMY

"Is Canada's forest industry contributing significantly to the development of the Canadian economy?"

To sustainably develop its forest resources, Canada will need to carefully balance the economic, environmental and social benefits they provide. Forests contribute to our economy in a number of ways. For example, according to a recent survey by the Canadian Wildlife Service, Canadians devoted 1.3 billion days and spent $5.6 billion on wildlife-related activities in 1991.

This year's indicator focuses on the contribution of forest industries to Canada's Gross Domestic Product (GDP) and measures the opportunities for Canadians to benefit from industry profits.

GDP is a measure of national income. It shows the amount paid to Canadians in term of salaries and wages, profits and taxes. Generally,

the GDP contribution of a particular industry can be measured by calculating the amount of value it adds to the goods or services it produces (known as "value added").

The forest sector's contribution to GDP, though erratic, has increased each year since 1961. The highest contribution is made by the paper and allied industries, although the most significant increase in contribution can be attributed to the wood industries, whose rate more than tripled between 1964 and 1992 *(graph 4.8.1)*.

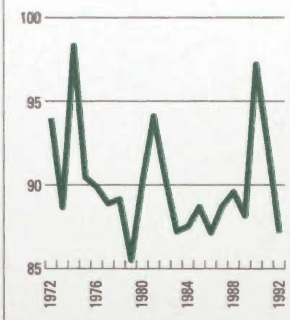
In spite of its increased contribution to GDP, the forest sector's contribution to the nation's economy has declined, from 4.4% of GDP in 1970, to approximately 3.1% in 1992. That trend reflects the significant diversification of our economy, particularly in the service sector.

This indicator highlights the total GDP contribution of the logging, wood, and paper and allied industries between 1972 and 1992 per cubic metre harvested *(graph 4.8.2)*. The lack of a clear trend suggests that when the sector is viewed as a whole, there was little increase in the amount of value added per unit harvested. There were, however, significant changes in the product mix. The proportion of higher value-added newsprint declined, while the proportion of lower value-added lumber products increased. Those trends were offset by a significant increase in the proportion of fine papers and specialty groundwoods.

The potential to increase the contribution of and benefits from forest industries is not necessarily limited to an increased production of value-added products in the secondary manufacturing sector. The second graph on this page *(graph 4.8.3)* shows the difference in the value of lumber exports to Japan versus the value of exports to the USA. Lumber destined for the Japanese market is produced from the highest-quality logs and is milled, dried and wrapped to a very select set of specifications. The result is a higher value-added product. Shipments to the Japanese market have increased significantly, from 3.7 % of the total value of Canadian softwood lumber exports in 1972, to 20.8 % in 1992.

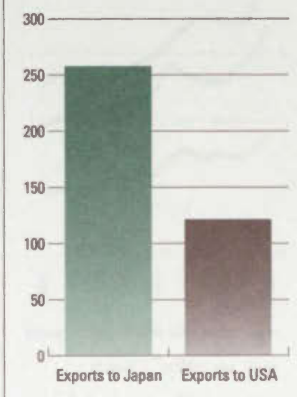
An added dimension to this indicator is the extent to which economic benefits from the forest sector are distributed to individual Canadians. The last graph *(graph 4.8.4)* shows the trend in the percentage of shares available to the public for firms included in the TSE's paper and forest products sub-index. The significant percentage increase between 1988 and 1993 means that the opportunities for individual Canadians to earn investment income from the forest sector have increased in recent years.

4.8.2
Forest sector's contribution to GDP (1986 $)



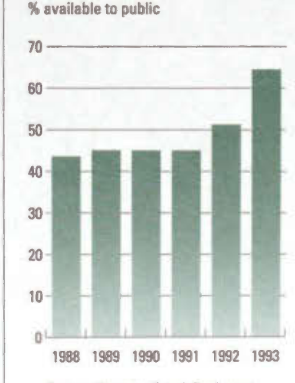
Source: Statistics Canada

4.8.3
Average value of softwood lumber exports (1990-1992)



Source: Statistics Canada

4.8.4
Forest industry stocks



Source: Toronto Stock Exchange

9 EMPLOYMENT IN CANADA'S FOREST INDUSTRIES

"Will the forest sector continue to provide quality employment?"

One in every 16 Canadians depends on the forest sector for employment. In 1993, the logging and forest services industries employed 61 000 people; the wood industries, 132 000; and the pulp and allied industries, 118 000. Together, they accounted for 311 000 direct jobs. The 7.6% increase over 1992 employment levels is attributed mainly to the increased U.S. demand for Canadian lumber products.

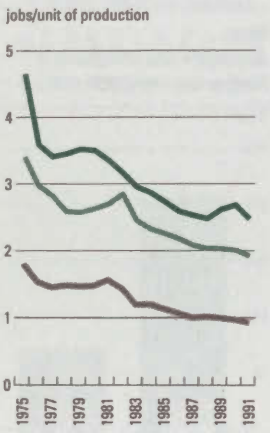
There are four main features of Canada's forest industries that have affected or are likely to affect employment opportunities: Canada's forest sector is export oriented; our commodity products are less valued than our manufactured goods; workers in Canada are paid more than those employed by the new competitors entering the global marketplace; and some local shortages of timber exist in Canada.

Those four factors have influenced industry restructuring and new technologies, which in turn have resulted in changes in the production process and the replacement of low-skilled jobs with higher-skilled jobs. For example, sawmill automation and computerization, and the manufacturing of more engineered and composite-wood products demand fewer, but more highly skilled personnel.

Through the 1980s, the number of forestry jobs created per unit of output declined significantly (*graph 4.9.1*). That trend was evident in all forest industries: mechanized harvesting systems became more predominant in the logging industry; in the wood products industries, high-speed, high-recovery computerized log-breakdown systems replaced older, more labour-intensive technologies; and small, old and less-efficient machines were replaced in the pulp and paper industry by large, fast and highly mechanized processing systems.

The forest sector continues to provide a significant number of jobs in Canada; however, rationalization, restructuring and changes in equipment and technology are resulting in the hiring of fewer and more highly skilled workers. That trend is evident in British Columbia, where rationalization and restructuring in the wood products industries will mean a significant shift in the number and skill level of forest workers. A recent study of the human resources of British Columbia's wood products industries indicates that, although the province enjoys a highly

4.9.1
Effect of new technologies on employment



Sources: Canadian Pulp & Paper Association/Canadian Forest Service/ Statistics Canada

skilled workforce, workers are now being asked to perform more than one task. Therefore the workforce will need to develop new skills, such as problem solving, team participation, and communication.

10 COMMUNITY STABILITY

"Will the forest sector continue to contribute to community stability?"

Forests have played a significant role in the development of rural communities throughout Canada. Less-diversified communities are more vulnerable to seasonal and cyclical changes in forest industry production, and the societal impacts of structural changes in the forest sector will be more severe in those communities. In many cases, other economic opportunities are limited.

The community stability indicator provided this year is based on the recently completed 1991 Canada census. Communities with a significant forest manufacturing component were identified by determining the percentage of the communities' total base income derived from the forest industry. (Total base income includes all of the income considered necessary for economic survival that was earned from the export of goods and services from the local economy.) Table 4.10.1 shows the number of forest-based communities, as well as the percentage of the population in each forest region that resides within forest-based communities. The Montane and Subalpine/Columbia forest regions have

4.10.1 FOREST-INDUSTRY DEPENDENCE IN CANADIAN COMMUNITIES BY FOREST REGION

Forest region	Total population	Slight or no reliance[1]	Moderate reliance[2]		Heavy reliance[3]	
		Population	Population	# of communities	Population	# of communities
Coast	2 487 455	36%	52%	53	12%	35
Montane	290 702	9%	30%	22	61%	28
Subalpine/Columbia	86 009	39%	10%	4	51%	6
Boreal west	3 170 975	86%	11%	91	3%	12
Boreal east	1 116 072	59%	30%	169	11%	58
Great Lakes-St. Lawrence	10 252 541	78%	20%	599	2%	136
Acadian	1 673 453	66%	30%	130	4%	34
Total	**19 077 207**			**1 068**		**309**

1 Includes all small communities (less than 250 residents) and communities where the forest industry accounts for less than 10% of the communities' base income.

2 Moderately dependent communities are those where between 10 and 50% of the communities' base income is derived from the forest sector.

3 Heavily forest-based communities are those where more than 50% of the base income is from the forest sector.

Source: Canadian Forest Service

the highest percentage of total population in communities that are heavily reliant on the forest industry. Ninety-one percent of the population in the Montane forest region resides in communities where at least 10% of the base income is tied to the forest sector.

The forest sector is also important in the Boreal west forest region, although the communities are dominated by agriculture in Manitoba and Saskatchewan, and by the oil and gas sector in Alberta. Forest industries, however, have an important stabilizing effect in those regions by diversifying the rural communities.

The heavily populated Great Lakes-St. Lawrence forest region has the largest number of communities with a significant forest base. Forest industries account for at least 50% of the base income in 136 of the region's communities.

11 ACCESS TO NATURE

"What role do forests play in satisfying the recreational needs of Canadians?"

Although the majority of Canadians now reside in major urban centres, the level of participation in forest-based activities is growing. Last year's state of the forests report described the interest in such activities as park visits and hunting. This year the report attempts to assess the opportunities for residents in Canada's major centres to access forests for nature, wilderness or recreation.

This indicator measures the opportunity for outdoor recreation within forested parks by showing the amount of forested parkland within municipal boundaries, as well as the availability of provincial and national parks within a two-hour drive of urban areas. Although Canadians also enjoy forests outside parks, it is not possible at this time to assess the opportunity or frequency of such activities.

Table 4.11.1 describes the number of parks across Canada and the total area of forested parks in 12 major urban centres. A "forested park" is one in which trees cover all or part of the park area. Municipal parks with scattered tree cover are not included.

Toronto leads the country in forested parks, with 493 such areas. Ottawa-Hull has the largest total area of parkland, with more than 21 000 hectares of forested parks. All but three of the urban areas (Halifax, Montreal and Quebec) have public or privately owned campgrounds within their boundaries.

"A Change of Heart" (a community organization that promotes heart health) developed a walking guide for the borough of East York in Metro Toronto.

The City of Calgary obtained support from industry to produce "Greening of Calgary," a magazine that includes a map of the city's forest lands, and describes its natural areas and recreational pathways.

4.11.1 URBAN ACCESS TO FORESTS

Urban centre (East → West)	Population	Forested parks[1]	
		Number	Hectares
St. John's	95 770	1	1 740
Saint John	74 969	3	930
Halifax	114 455	10	240
Quebec	167 517	137	278
Montreal	1 566 419	40	1 325
Ottawa-Hull	804 717	132	21 243
Toronto	2 275 771	493	4 181
Winnipeg	616 790	3	356
Saskatoon	186 058	9	77
Calgary	710 677	30	1 600
Edmonton	616 741	9	2 000
Vancouver	1 505 686	275	3 361
Total	**8 735 570**	**1 142**	**37 331**

[1] Urban forests that are not designated as parkland, and parks and outdoor recreation areas that have scattered trees but no continuous forest cover may not be included in the statistics.

