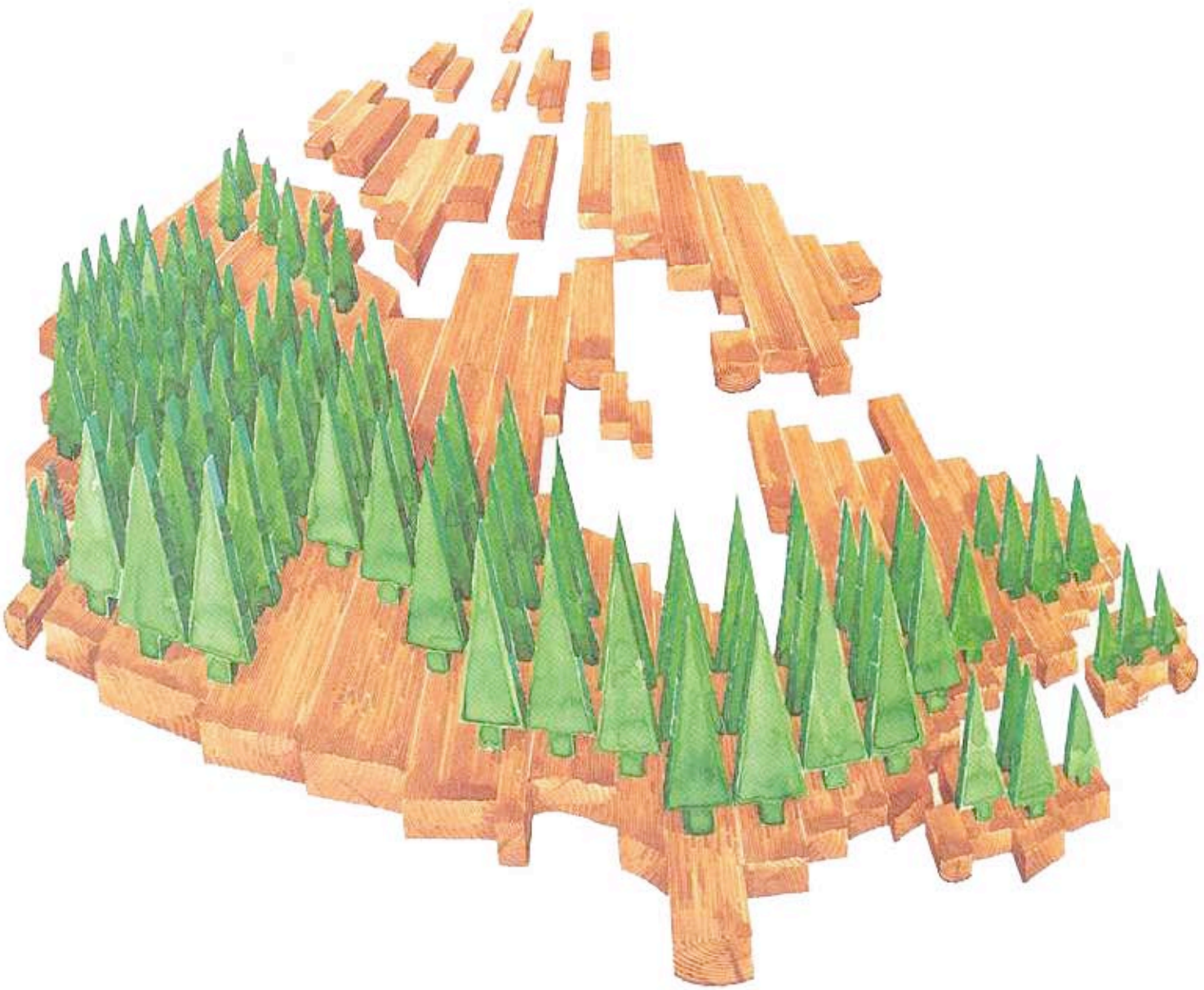
Our Forest Resources – 1976

Information Report DPC-X-9



Environment Canada
Forestry Service

Environnement Canada
Service des forêts

bdsz

OUR FOREST RESOURCES — 1976

INFORMATION REPORT DPC-X-9

Environment Canada Environnement Canada
Forestry Service Service des forêts

ISSN 0705-324X

OUR FOREST RESOURCES - 1976

Department of the Environment
Canadian Forestry Service
Information Report DPC-X-9
Ottawa, 1979