Source: Canadian Forest Service

Table 4.11.2 shows the number and area of forested provincial and national parks. Parks in the non-forested grasslands region of southern Alberta, Saskatchewan and Manitoba are not included. The table includes all forested park areas, regardless of whether they contain campsites.

Within a 200-km radius of Canada's cities, Toronto has the largest number of national and provincial parks, with 358. However, with more than 2.2 million hectares of parks, Quebec City has the largest area of parkland. Calgary has the largest number of campsites (590 794). Its parks are located on the eastern slopes of the Rocky Mountains and attract tourists from around the world.

Central Canada has the highest number of parks, as well as a fairly large area of parkland, but has a relatively small number of campsites to serve the region's large population. The nation's two major urban centres, Toronto and Montreal, have few campsite facilities. Cities within non-forested areas appear to offer less opportunities for overnight camping in forested areas. That applies in particular to Saskatoon and, to a lesser extent, to Winnipeg.

The City of Saint John enlists the help of Boy Scout troops on a park clean-up day.

The City of Ottawa has a community partnership program to encourage tree planting in its parks, and has a volunteer advisory committee that provides input to the municipality on urban forest management.

4.11.2 CAMPSITES AND NATIONAL AND PROVINCIAL PARKS (200-km radius)

Urban centre (East → West)	Parks		Number of campsites
	Number	Hectares	
St. John's	43	450 621	41 222
Saint John	132	436 283	217 582
Halifax	163	250 199	234 335
Quebec	57	2 205 694	69 240
Montreal	134	1 402 039	69 943
Ottawa-Hull	228	737 588	26 554
Toronto	358	97 694	42 973
Winnipeg	61	851 264	2 919
Saskatoon	79	38 705	1 127
Calgary	89	1 238 155	590 794
Edmonton	142	87 044	167 779
Vancouver	224	709 403	45 772
Total	**1 710**	**8 504 689**	**1 510 240**

Source: Canadian Forest Service

12 PUBLIC INVOLVEMENT IN DECISION MAKING

"Does the public have the opportunity to influence how Canada's forests are managed?"

Last year's state of the forests report provided some general descriptions of public-input processes, ranging from local forest operational plans, to provincial forestry policies, and national strategies. This year we will focus on how those processes have been tailored to specific circumstances. The example we have selected deals with the public consultation in British Columbia leading to the province's decision on a land-use plan for the Clayoquot Sound area.

Clayoquot Sound

The Clayoquot Sound area is located approximately 200 km northwest of Victoria, British Columbia, on the west coast of Vancouver Island. It measures 350 000 hectares and encompasses Clayoquot Sound, a number of watersheds that drain into the Sound, portions of Strathcona Park, and the Pacific Rim National Park.

In the late 1980s, the provincial government embarked on an effort to reach public consensus regarding the controversial issue of land use in the Clayoquot Sound area. The Clayoquot Sound Sustainable

Development Task Force included stakeholders from the local forest industry and its employees, the local community, environmentalists, the Nuu-chah-nulth Tribal Council (which has a land claim on the area), and representatives of the tourism, fishing and mining sectors. After more than a year of discussions without reaching a consensus, the task force was disbanded.

In 1991, the government formed the Clayoquot Sound Sustainable Development Steering Committee, which included representatives of all of the principal stakeholders. The committee was asked to develop a consensus and make recommendations to the government on land use, resource management, and sustainable economic development.

An interagency team was set up to determine where harvesting would occur in the short term. Their decision was not supported by environmental interest groups, who withdrew from the steering committee in May 1991.

The steering committee released an initial draft strategy for public discussion in January 1992, and a second draft in August of the same year. Members agreed on the principles of sustainable development, but major disagreements remained concerning logging practices and land use in several pristine watersheds. Unable to reach a consensus on key issues, the committee disbanded in October 1992.

The chair of the committee, however, prepared a report for the government that described the respective points of view of labour, industry and the local communities, but could not fully reflect the positions of environmentalists or the Nuu-chah-nulth Tribal Council. The provincial government then heard representations from several interest groups before considering a range of land-use options.

The subsequent decision, announced in April 1993, permanently protects 33% (87 600 hectares) of the Sound and dedicates approximately 45% to resource use, including logging. Special management zones (covering roughly 17% of the area) were created where some logging is allowed, but the management emphasis is on wildlife, recreation and scenic landscapes. The stringent harvesting standards currently in place are being evaluated by an independent 19-member scientific panel, which includes representatives of the Nuu-chah-nulth Tribal Council, as well as scientists from the province of British Columbia and the state of Washington. The panel's final recommendations on forest management practices in the integrated resource-management

On March 19, 1994, British Columbia and the Nuu-chah-nulth First Nations reached an Interim Measures Agreement on land use and resource management in the Clayoquot Sound area that provides for joint management of resources and special access to economic development opportunities.

areas are due in June 1994. A major monitoring program has been established to ensure compliance with the new standards.

As evidenced in the summer of 1993 by the widely publicized protests over logging in Clayoquot Sound, significant disagreement remains regarding the land-use decision. Although it has not yet been successful in completely resolving the conflict, the process developed by the province did provide large sectors of the public with more information, as well as an opportunity to voice their concerns. The process also contributed to the government's understanding of the public's values.

13 THE INFLUENCE OF CANADA'S FORESTS ON CANADIAN CULTURE

"Have forests influenced Canadian culture?"

Canada is a large, diverse, sparsely populated land with people from various origins and traditions. Overriding our differences is a unique Canadian identity that can be linked to our relationship with the natural environment. Looking at forests through the eyes of artists can provide us with some perspective of our natural heritage, and a better understanding of the value that society places on the various dimensions of the forests.

This indicator focuses on landscape art, and describes how trees and forests have been and are portrayed in Canadian art. Three distinct periods of Canadian art history are reviewed: pre-1910, early 20th century, and contemporary.

A well-known Canadian journalist, Robert Fulford, recently asserted, "The landscape and the forest are at the centre of not only our culture, but also our self-image."

Before 1910, a Canadian art movement inspired by the Canadian environment was not thought possible. The earliest European artists refused to paint the forest landscape because forests in Canada seemed so monotonous compared with the cultured forest landscapes in Europe. Even after settling in the New World, Canadian art authorities continued to believe that our rough landscape was not art material. For years it had been said that pine trees were unpaintable, and that our hinterlands were too ugly unless painted to look like Europe.

To the early explorers and agrarian-minded immigrants of that period, the forest symbolized a dark, mysterious, dangerous and unfriendly place. Because of the difficulties it created in daily life, immigrants viewed the forest as an enemy — serious efforts were made through cutting, burning and clearing to rid the landscape of the seemingly inexhaustible forests.

Given the unattractiveness of Canadian forest landscapes to the European eye, virtually all paintings before 1910 were Old World in both technique and subject matter. Painters of that tradition in its truest sense include Thomas Davies, James Peachey and George Heriot. For example, Thomas Davies' *A View of the River Lapuce near Quebec* depicted the forests of Canada as Rousseau would have painted a European landscape.

The next major period — after 1910 — included works by Emily Carr, Tom Thomson and painters in the Group of Seven. They actively sought to change immigrants' perceptions of the forests in Canada.

Led by the Group of Seven, a cult of "Canadianism" was developed, symbolized by the Precambrian northern shield. J.M. Millman, an art critic, summed up the work of the Group of Seven as being the essence of Canada and the genuine achievement of a Canadian spirit of painting. A.Y. Jackson, a Group member, attributes Tom Thomson with being the guide and interpreter of the north country. On the west coast, Emily Carr was busy using forest symbols to raise the profile of Aboriginal culture, to protest against logging practices, and finally, to convey the renewal of spirit and mind by painting scenes of forest regeneration.

Those artists developed a symbol of Canada's nationhood — the northern forested landscape that made Canada unique. That symbol represented the Canadian identity and illustrated the bond we share with our northern neighbours around the globe.

Augustus Bridle perhaps best described the excitement with which art critics greeted the new, uniquely Canadian art:

A joy, oh Augustus, which too few of your countrymen know! The north is here — its incomparable sunlight; its whiffs of balsam, pine and spruce; frost-touched corners of the forest; the splash of tumbling rapids and cub waterfalls. The land is beginning to talk. Something is being born. The tang of the north is colouring souls as it colours the leaves in autumn.

A View of the River Lapuce near Quebec
by Thomas Davies

The forest was perceived as a place of refuge, joy, spiritual reflection and renewal — a place to sustain and enrich the quality of life. *The Pool* by Tom Thomson invites the viewer into the interior of the forest to experience joy, renewal and enrichment.

Interestingly, that new perception paralleled in a temporal sense the early conservation efforts in Canada, such as the creation of national parks, the appointment of the Commission on Conservation, the establishment of university forestry schools, and the passing of provincial forest-conservation legislation.

The Pool
BY TOM THOMSON

In the 1930s, the forests of Canada had important cultural dimensions. The same is true today. The "environmental movement" has used landscape art as an instrument for social and cultural change. Artists such as Robert Bateman, Jack Shadbolt and Toni Onley have heightened our awareness of the forest environment. Arthur Lindmer from Manitoba invites viewers to examine bark, lichen, mold and foliage, forcing them to take a fresh look at the forest world at their feet.

Today the forest symbolizes a healthy environment, a place for worship, wonder and mystery, a refuge, and a source of wisdom. Through symbolism, artists are further developing the cultural themes of the previous period, emphasizing the intimate connection between humans and forests. Arthur Lindmer's *Deep in the Woods* illustrates the intricacies of nature, the process of dying and renewal, and the mystery and wonder of nature's workings.

The shift in landscape art that has occurred in the modern period is consistent with the basic shift in values that now attributes significantly more importance to forest ecosystems. That shift is most pronounced with respect to cultural values.

Deep in the Woods
BY ARTHUR LINDMER

14 ABORIGINAL PEOPLES' INVOLVEMENT IN THE FOREST

"Do Aboriginal peoples have opportunities to participate in forest-management activities in Canada?"

Indian reserves comprise some 3.25 million hectares of land in Canada, including nearly 1.5 million hectares of commercial forest land. By the end of 1992, nearly half the forested areas on reserves — some 757 000 hectares — had received at least one of the following treatments under the Forest Resource Development Agreements: site preparation, reforestation or stand tending. Nearly 20 million seedlings had been planted. Forest inventories and management plans were also enhanced.

Aboriginal peoples have historically depended on forests for fuel, building and crafts materials, berries, wild rice, mushrooms, and medicinal plants, as well as for the wildlife used for food, skins and fur.

Two Aboriginal communities hold major forest tenures. Tanizul Timber Ltd., owned by the Tl'azt'en Nation in the Fort St. James area of British Columbia, operates a 51 500-hectare tree-farm license that incorporates 2 500 hectares of its Indian reserve. The Meadow Lake Tribal Council and employees of the Meadow Lake sawmill are equal majority shareholders in a firm that holds a large forest-management license agreement in Saskatchewan. The firm supplies softwood to the Meadow Lake sawmill and hardwood to Miller Western Pulp Mill Ltd. The number of Aboriginal firms operating smaller provincial tenures is not known.

A variety of cooperative resource-management agreements across the country have been signed between First Nations, governments and forest industries. One example is the trilateral agreement between the Algonquin of Barrière Lake — a First Nation following a traditional life-style — and the governments of Canada and Quebec. A conflict arose over the impacts of harvesting and hunting in areas traditionally used by the Algonquins. To ensure the sustainable development of the resources in those areas, the designated partners are charged with developing an integrated forest-management plan that combines traditional knowledge with modern technical skills. Key wildlife habitats are protected from logging during the planning period; in addition, the province and Algonquins must negotiate an agreement to implement the recommendations of the plan.

In northeastern Ontario, for more than 100 years, the Teme-Augama Anishnabai First Nation has faced continuous pressures on its traditional territories, particularly from logging. In 1993, an agreement was

negotiated with Ontario to try to resolve the dispute. If ratified by members of the First Nation, the agreement will provide for cash compensation, exclusive title to 300 km^2 of land, as well as shared stewardship over a larger area. The agreement also commits the province and First Nation to negotiating a treaty of coexistence.

Indian and Métis communities in northern Alberta use the forest for traditional hunting, trapping and gathering activities. Negotiations between the Athabasca Native Development Corporation — which represents six Indian and Métis communities in the affected area — and the Alberta Department of Environmental Protection led to the establishment in 1993 of the Parallel Aboriginal Process, a forum to integrate traditional land-use information into the firm's detailed forest-management plan. The Parallel Aboriginal Process will also design special management zones adjacent to reserves and communities, address employment opportunities for Aboriginal people, consider provisions to protect fish habitat, assess a trappers' compensation program, and set up a monitoring program to determine the effects of logging operations on the traditional use of fish and wildlife resources.

In the last few years, a number of steps have been taken in British Columbia to address the issue of outstanding land claims. The province has established a "joint stewardship" policy to provide a framework for government-to-government relations with First Nations on all aspects of land and resource management within traditional territories. Under the policy, joint stewardship agreements have been signed with several First Nations, providing for First Nation involvement in land and resource disposition, integration of traditional knowledge in decision making, joint undertaking of resource-management plans, employment on government forestry projects, and provision of timber sale licenses to the First Nations. Such an agreement was signed with the Xax'lip First Nation in the Lillooet area in 1992, and recently the province and the Nuu-chah-nulth Tribal Council negotiated an agreement to oversee forest management on part of the west coast of Vancouver Island, including the Clayoquot Sound area.

In 1993, British Columbia also set up a First Nations Forestry Council to assist the government in outlining policies to increase First Nations forest tenures, to assist in the development of government-industry-First Nations joint ventures, to develop a First Nations silviculture program, and to help develop a First Nations forestry education program.

British Columbia has a unique tenure category in which individuals or Indian bands as defined by the Indian Act may obtain 15-year woodlot licenses of up to 400 hectares. At least 13 First Nations have taken advantage of this provision, combining the forested areas of their reserves with leased lands under a single forest-management plan.

Another indicator of First Nations' involvement in forestry and forest management is their participation in the Model Forests Program. Of the 10 model forests, 6 are in regions embracing reserves and traditional territories of First Nations. A variety of archaeological, traditional-use and wildlife studies are being undertaken as prerequisites to developing forest-management plans for the model forests projects that will integrate Aboriginal forest values with timber values.

The National Forest Strategy commits governments, industry and First Nations to building further on the examples of the growing participation of Aboriginal peoples in forest management decision-making and operations across Canada.

Under the sponsorship of the Canadian Council of Forest Ministers, a new process has been initiated with representatives of environmental organizations, industries, governments and scientists to develop a more comprehensive set of criteria and indicators to monitor the extent to which Canada's forest resources are being managed sustainably. By developing its own national framework, Canada will be in a better position to discuss the sustainable development of the world's forest resources at the meeting of the United Nations Commission on Sustainable Development, scheduled for June 1995.

Commercial Forest Account

	Area (million ha)			Volume (million m^3)		
	1977	1982	1987	1977	1982	1987
COMMERCIAL FOREST	**234.53**	**234.53**	**234.53**	**24 618**	**24 967**	**25 279**
Seedling stage	29.19	28.43	28.45	290	410	362
Young forest	92.53	89.68	86.48	7 181	7 297	6 907
Mature, old and mixed-aged	102.04	103.27	104.24	17 148	17 259	18 010
Area regenerating following:						
fire or insects	6.99	8.37	9.83	-	-	-
recent harvesting	1.40	1.75	1.84	-	-	-
Area not growing commercial species 10 years after harvesting	2.37	3.03	3.69	-	-	-

CHANGES	1977-81	1982-86	1987-91	1977-81	1982-86	1987-91
Depletions:						
Harvesting	4.23	4.43	4.64	785	815	846
Fire	3.06	3.42	3.77	374	377	381
Insects and disease	2.30	2.29	2.29	321	318	315
Total depletions	9.59	10.14	10.70	1 480	1 150	1 542
Additions:						
Natural regeneration	6.04	6.41	6.79	52	54	56
Planting and seeding	1.16	1.52	1.88	21	28	34
Growth in the standing forest	-	-	-	1 755	1 741	1 728
Total additions	7.20	7.93	8.67	1 828	1 823	1 818

	1981	1986	1991	1981	1986	1991
COMMERCIAL FOREST	**234.53**	**234.53**	**234.53**	**24 967**	**25 279**	**25 555**
Seedling stage	28.43	28.45	30.05	410	362	423
Young forest	89.68	86.48	84.41	7 297	6 907	6 980
Mature, old and mixed-aged	103.27	104.24	102.67	17 259	18 010	18 152
Area regenerating following:						
fire or insects	8.37	9.83	10.81	-	-	-
recent harvesting	1.75	1.84	2.22	-	-	-
Area not growing commercial species 10 years after harvesting	3.03	3.69	4.37	-	-	-
Net increase in area not growing commercial species 10 years after harvesting	0.66	0.66	0.68	-	-	-
Net increase in volume of commercial species	-	-	-	348	312	276

HIGHLIGHTS

The Commercial Forest Account presents some of the changes that occurred in Canada's commercial forests over three separate five-year periods (1977-1981, 1982-1986 and 1987-1991).

- There was a net increase of 3.8% in the volume of trees growing in our commercial forests. However, the rate of increase declined from 348 million m^3 (1977-1981) to 276 million m^3 (1987-1991).
- Fire, insects and disease were the major disturbances during the three periods. Those disturbances depleted an area greater than the area harvested during the full 15-year period.
- The area regenerating following natural disturbances or recent harvesting increased by 55% over the full 15-year period. The area not growing commercial species 10 years after harvesting increased from 2.37 million hectares to 4.37 million hectares. That area represents less than 2% of the total commercial forest.

The Commercial Forest Account presents an overview of the broad changes that occurred in the composition of Canada's commercial forests during three five-year periods: 1977-1981, 1982-1986 and 1987-1991. Last year's report provided an assessment of the changes that had occurred over a 10-year period — 1982-1991. In assessing the changes in the commercial forest, the forest account distinguishes between natural and human-caused disturbances. Fire, insects and disease are all part of a forest's natural cycle of renewal. In Canada, forest areas that are depleted by nature tend to regenerate naturally over time.

Area

- The area growing forests at the seedling stage decreased by 2.6% between 1977 and 1981. During the second five-year period, the area increased slightly, and between 1987 and 1991, it increased by 5.6%.
- The area with young forests decreased by 3% during the first five-year period, and the volume increased by 1.6%. During the second period, the area decreased slightly, and between 1987 and 1991, it decreased by 2.4%.
- The area with mature, old or mixed-aged forests increased slightly over the first two periods (by 1.2% and 0.9% respectively), but decreased by 1.5% between 1987 and 1991.

Volume

- The volume of wood in young forests increased by 1.6% during the first five-year period. It decreased by 5.3% during the second period, and increased slightly (by 1%) between 1987 and 1991.
- The volume of old or mixed-aged forests increased by 0.6% over the first five-year period, by 4.35% between 1982 and 1986, and by 0.8% between 1987 and 1991.

Depletions

- The area harvested increased by 4.7% during each five-year period; the volume of wood harvested increased by 3.8%.
- The area depleted by forest fires increased by 11.8% over the first two periods, and by 10.2% over the second two periods; however, the volume increase was not very high — 0.8% over the first two five-year periods, and 1.06% over the second and third periods.
- The area depleted by insects and disease decreased by 0.4% over the first two periods, and remained the same over the second two periods; the volume of wood affected by insects and disease decreased by 1.9% between the first and third five-year periods.

In all three periods, natural disturbances depleted more commercial forests than harvesting.

Additions

Additions to the forest result from natural regeneration, planting and seeding, and from annual growth in the forest.

- The area regenerated naturally increased by 6% over each five-year period; the volume increased by 3.8%.
- Planting and seeding increased by 31% over the first and second periods, and by 23.7% over the second and third periods.
- Growth in the standing forest decreased by 0.8% between each five-year period.

Total additions increased by 20.4% (area) and decreased by 0.5% (volume) between the first and third five-year periods.

The account distinguishes between commercial forest lands that were harvested recently and those harvested more than 10 years ago. In 1991, some 2.2 million hectares of recently harvested forests were considered to be regenerating.

The total area that had not regenerated with commercial species within an acceptable time frame increased from 2.37 million hectares in 1977, to 4.37 million hectares in 1991 — an average annual increase of 130 000 hectares. The increase is equivalent to approximately 14% of the average area harvested annually. The total area that had not regenerated with commercial species over the 15-year period represents less than 2% of the commercial forest land base.

It should be noted that most of the areas are not barren, but have regenerated with a variety of bushes and plants, such as alder, willow and hazel. However, they do not contain sufficient quantities of commercial tree species to be considered successfully regenerated for commercial purposes. In addition, some areas may have regenerated, but have not been surveyed recently. The older harvested areas will likely require some form of silvicultural treatment to successfully reestablish commercial species in the near future.

Notes

Source — 1991Canada Forest Inventory; National Forestry Database.
Land base — The account covers only the commercial forest land base. There are 2.2 million hectares of forest for which the age class has not yet been determined. Lands that may have changed status (i.e., from forests to farm lands, or from farm lands to forest lands) are not included in this account.
Disturbances — Fire, insects, disease and harvesting are the only disturbances recorded within the commercial forest land base.

Definitions

(The terms used in the 1991 Canada Forest Inventory and National Forestry Database are in italics.)
Commercial forest *(timber-productive forest)* — Forest land that is able to grow commercial timber within an acceptable time frame.
Seedling stage *(regeneration)* — Trees less than 1.3 metres high.
Young forest *(immature)* — Trees more than 1.3 metres high.
Mature *(mature)* — Timber ready to be harvested.
Old *(overmature)* — Trees that have grown past the mature stage. The age of maturity varies for each species, from 80 years for jack pine, to 200 years for subalpine fir.
Mixed-aged *(uneven-aged)* — Forests in which trees differ markedly in age (usually greater than 20 years).
Area regenerating *(non-stocked)* — Includes areas that have been harvested recently (less than 10 years ago) and areas depleted by natural disturbances, such as fire, insects and disease.
Area not growing commercial species 10 years after harvesting *(non-stocked)* — Areas that were harvested more than 10 years ago and have not yet regenerated to commercial species.

5 CHAPTER FIVE

Nearly half of Canada's land base is forested — almost three times the forest lands of Europe — and our forests are as diverse as they are extensive. They are also unique in that most (94%) are publicly owned. Every province and territory in Canada benefits substantially from the forest sector.

Forestry Profiles

FOCUS ON THE PLAYERS

CANADA (1993)

Population	**28.8 million**
Land area	**921.5 million ha**
Forest land	**416.2 million ha**
Forest ownership	**71% provincial**
	23% federal
	6% private

Major exports (1992)	
Softwood lumber	28%
Newsprint	25%
Wood pulp	22%

Employment in forestry	311 000 direct jobs

USA (1992)

Population	**255.0 million**
Land area	**915.9 million ha**
Forest land	**298.0 million ha**
Forest ownership	**68% private**
	32% public

Major exports	
Wood pulp	22%
Logs	17%
Packaging paper and board	17%
Lumber	14%

Employment in forestry	1 600 000 direct jobs

MEXICO (1991)

Population	**87.8 million**
Land area	**190.9 million ha**
Forest land	**38.9 million ha**
Forest ownership	**93% private**
	7% public

Employment in forestry	73 318 direct jobs

BRAZIL (1991)

Population	**153.3 million**
Land area	**845.7 million ha**
Forest land	**558.0 million ha**

Major exports	
Wood pulp	41%
Paper and paperboard	34%
Wood-based panels	15%

Employment in forestry	141 681 direct jobs

SWEDEN (1991)

Population	**8.6 million**
Land area	**40.8 million ha**
Forest land	**28.0 million ha**
Forest ownership	**70% private**
	30% public

Major exports	
Paper and paperboard	58%
Lumber	21%
Wood pulp	19%

Employment in forestry	142 612 direct jobs

NEW ZEALAND (1991)

Population	**3.4 million**
Land area	**26.8 million ha**
Forest land	**7.5 million ha**
Forest ownership	**74% public**
	26% private

Major exports	
Wood pulp	25%
Paper and paperboard	22%
Logs	18%
Lumber	17%

Employment in forestry	25 604 direct jobs

CANADA

Population (1993)	**28.8 million**
Total area	**997.0 million ha**
Land area	**921.5 million ha**
Forest land	**416.2 million ha**
National parks	**21.7 million ha**
Provincial parks	**22.9 million ha**

FOREST RESOURCE (1992)

Ownership	Provincial	71%
	Federal	23%
	Private	6%
Forest type	Softwood	64%
	Hardwood	15%
	Mixedwood	21%
Allowable annual cut[a]		247.0 million m³
Harvesting-industrial roundwood (volume)[b]		163.8 million m³
Harvesting (area)		933 177 ha
Insect defoliation[c]		41.9 million ha
Forest fires		868 388 ha
Regeneration method[d]		
	Natural	61%
	Planting or seeding	39%

FOREST INDUSTRY

Value of exports (1992)		$23.1 billion
	Softwood lumber	28%
	Newsprint	25%
	Wood pulp	22%
Major export markets (1992)		
	United States	68%
	European Union	13%
	Japan	10%
	Others	9%
Balance of trade (1992)		$+19.2 billion
Contribution to GDP (1992)		$+18.7 billion
Value of shipments (1991)		$41.9 billion
	Sold domestically	50%
	Exported	50%
Number of establishments (1991)		11 869
	8 015 logging	
	3 173 wood	
	681 paper and allied	
Employment (1993)[e]		777 000
	311 000 direct jobs	
	466 000 indirect jobs	
	1 job in 16	
Wages and salaries (1991)[f]		$9.4 billion
New investments (1992)		$5.9 billion

a, b, c, d, e, f *See page 99.*

NEWFOUNDLAND AND LABRADOR

Black spruce *(Picea mariana)*

Population	**581 000**
Total area	**40.6 million ha**
Land area	**37.2 million ha**
Forest land	**22.5 million ha**
Provincial parks	**439 400 ha**

FOREST RESOURCE (1992)

Ownership	Provincial	99%
	Private	1%
Forest type	Softwood	94%
	Hardwood	1%
	Mixedwood	5%
Allowable annual cut[a]		3.0 million m³
Harvesting (volume)[b]		1.9 million m³
Harvesting (area)		18 931 ha
Insect defoliation		13 500 ha
Forest fires		1 439 ha
Regeneration method		
	Natural	87%
	Planting or seeding	13%

FOREST INDUSTRY

Value of exports (1992)		$448 million
	Newsprint	100%
Major export markets (1992)		
	European Union	40%
	United States	28%
	South and Central America	22%
Balance of trade (1992)		$+442 million
Value of shipments (1991)		not available
Number of establishments (1991)		137
	90 logging	
	42 wood	
	5 paper and allied	
Employment (1993)[e]		8 000
	5 000 direct jobs	
	3 000 indirect jobs	
	1 job in 23	
Wages and salaries (1991)[f]		not available
New investments (1992)		not available

a, b, e, f See page 99.

PRINCE EDWARD ISLAND

Red oak *(Quercus rubra)*

Population	**132 000**
Total area	**0.57 million ha**
Land area	**0.57 million ha**
Forest land	**0.29 million ha**
Provincial parks	**1 500 ha**

FOREST RESOURCE (1992)

Ownership	Provincial	7%
	Federal	1%
	Private	92%
Forest type	Softwood	37%
	Hardwood	28%
	Mixedwood	35%
Allowable annual cut[a]		0.4 million m³
Harvesting (volume)[b]		0.2 million m³
Harvesting (area)		2 550 ha
Insect defoliation		35 010 ha
Forest fires		43 ha
Regeneration method		
	Natural	55%
	Planting or seeding	45%

FOREST INDUSTRY

Value of exports (1992)		$283 000
	Softwood lumber	62%
Major export markets (1992)		
	United States	100%
Balance of trade (1992)		$+207 000
Value of shipments (1991)		not available
Number of establishments (1991)		31
	16 logging	
	14 wood	
	1 paper and allied	
Employment (1993)[e]		not available
Wages and salaries (1991)[f]		not available
New investments (1992)		not available

a, b, e, f See page 99.

NOVA SCOTIA

Red spruce *(Picea rubens)*

Population	**923 000**
Total area	**5.6 million ha**
Land area	**5.3 million ha**
Forest land	**3.9 million ha**
Provincial parks	**21 800 ha**

FOREST RESOURCE (1992)

Ownership	Provincial	28%
	Federal	3%
	Private	69%
Forest type	Softwood	46%
	Hardwood	31%
	Mixedwood	23%
Allowable annual cut[a]		5.3 million m³
Harvesting (volume)[b]		3.8 million m³
Harvesting (area)		33 932 ha
Insect defoliation		3 630 ha
Forest fires		1 160 ha
Regeneration method		
	Natural	70%
	Planting or seeding	30%

FOREST INDUSTRY

Value of exports (1992)		$511 million
	Newsprint	46%
	Wood pulp	44%
Major export markets (1992)		
	United States	64%
	European Union	25%
Balance of trade (1992)		$+494 million
Value of shipments (1991)		$825 million
Number of establishments (1991)		429
	334 logging	
	83 wood	
	12 paper and allied	
Employment (1993)[c]		15 000
	9 000 direct jobs	
	6 000 indirect jobs	
	1 job in 24	
Wages and salaries (1991)		$200 million
New investments (1992)		not available

a, b, c See page 99.

NEW BRUNSWICK

Balsam fir *(Abies balsamea)*

Population	**751 000**
Total area	**7.3 million ha**
Land area	**7.2 million ha**
Forest land	**6.1 million ha**
Provincial parks	**24 900 ha**

FOREST RESOURCE (1992)

Ownership	Provincial	48%
	Federal	1%
	Private	51%
Forest type	Softwood	45%
	Hardwood	27%
	Mixedwood	28%
Allowable annual cut[a]		12.0 million m³
Harvesting (volume)[b]		9.1 million m³
Harvesting (area)		103 335 ha
Insect defoliation		165 450 ha
Forest fires		5 399 ha
Regeneration method		
	Natural	82%
	Planting or seeding	18%

FOREST INDUSTRY

Value of exports (1992)		$1.3 billion
	Wood pulp	35%
	Other paper and paperboard	29%
	Newsprint	21%
Major export markets (1992)		
	United States	57%
	European Union	28%
	Japan	8%
Balance of trade (1992)		$+1.2 billion
Value of shipments (1991)		$2.2 billion
Number of establishments (1991)		878
	722 logging	
	133 wood	
	23 paper and allied	
Employment (1993)[c]		21 000
	13 000 direct jobs	
	8 000 indirect jobs	
	1 job in 14	
Wages and salaries (1991)		$462 million
New investments (1992)		not available

a, b, c See page 99.

QUEBEC

Yellow birch *(Betula alleghaniensis Britton)*

Population	**7 209 000**
Total area	**154.1 million ha**
Land area	**135.7 million ha**
Forest land	**82.5 million ha**
Provincial parks	**7.1 million ha**

FOREST RESOURCE (1992)

Ownership	Provincial	92%
	Private	8%
Forest type	Softwood	67%
	Hardwood	14%
	Mixedwood	19%
Allowable annual cut[a]		56.5 million m³
Harvesting (volume)[b]		28.9 million m³
Harvesting (area)		283 124 ha
Insect defoliation		81 418 ha
Forest fires		27 112 ha
Regeneration method		
	Natural	80%
	Planting or seeding	20%

FOREST INDUSTRY

Value of exports (1992)		$5.6 billion
	Newsprint	44%
	Other paper and paperboard	20%
	Wood pulp	13%
Major export markets (1992)		
	United States	83%
	European Union	10%
Balance of trade (1992)		$+4.8 billion
Value of shipments (1991)		$11.5 billion
Number of establishments (1991)		3 429
	2 018 logging	
	1 202 wood	
	209 paper and allied	
Employment (1993)[c]		159 000
	85 000 direct jobs	
	74 000 indirect jobs	
	1 job in 19	
Wages and salaries (1991)		$2.6 billion
New investments (1992)		$1.3 billion

a, b, c See page 99.

ONTARIO

Eastern white pine *(Pinus strobus)*

Population	**10 746 000**
Total area	**106.9 million ha**
Land area	**89.1 million ha**
Forest land	**58.0 million ha**
Provincial parks	**6.3 million ha**

FOREST RESOURCE (1992)

Ownership	Provincial	88%
	Federal	1%
	Private	11%
Forest type	Softwood	56%
	Hardwood	18%
	Mixedwood	26%
Allowable annual cut[a]		0.5 million ha
Harvesting (volume)[b]		22.0 million m³
Harvesting (area)		190 677 ha
Insect defoliation		39.8 million ha
Forest fires		175 994 ha
Regeneration method		
	Natural	52%
	Planting or seeding	48%

FOREST INDUSTRY

Value of exports (1992)		$4.3 billion
	Newsprint	32%
	Other paper and paperboard	21%
	Softwood lumber	17%
Major export markets (1992)		
	United States	95%
Balance of trade (1992)		$+2.2 billion
Value of shipments (1991)		$10.0 billion
Number of establishments (1991)		2 281
	1 219 logging	
	755 wood	
	307 paper and allied	
Employment (1993)[c]		154 000
	79 000 direct jobs	
	75 000 indirect jobs	
	1 job in 31	
Wages and salaries (1991)		$2.3 billion
New investments (1992)		$1.0 billion

a, b, c See page 99.

MANITOBA

White spruce *(Picea glauca)*

Population	**1 116 000**
Total area	**65.0 million ha**
Land area	**54.8 million ha**
Forest land	**26.3 million ha**
Provincial parks	**1.5 million ha**

FOREST RESOURCE (1992)

Ownership	Provincial	94%
	Federal	1%
	Private	5%
Forest type	Softwood	67%
	Hardwood	19%
	Mixedwood	14%
Allowable annual cut[a]		8.4 million m³
Harvesting (volume)[b]		1.5 million m³
Harvesting (area)		11 414 ha
Insect defoliation		77 453 ha
Forest fires		457 455 ha
Regeneration method		
	Natural	36%
	Planting or seeding	64%

FOREST INDUSTRY

Value of exports (1992)		$168 million
	Wrapping paper	41%
	Softwood lumber	33%
Major export markets (1992)		
	United States	93%
Balance of trade (1992)		$+27 million
Value of shipments (1991)		$494 million
Number of establishments (1991)		139
	42 logging	
	72 wood	
	25 paper and allied	
Employment (1993)[e]		8 000
	5 000 direct jobs	
	3 000 indirect jobs	
	1 job in 61	
Wages and salaries (1991)		$121 million
New investments (1992)		not available

a, b, e See page 99.

SASKATCHEWAN

White birch *(Betula papyrifera)*

Population	**1 003 000**
Total area	**65.2 million ha**
Land area	**57.1 million ha**
Forest land	**28.8 million ha**
Provincial parks	**908 000 ha**

FOREST RESOURCE (1992)

Ownership	Provincial	97%
	Federal	2%
	Private	1%
Forest type	Softwood	56%
	Hardwood	24%
	Mixedwood	20%
Allowable annual cut[a]		7.1 million m³
Harvesting (volume)[b]		3.0 million m³
Harvesting (area)		18 471 ha
Insect defoliation		87 000 ha
Forest fires		96 998 ha
Regeneration method		
	Natural	63%
	Planting or seeding	37%

FOREST INDUSTRY

Value of exports (1992)		$184 million
	Wood pulp	39%
	Softwood lumber	28%
	Other paper and paperboard	18%
Major export markets (1992)		
	United States	66%
	Japan	11%
Balance of trade (1992)		$+155 million
Value of shipments (1991)		not available
Number of establishments (1991)		188
	127 logging	
	57 wood	
	4 paper and allied	
Employment (1993)[e]		8 000
	5 000 direct jobs	
	3 000 indirect jobs	
	1 job in 55	
Wages and salaries (1991)[f]		not available
New investments (1992)		not available

a, b, e, f See page 99.

ALBERTA

Lodgepole pine *(Pinus contorta)*

Population	**2 662 000**
Total area	**66.1 million ha**
Land area	**64.4 million ha**
Forest land	**38.2 million ha**
Provincial parks	**1.25 million ha**

FOREST RESOURCE (1992)

Ownership	Provincial	87%
	Federal	9%
	Private	4%
Forest type	Softwood	43%
	Hardwood	37%
	Mixedwood	20%
Allowable annual cut[a]		25.6 million m³
Harvesting (volume)[b]		14.6 million m³
Harvesting (area)		48 100 ha
Insect defoliation		34 200 ha
Forest fires		3 329 ha
Regeneration method[d]		
	Natural	27%
	Planting or seeding	73%

FOREST INDUSTRY

Value of exports (1992)		$846 million
	Wood pulp	69%
	Softwood lumber	14%
Major export markets (1992)		
	United States	56%
Balance of trade (1992)		$+748 million
Value of shipments (1991)		$2.1 billion
Number of establishments (1991)		573
	350 logging	
	192 wood	
	31 paper and allied	
Employment (1993)[e]		29 000
	17 000 direct jobs	
	12 000 indirect jobs	
	1 job in 43	
Wages and salaries (1991)		$456 million
New investments (1992)		not available

a, b, d, e See page 99.

BRITISH COLUMBIA

Western red cedar *(Thuya plicata)*

Population	**3 535 000**
Total area	**94.8 million ha**
Land area	**93.0 million ha**
Forest land	**60.6 million ha**
Provincial parks	**5.34 million ha**

FOREST RESOURCE (1992)

Ownership	Provincial	95%
	Federal	1%
	Private	4%
Forest type	Softwood	83%
	Hardwood	5%
	Mixedwood	12%
Allowable annual cut[a]		72.0 million m³
Harvesting (volume)[b]		78.6 million m³
Harvesting (area)		221 599 ha
Insect defoliation[c]		1.5 million ha
Forest fires		30 453 ha
Regeneration method[d]		
	Natural	50%
	Planting	50%

FOREST INDUSTRY

Value of exports (1992)		$9.5 billion
	Softwood lumber	49%
	Wood pulp	25%
	Newsprint	10%
Major export markets (1992)		
	United States	50%
	Japan	21%
	European Union	17%
Balance of trade (1992)		$+9.0 billion
Value of shipments (1991)		$13.9 billion
Number of establishments (1991)		3 778
	3 091 logging	
	623 wood	
	64 paper and allied	
Employment (1993)[e]		182 000
	94 000 direct jobs	
	88 000 indirect jobs	
	1 job in 9	
Wages and salaries (1991)		$3.0 billion
New investments (1992)		$2.1 billion

a, b, c, d, e See page 99.

YUKON TERRITORY

The Yukon Territory has not officially adopted a tree.

Population	**32 000**
Total area	**48.3 million ha**
Land area	**47.9 million ha**
Forest land	**27.5 million ha**

FOREST RESOURCE (1992)

Ownership	Federal	100%
Forest type	Softwood	75%
	Hardwood	2%
	Mixedwood	23%
Allowable annual cut[a]		—
Harvesting (volume)[b]		0.2 million m³
Harvesting (area)		639 ha
Insect defoliation[c]		—
Forest fires		30 115 ha
Regeneration method		
	Natural	72%
	Planting or seeding	28%

a, b, c See page 99.

NORTHWEST TERRITORIES

Jack pine *(Pinus banksiana)*

Population	**63 000**
Total area	**342.6 million ha**
Land area	**329.3 million ha**
Forest land	**61.4 million ha**

FOREST RESOURCE (1992)

Ownership	Federal	100%
Forest type	Softwood	29%
	Hardwood	5%
	Mixedwood	66%
Allowable annual cut[a]		0.15 million m³
Harvesting (volume)[b]		0.03 million m³
Harvesting (area)		405 ha
Insect defoliation		80 000 ha
Forest fires		36 950 ha
Regeneration method		
	Natural	85%
	Planting	15%

a, b See page 99.

NOTES

Data Sources

The main sources for the data are Statistics Canada, Environment Canada, the Canadian Pulp and Paper Association and the Canadian Forest Service. Most of the information was collected by provincial and territorial natural resource ministries.

Provincial Trees

An illustration of the tree species that has been designated or officially adopted as the arboreal emblem of each province is included in the profiles on the preceding pages.

Forest Land

The data regarding Canada's forest land are based on the 1991 Canada Forest Inventory. The map on page 92 shows the forest land boundary.

Forest Resource

Ownership data are provided for the total forest land.

a **Allowable annual cut:** The level of harvest set by the provinces for a certain length of time is called the allowable annual cut (AAC). AAC figures include data for both softwoods and hardwoods. The AAC figures for Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec and Manitoba include federal, provincial and private lands. Given the differences outlined below, a national AAC cannot be calculated by simply adding provincial AACs.

- The national AAC figure that appears on page 92 was arrived at by estimating some data for private and federal lands, and converting the Ontario area figures into volume figures.
- Ontario provides figures for AAC (which it refers to as the "maximum allowable depletion") in hectares only.
- Saskatchewan's and Alberta's AAC figures do not include private lands.
- The AAC for British Columbia does not include all private lands.
- The Yukon has no established AAC.
- The Northwest Territories' AAC does not include data for federal lands.

b **Harvesting:** The national and provincial figures for harvesting only include data for industrial roundwood. Provincial harvest levels for industrial fuelwood or firewood may range from 100 000 m^3 to 2.3 million m^3.

- Although the AAC for British Columbia does not include all private lands, the harvest figure does. The yearly harvest rate for British Columbia may fluctuate, and in some cases, it may exceed the AAC. Over a five-year period, however, the harvest figure would be equal to or lower than the AAC.

c **Insect defoliation:** The data relating to insects were provided by provincial and territorial agencies, and include moderate-to-severe defoliation only.

- The limited amount of defoliation that occurs in the Yukon is included in the figures for British Columbia.

d **Regeneration method:** Areas harvested are regenerated naturally, or by planting or seeding. Various silvicultural activities (e.g., surveys, site preparation, spacing and weeding) are undertaken to ensure the success of both regeneration methods. In most cases, the percentages shown for regeneration methods are average or target figures. The Canadian Forest Service is working with the provinces to develop conventions for measuring, analyzing and reporting national forest regeneration statistics.

- The data provided by Alberta for planting and seeding may also include site preparation or a combination of treatments.
- In British Columbia, all artificial regeneration was carried out by planting.

Forest Industry

e **Employment:** The national employment figure includes both direct and indirect jobs in the forest sector. The total indirect jobs provided for each province will not add up to the national total because the provincial figures do not include the indirect jobs created outside the province.

- The limited number of forestry jobs in Prince Edward Island are not reported by Statistics Canada.

f **Wages and salaries:** Some of the provincial data for wages and salaries are considered confidential and are therefore not available.

Statistical Highlights

TEN-YEAR TRENDS

SUMMARY FIGURES

Allowable Annual Cut
1992
247 million m^3 ▼

Harvesting
1992
933 177 hectares ▲

Fire
1992
868 388 hectares ▼

Planting and Seeding
1992
463 364 hectares ▼

Site Preparation and Stand Tending
1992
721 599 hectares ▼

Forest Management Expenditures
1992
$2.5 billion ▼

Employment
1993
777 000 direct and indirect jobs ▲

Wages and Salaries
1991
$9.4 billion ▼

Exports
1992
$23.0 billion ▲

Value of Shipments
1991
$41.9 billion ▼

Balance of Trade
1992
$19.2 billion ▲

Capital and Repair Expenditures
1992
$5.9 billion ▼

Note: Some of these statistics are detailed on the following pages.

TOTAL ALLOWABLE ANNUAL CUTS AND HARVESTING (1992)

The provinces own the majority of forest lands in Canada and control the rate of harvesting through allowable annual cut levels — AACs. An AAC is the prescribed rate of harvesting for a specified area of forest over a certain length of time (usually about five years). The rates are determined by a number of factors, including the age and growth of the forest, the level of management activity, and the demand for non-timber uses of the forest such as parks.

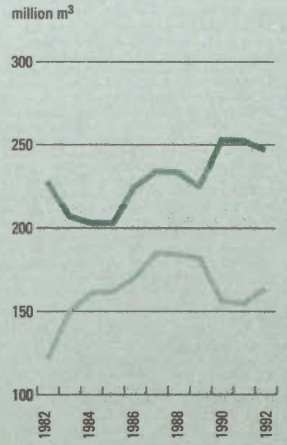
The AAC for Canada is calculated by totalling the individual AACs for all of the regions and provinces. In 1992, the national AAC declined by roughly 2%, while the total harvest rose by almost 6%.

	million m^3	annual % change 1 year	10 years
Total AAC	247.0	-2.2	+1.0
Total harvest	163.8	+5.9	+3.4

* Harvest figure includes industrial roundwood only.

Source: Statistics Canada/Canadian Forest Service

Total AACs & harvesting



SOFTWOOD AND HARDWOOD ALLOWABLE ANNUAL CUTS AND HARVESTING (1992)

Softwood species account for more than 90% of Canada's harvest. The 1992 national estimate for the softwood AAC is approximately 185 million m^3, compared with an estimated harvest of 147 million m^3. The situation for hardwood is different — the AAC is significantly higher than the harvest.

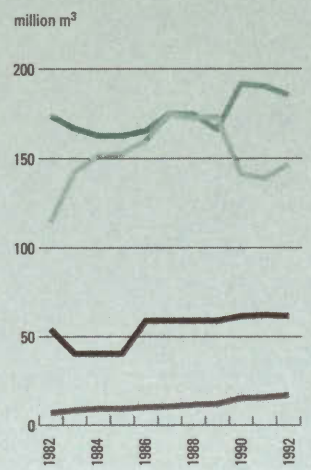
In some regions of Canada the harvest level is now the same as the AAC level, particularly for softwood species. Some provinces are reviewing their AAC levels to ensure that harvesting is sustainable over the long term.

	million m^3	annual % change 1 year	10 years
Softwood AAC	185.3	-2.6	+0.8
Softwood harvest	146.8	+5.7	+3.0
Hardwood AAC	61.7	-0.9	+2.5
Hardwood harvest	17.0	+7.9	+9.5

* Harvest figure includes industrial roundwood only.

Source: Statistics Canada/Canadian Forest Service

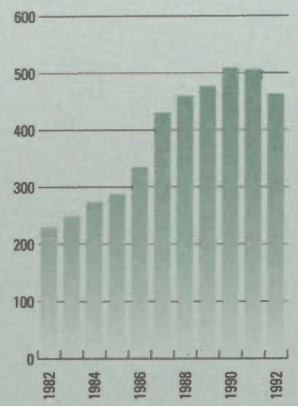
Softwood & hardwood AACs & harvesting



PLANTING AND SEEDING (1992)

Area planted & seeded

thousand hectares



Throughout the 1980s, the federal-provincial/territorial forest resource development agreements resulted in a significant increase in the amount of replanting and seeding carried out in Canada. Most of the efforts were concentrated in areas that had been disturbed in the past by fire, insects, disease or harvesting, and had not regenerated. The intention was to reforest the backlog of disturbed areas and restore the commercial forests. Most of the provinces now rely more on natural regeneration.

By 1992, the level of planting and seeding had decreased slightly, to 463 364 hectares.

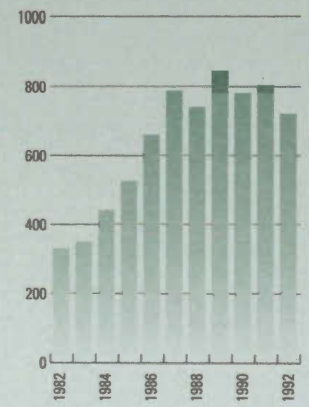
	hectares	annual % change 1 year	10 years
Area planted & seeded	463 364	-8.4	+7.7

Source: Canadian Forest Service

SITE PREPARATION AND STAND TENDING (1992)

Site preparation & stand tending

thousand hectares



Forest managers have learned that by thinning, fertilizing and pruning recently planted forests, they can improve the growth and quality of young trees. Many of Canada's second-round federal-provincial/territorial agreements focus on those and other forest-renewal practices.

The level of site preparation and stand tending activities in Canada rose from 329 936 hectares in 1982, to 805 411 hectares in 1991. In 1992, the level fell by roughly 10%, as did planting and seeding.

	hectares	annual % change 1 year	10 years
Site preparation & stand tending	721 599	-10.4	+9.0

Source: Canadian Forest Service

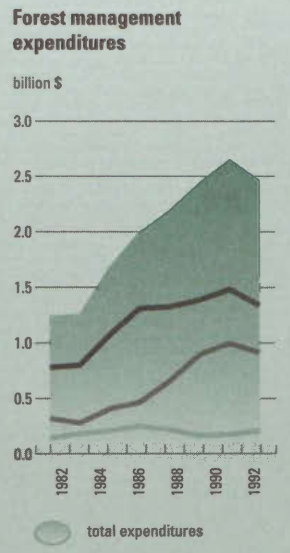
FOREST MANAGEMENT EXPENDITURES (1992)

During the past decade, the federal and provincial governments have funded forest management programs to ensure the sustainability of Canada's forests. More of the responsibility for regenerating and managing Canada's forests has been assigned to the forest companies harvesting forest lands.

Federal expenditures increased significantly between 1991 and 1992, in most part because several new forest management agreements were signed with the provinces.

	billion $	annual % change 1 year	annual % change 11 years
Provincial	1.3	-9.7	+5.0
Industry	0.9	-8.4	+10.0
Federal	0.2	+20.2	+3.6
Total expenditures	2.5	-7.2	+6.4

Sources: Canadian Pulp & Paper Association/Canadian Forest Service

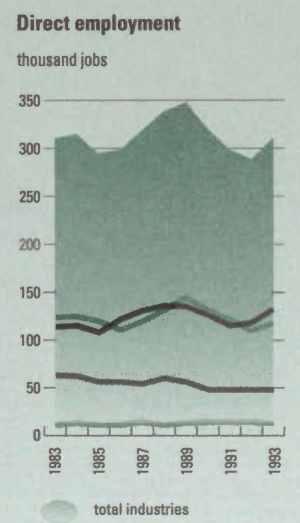


EMPLOYMENT (1993)

In the past few years, the forest sector in Canada has installed new processing equipment and adopted less labour-intensive technologies. As a result, employment opportunities for lower-skilled workers declined, while the demand for higher-skilled workers increased. The overall employment level rose from 289 000 direct jobs in 1992, to 311 000 jobs in 1993. The only sector to lose jobs in 1993 was forestry services. Forest-sector employment now accounts for 1 job in every 16 in Canada.

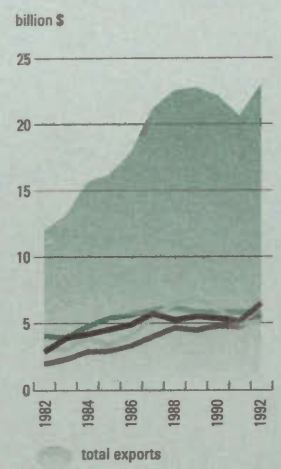
	thousand direct jobs	annual % change 1 year	annual % change 10 years
Wood industries	132	+11.9	+1.7
Paper & allied industries	118	+7.3	-0.2
Logging industry	48	0.0	-2.5
Forestry services	13	-7.1	+2.7
Total industries	311	+7.6	+0.2

Source: Statistics Canada



EXPORTS (1992)

Forest products exports



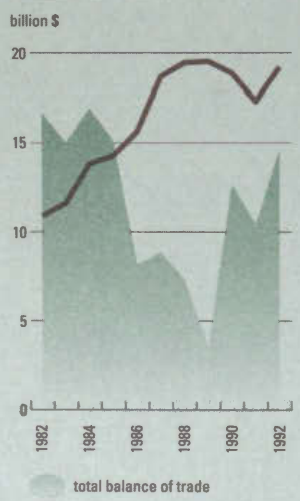
In 1992, the total value of Canadian forest products exports rose by 11.1% to reach $23.0 billion, reversing the downward trend that had been observed in 1990 and 1991. The increase was most noticeable for lumber exports, which shot up 27.1% as a result of increased demand and prices. The demand for other forest products also grew substantially, while sales of pulp increased just slightly. Newsprint exports were the only segment to decrease.

	billion $	annual % change 1 year	10 years
Lumber	6.5	+27.1	+9.5
Newsprint	5.8	-1.6	+3.8
Other forest products	5.6	+18.5	+11.6
Wood pulp	5.1	+2.5	+6.1
Total exports	23.0	+11.1	+6.9

Source: Statistics Canada

BALANCE OF TRADE (1992)

Balance of trade



Canada's standard of living is closely linked to the export of forest products. The majority of our forest products exports are sold to the United States (68%); the European Union buys 13%; and Japan purchases roughly 10%. In 1992, forest products exports contributed $19.2 billion to Canada's balance of trade. That level almost matches the high export levels recorded just prior to the global recession.

	billion $	annual % change 1 year	10 years
Forest products' contribution	19.2	+10.8	+6.2
Total balance of trade	14.6	+39.9	+16.8

Source: Statistics Canada

CAPITAL AND REPAIR EXPENDITURES (1992)

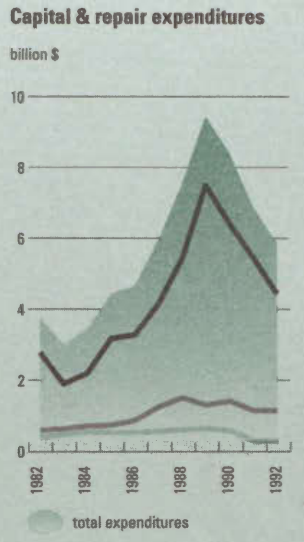
Capital and repair expenditures were down in 1992, reflecting the low profitability of pulp and paper companies in particular.

Additions to capacity were substantially lower in 1992, compared with the boom that occurred between 1988 and 1991. Nearly half of all capacity additions in Canada were for de-inked pulp, with almost no new paper or newsprint capacity coming on line.

	billion $	annual % change 1 year	10 years
Paper & allied industries	4.4	-18.7	+8.0
Wood industries	1.1	+0.3	+8.2
Logging industry	0.3	+5.9	-0.4
Total expenditures*	5.9	-14.5	+6.4

*Total does not add up due to rounding.

Source: Statistics Canada



LUMBER (1992)

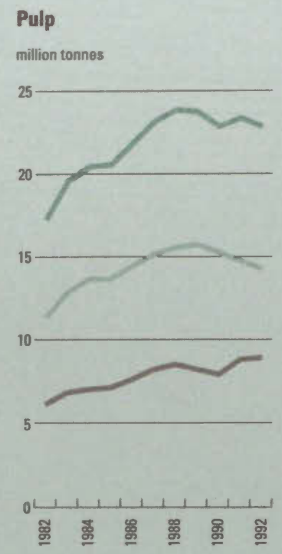
Canada's production and export levels for lumber increased in 1992, helping to reverse the gradual decline that had begun during the global recession. Exports in 1992 rose by 9.4% in terms of quantity and by 27% in terms of value. That increase reflects the higher U.S. demands for building products that followed several natural catastrophes south of the border.

Continued favorable market conditions, combined with the devaluation of the Canadian dollar, indicate that 1993 will also be a good year, with preliminary figures showing an increase of 53% in softwood lumber exports to the United States alone.

	million m^3	annual % change 1 year	10 years
Production	55.7	+7.9	+4.6
Exports	39.8	+9.4	+4.0
Consumption	17.3	+4.3	+6.8

Source: Statistics Canada

PULP (1992)



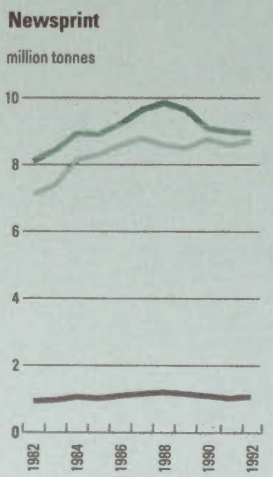
Canada's softwood pulp is still renowned for its brightness and strength. However, it is facing increased competition from other suppliers, particularly in Europe. In 1992, Canadian exports of pulp increased very slightly, while both production and domestic consumption levels decreased.

Pulp prices steadied in 1992 after falling from peak levels in early 1990, but continued to be low as a result of the continued worldwide recession and industry overcapacity. Price erosion continued into 1993.

	million tonnes	annual % change 1 year	annual % change 10 years
Production	22.8	-2.0	+3.0
Consumption	14.2	-3.1	+2.5
Exports	8.9	+0.5	+3.9

Source: Statistics Canada

NEWSPRINT (1992)



The production of newspapers and magazines in the early 1990s was particularly hard hit by the recession and by changes in consumer purchasing habits. Although domestic consumption grew in 1992, production levels continued to decline, as a number of old paper machines were shut down. Also, the use of recycled fibre increased substantially in 1992, when several new de-inking plants started operations.

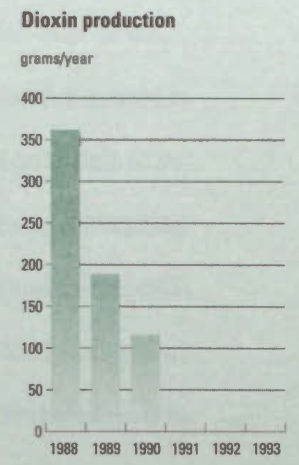
Low newsprint prices led to a third year of net losses for the industry. The situation began to improve in late 1992, as the devaluation of the Canadian dollar provided the competitive edge required for the industry to recover its eroded market share.

	million tonnes	annual % change 1 year	annual % change 10 years
Production	8.9	-0.5	+1.0
Exports	8.7	+1.5	+2.1
Consumption	1.1	+4.5	+1.6

Sources: Canadian Pulp & Paper Association/Canadian Forest Service

DIOXIN PRODUCTION (1993)

New government regulations and the use of new technologies have resulted in significant environmental improvements to pulp and paper mills. Under the federal regulations that came into effect in 1992, kraft pulp mills must reduce dioxins and furans in effluent to non-measurable levels by the end of 1993. Between 1988 and 1993, there was a reduction of 98.4% in the production of dioxins and furans. Research is underway to reduce the need for bleaching and to find environmentally safe bleaching agents. Of the 145 pulp and paper mills in Canada, only 46 use chlorine to bleach pulp during the kraft process.



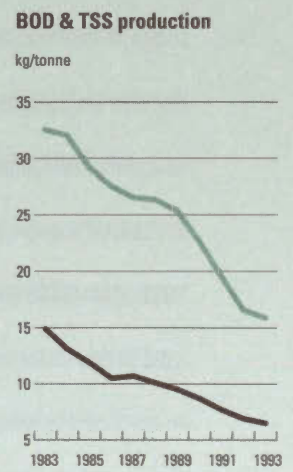
	grams/ year	annual % change 1 year	5 years
Dioxin production	5.9	-52.0	-50.3

Source: Pulp & Paper Research Institute of Canada

DISCHARGE LEVELS (1993)

Environmental quality is a major concern in the 1990s, and its influence has affected the decisions and expenditures of Canada's forest industries. Environmental projects now account for roughly a quarter of the total capital expenditures in the pulp and paper industries — a marked increase from a decade earlier. Roughly 75% of the expenditures targeted improvements in water quality.

In addition, amendments to the federal Fisheries Act have substantially reduced the level of BOD (Biochemical Oxygen Demand) in the water, as well as the level of TSS (Total Suspended Solids), which may deposit on the bottom of rivers and lakes.



	kg/ tonne	annual % change 1 year	10 years
BOD production	15.8	-4.2	-6.8
TSS production	6.5	-5.8	-7.9

Source: Canadian Pulp & Paper Association

Glossary

TERMS OF THE TRADE

ALLOWABLE ANNUAL CUT (AAC) The amount of timber that is permitted to be cut annually from a specified area. The AAC is used to regulate the harvest level to ensure a long-term supply of timber. **AOX (ADSORBABLE ORGANIC HALOGEN)** A measure of the organic chlorine concentration in effluent. It is often used to indicate the level of contamination by organic chemicals. ***BACILLUS THURINGIENSIS (B.t.)*** A biological insecticide developed in Canada. This natural bacterium, which occurs in soils everywhere, is sprayed on forests against the spruce budworm and other similar insects. **BIOENERGY** Energy that is produced from organic matter (both plant and animal) by burning or by a bioconversion method such as fermentation. **BIOMASS** The dry weight of all organic matter in a given ecosystem. It also refers to plant material that can be burned as fuel. **BIOSPHERE** Regions of the planet where life is found, ranging from the oceans to the lower atmosphere. **CARBON BALANCE** The concentration of carbon released into the atmosphere compared to the amounts stored in the Earth's oceans, soil and vegetation. **CLEARCUTTING** A forest management method that involves the complete felling and removal of a stand of trees. Clearcutting may be done in blocks, strips or patches. **CLIMAX SPECIES** Species of trees or other vegetation often found in a forest ecosystem at the final stage of its development. **DE-INKING** A process that removes the inks, clays, coatings, binders and other contaminants from waste papers so that the fibres can be recycled into new products. **DIOXIN** A chlorinated hydrocarbon that may be highly toxic. **ECO-LABELLING** Special product labels that indicate that a product meets standards of environmental soundness that are supported by extensive research into the product's impact on the environment. **EFFLUENT** Liquid waste containing solids and organic material that is discharged into the environment. **FULL-TREE HARVESTING** A tree harvesting process that includes removing the trunk, branches and, in some instances, the roots from a forest site. In Canada, this process is used to control root diseases. **FURAN** A chlorinated compound that is an unwanted by-product of certain manufacturing processes. **GENE** The functional unit of heredity that has a fixed place on a chromosome and determines the nature and development of an inherited characteristic. **HARDWOODS** Trees that lose their leaves in autumn. They belong to the botanical group Angiospermae. **INDICATOR SPECIES** An organism whose presence or absence suggests that certain environmental conditions prevail. Can be used to monitor

how much of a factor is present, and how the environment is responding to stresses and changes. **INTEGRATED FOREST-RESOURCE MANAGEMENT** A holistic approach to forest management involving preservation, protection, extraction and development that includes managing two or more resources in the same general area, such as water, soil, timber, grazing land, fish, wildlife and recreation. **LOG-BREAKDOWN SYSTEMS** A sawmill term referring to the computer programs used to determine how a log will be sawn to optimize wood use and to produce the desired end products. **MICROORGANISMS** Microscopic one- or multi-celled organisms such as bacteria, viruses, yeasts, algae, fungi and protozoans. **MONOCULTURES** Cultivation of a single crop or product on a piece of land to the exclusion of other products or crops. **NATURAL REGENERATION** Renewal of a tree crop by the natural occurrences of seeding, sprouting, suckering or layering. **OLD-GROWTH FORESTS** A stand of mature or overmature trees relatively uninfluenced by human activity. The stand can contain multiple layers of tree canopies, and various ages and species of vegetation. **ORGANOCHLORIDES** Chlorine-containing organic compounds used to create many pesticides and industrial chemicals. Many of those chemicals tend to be persistent, that is, they do not break down easily in the environment. **PAPERBOARD** A term used to describe a variety or group of varieties of board materials used in the production of boxes, folding cartons, and solid-fibre and corrugated shipping containers. **PINEWOOD NEMATODE** A microscopic worm carried by wood-boring insects that is rarely found in Canada. **PIONEER SPECIES** Tree species that establish themselves before other species in a forest area that has recently been cleared by nature or by mechanical means. **SELECTIVE LOGGING** A partial-harvest method that removes only the most valuable species of trees, or only trees of prescribed size and quality. **SHORT-WOOD HARVESTING SYSTEMS** A harvesting method by which a tree is cut down, delimbed and cut into 1.3-, 2.6-, 3.2-, or 4.8-metre (4-, 8-, 12- or 16-foot) lengths before being transported to a mill. **SILVICULTURE** The theory and practice of controlling the establishment, composition, growth and quality of forest stands to achieve certain management objectives. **SLASHBURNING** Burning the residue on the forest floor that is left after stand tending or harvesting, or after accumulating from natural causes. **SNAG** A standing dead tree from which the leaves and most of the branches have fallen. **SOFTWOODS** Cone-bearing trees with needles or scale-like leaves. They belong to the botanical group Gymnospermae. **STREAM TURBIDITY** Cloudy or muddy water caused by churned-up sediment. **STUMPAGE POLICY** A policy governing the harvesting of trees on Crown land. **TEMPERATE FOREST** One of the three main forest types in the world composed mainly of deciduous trees. The other two types are the tropical evergreen forest and

the northern coniferous forest. **TIMBER LICENSES** A license to cut and remove Crown timber. **TREE CANOPY** The more-or-less continuous cover of branches and foliage formed by the crowns of adjacent trees. **TREE FARM LICENSE** A specific tenure arrangement found only in British Columbia that grants exclusive timber-harvesting rights and management responsibilities within the area licensed. **TREE-LENGTH HARVESTING SYSTEMS** A method of harvesting that includes felling a tree, cutting off its top, and delimbing it before transporting the tree to a mill. **WATERSHED** An area of land that drains naturally into a stream or other waterway.

National Forest Strategy Coalition

MEMBERS

Composed of all the various signatories of the Canada Forest Accord, the Coalition members oversee implementation of Canada's National Forest Strategy.

The following organizations can provide you with more information about Canada's forest resources and commitment to achieving sustainable forests.

Alberta Forest Products Association
20 - 11738 Kingsway Avenue
Edmonton, Alberta T5G 0X5
Phone: (403) 452-2841 Fax: (403) 455-0505

Association of University Forestry Schools of Canada
c/o School of Forestry
Lakehead University
955 Oliver Road
Thunder Bay, Ontario P7B 5E1
Phone: (807) 343-8511 Fax: (807) 343-8116

Canadian Federation of Woodlot Owners
88 Prospect Street
Fredericton, New Brunswick E3B 5P8
Phone: (506) 459-2990 Fax: (506) 459-3515

Canadian Forest Service
Natural Resources Canada
351 St. Joseph Boulevard
Hull, Quebec K1A 1G5
Phone: (819) 997-1107 Fax: (819) 953-2104

Canadian Forestry Association
203 - 185 Somerset Street West
Ottawa, Ontario K2P 0J2
Phone: (613) 232-1815 Fax: (613) 232-4210

Canadian Institute of Forestry
606 - 151 Slater Street
Ottawa, Ontario KlP 5H3
Phone: (613) 234-2242 Fax: (613) 234-6181

Canadian Nature Federation
520 - 1 Nicholas Street
Ottawa, Ontario KlN 7B7
Phone: (613) 562-3447 Fax: (613) 562-3371

Canadian Pulp and Paper Association
19th floor, Sun Life Building
1155 Metcalfe Street
Montreal, Quebec H3B 4T6
Phone: (514) 866-6621 Fax: (514) 866-3035

Canadian Silviculture Association
c/o Brinkman and Associates Reforestation
520 Sharpe Street
New Westminster, British Columbia V3M 4R2
Phone: (604) 521-7771 Fax: (604) 520-1968

Canadian Wildlife Federation
2740 Queensview Drive
Ottawa, Ontario K2B 1A2
Phone: (613) 721-2286 Fax: (613) 721-2902

Council of Forest Industries
1200 - 555 Burrard Street
Vancouver, British Columbia V7X 1S7
Phone: (604) 684-0211 Fax: (604) 687-4930

Department of Agriculture, Fisheries and Forestry
Government of Prince Edward Island
P.O. Box 2000
Jones Building
11 Kent Street
Charlottetown, Prince Edward Island C1A 7N8
Phone: (902) 368-4830 Fax: (902) 368-4857

Department of Environment and Resource Management
Government of Saskatchewan
3211 Albert Street
Regina, Saskatchewan S4S 5W6
Phone: (306) 787-2930 Fax: (306) 787-2947

Department of Environmental Protection
Government of Alberta
9915 - 108 Street
Edmonton, Alberta T5K 2C9
Phone: (403) 427-3552 Fax: (403) 422-6068

Department of Forestry and Agriculture
Government of Newfoundland
P.O. Box 8700
5th floor, Confederation Building, West Block
St. John's, Newfoundland A1B 4J6
Phone: (709) 729-3228 Fax: (709) 729-0107

Department of Natural Resources
Government of Manitoba
327 Legislative Building
Winnipeg, Manitoba R3C 0V8
Phone: (204) 945-3785 Fax: (204) 948-2403

Department of Natural Resources
Government of Nova Scotia
P.O. Box 698
2nd floor, Founder's Square
1701 Hollis Street
Halifax, Nova Scotia B3J 2T9
Phone: (902) 424-4121 Fax: (902) 424-7735

Department of Natural Resources
Government of Ontario
Whitney Block
99 Wellesley Street West
Toronto, Ontario M7A 1W3
Phone: (416) 314-2150 Fax: (416) 314-2159

Department of Natural Resources
Government of Quebec
A-303
5700, 4th Avenue West
Charlesbourg, Quebec G1H 6R1
Phone: (418) 643-4676 Fax: (418) 643-1443

Department of Natural Resources and Energy
Government of New Brunswick
P.O. Box 6000
Fredericton, New Brunswick E3B 5H1
Phone: (506) 453-2614 Fax: (506) 457-4881

Department of Renewable Resources
Government of the Northwest Territories
P.O. Box 1320
Yellowknife, Northwest Territories X1A 2L9
Phone: (403) 873-7420 Fax: (403) 873-0114

Department of Renewable Resources
Government of the Yukon Territory
P.O. Box 2703
10 Burns Road
Whitehorse, Yukon Y1A 2C6
Phone: (403) 667-5460 Fax: (403) 667-2438

IWA-Canada
500 - 1285 West Pender Street
Vancouver, British Columbia V6E 4B2
Phone: (604) 683-1117 Fax: (604) 688-6416

Maritime Lumber Bureau
P.O. Box 459
Amherst, Nova Scotia B4H 4A1
Phone: (902) 667-3889 Fax: (902) 667-0401

Ministry of Forests
Government of British Columbia
1450 Government Street
Victoria, British Columbia V8W 3E7
Phone: (604) 387-1285 Fax: (604) 387-6267

National Aboriginal Forestry Association
875 Bank Street
Ottawa, Ontario KlS 3W4
Phone: (613) 233-5563 Fax: (613) 233-4329

National Round Table on the Environment
and the Economy
1500 - 1 Nicholas Street
Ottawa, Ontario K1N 7B7
Phone: (613) 995-7519 Fax: (613) 992-7385

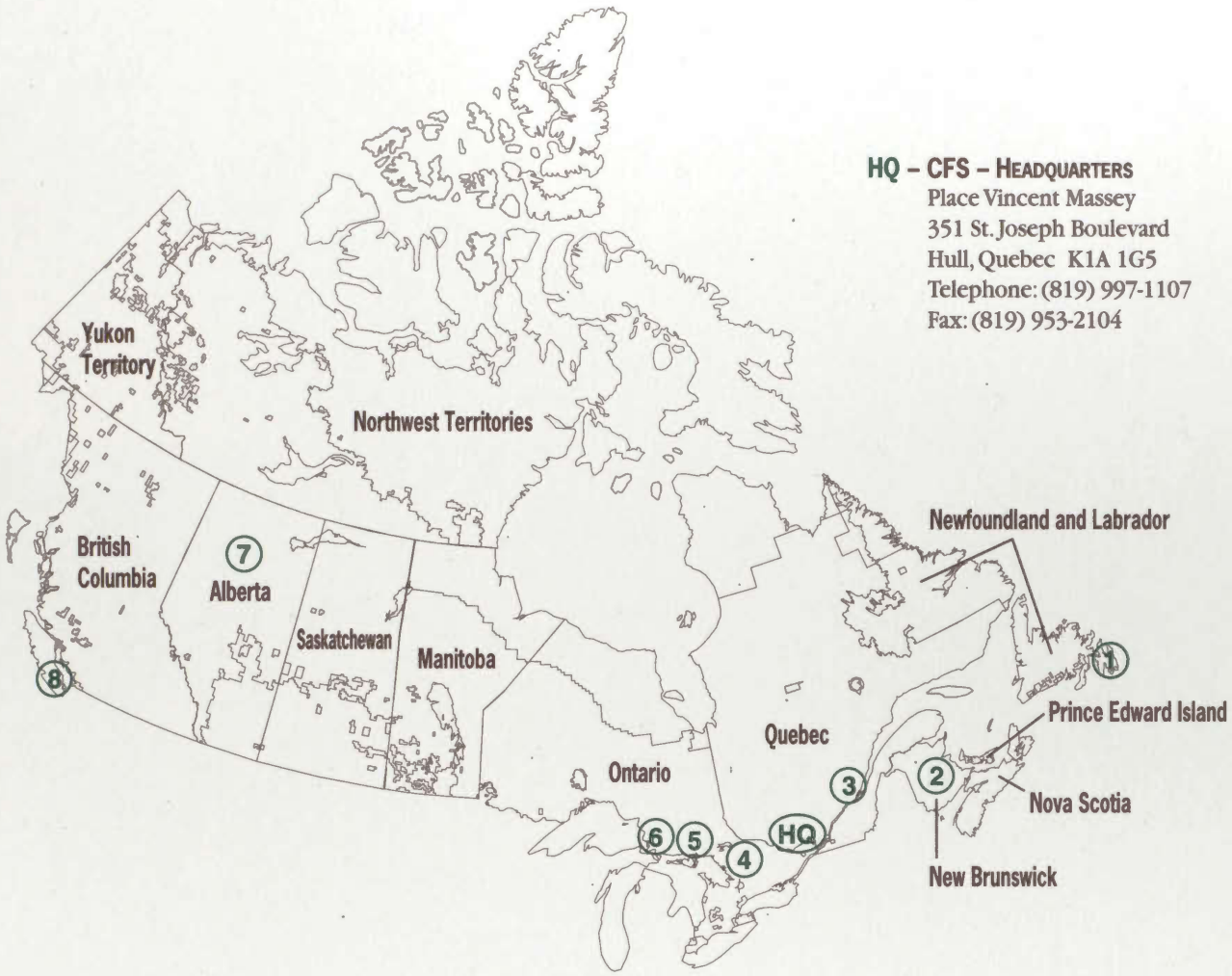
Ontario Forest Industries Association
1700 - 130 Adelaide Street West
Toronto, Ontario M5H 3P5
Phone: (416) 368-6188 Fax: (416) 368-5445

Prince Edward Island Nature Trust
P.O. Box 265
Charlottetown, Prince Edward Island ClA 7K4
Phone: (902) 892-7513 Fax: (902) 628-6331

Wildlife Habitat Canada
200 - 7 Hinton Avenue North
Ottawa, Ontario K1Y 4P1
Phone: (613) 722-2090 Fax: (613) 722-3318

SECRETARIAT
National Forest Strategy Coalition
Place Vincent Massey
351 St. Joseph Boulevard
Hull, Quebec K1A 1G5
Phone: (819) 997-1107 Fax: (819) 953-7048

Canadian Forest Service Establishments



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Hull, Quebec K1A 1G5
Telephone: (819) 997-1107
Fax: (819) 953-2104

1 CFS – NEWFOUNDLAND AND LABRADOR REGION
Building 304, Pleasantville
P.O. Box 6028
St. John's, Newfoundland A1C 5X8
Telephone: (709) 772-6019 Fax: (709) 772-2576

2 CFS – MARITIMES REGION
P.O. Box 4000
Fredericton, New Brunswick E3B 5P7
Telephone: (506) 452-3500 Fax: (506) 452-3525

3 CFS – QUEBEC REGION
1055 du P.E.P.S. Street
P.O. Box 3800
Ste. Foy, Quebec G1V 4C7
Telephone: (418) 648-5850 Fax: (418) 648-5849

4 CFS – PETAWAWA NATIONAL FORESTRY INSTITUTE
P.O. Box 2000
Chalk River, Ontario K0J 1J0
Telephone: (613) 589-2880 Fax: (613) 589-2275

5 CFS – FOREST PEST MANAGEMENT INSTITUTE
P.O. Box 490
1219 Queen Street East
Sault Ste. Marie, Ontario P6A 5M7
Telephone: (705) 949-9461 Fax: (705) 759-5714

6 CFS – ONTARIO REGION
P.O. Box 490
1219 Queen Street East
Sault Ste. Marie, Ontario P6A 5M7
Telephone: (705) 949-9461 Fax: (705) 759-5700

7 CFS – NORTHWEST REGION
5320 - 122 Street
Edmonton, Alberta T6H 3S5
Telephone: (403) 435-7210 Fax: (403) 435-7359

8 CFS – PACIFIC AND YUKON REGION
506 West Burnside Road
Victoria, British Columbia V8Z 1M5
Telephone: (604) 363-0600 Fax: (604) 363-0775