Issued under the authority of the
Minister, Environment Canada

Minister of Supply and Services Canada 1979
Catalogue No. Fo46-11/9
ISBN 0-662-10790-X
Printed in Canada

Additional copies of this publication can be
obtained from:
Environment Canada Distribution Centre
131 Greber Blvd.
Gatineau, Quebec
J8T 3R1

Cette publication est aussi disponible en
anglais sous le titre *Our Forest Resources*.

CONTENTS

ACKNOWLEDGMENTS

Many people in the Canadian Forestry Service and provincial forestry services contributed to this report.

Of special note is the participation of the members of the Canadian Forest Inventory Committee, who supplied most of the original data on forest land and wood volume for the fiscal year ended March 31, 1976. The basic statistics were collected and compiled by the National Forestry Statistics Program of the former Forest Management Institute--now amalgamated into the Petawawa National Forestry Institute--with the cooperation of the Canadian Forestry Service Research Centres and Headquarters. Charles R. Stanton, formerly of the Canadian Forestry Service and now self-employed, wrote and revised the final text under contract.

The help of all others who participated in the planning, review, and preparation of this report is gratefully acknowledged.

BETTER FIGURES FOR BETTER FORESTS

The availability of facts and figures on our natural resources and their logical interpretation are basic to development of national plans and policies respecting those resources.

Take the case of our oil, gas, and mineral deposits. Reliable information on their location, extent, and quality is clearly a necessity for long-range, effective national planning. Similarly, to arrive at a secure agriculture, we realized long ago the fundamental importance of knowing about the extent of our various soil types and their capacities to produce specific crops for national and international markets. The situation is the same for our forests. To allow us to derive the most from them in the most judicious way and for the benefit of all Canadians, we need current basic information on their area, ownership, species composition, age, health, and wood volumes.

The thing we are really talking about here is a national inventory or stocktaking of our forest lands. Because of its very nature, however, a national forest inventory cannot serve as a tool for everyday forest management, which, indeed, is the prerogative of our individual provinces and private landowners.

To produce an accurate national forest inventory for Canada is a formidable task. More than one-third of our land is classified as forest land, and within this area the forest pattern is everchanging. Both man and nature have a hand in this process. Timber-cutting and fire are two of man's major influences. Nature contributes with lightning fires, insect and disease outbreaks, and the succession of species. Keeping a finger on the pulse of all the changes calls for a constant updating of information.

Coupled with the continuing need for the inventory to keep abreast of forest changes on a national scale is a problem that arises from the fact that forestry agencies across the country have independently developed their own inventories. Not surprisingly, inventory terminology has not always been universal, and neither have the standards for measuring and recording the data.

Despite the obvious difficulties imposed by this lack of uniformity in terms and compatability of data, the Canadian Forestry Service has endeavored for many years to maintain a forest inventory for all of Canada by drawing together whatever information has been available from provincial and federal sources. The result, inevitably, has been a product that falls well short of being the best working tool for those responsible for national plans and policies respecting forest resources and forest industries, which, directly or indirectly, provide jobs for about 1 million Canadians and accounted for exports valued in excess of $9.0 billion in 1978.

In 1975, a major step was taken to improve the situation with

the establishment of the 15-member Canadian Forest Inventory Committee (CFIC). This committee included representatives from all of the provinces as well as from the Department of Indian and Northern Affairs, and Environment Canada. Its immediate challenge was to design and prepare a national forest inventory survey form and to reach an agreement on the definition of each term used in that form. By April 1977, the committee completed its task, and the following month the Canadian Forestry Service commenced the first inventory survey, using the new format.

From the information returned 69 tables were compiled, but in the process it quickly became apparent that there were gaps. Certain figures were simply not available at the time of the survey or did not relate to the requested reporting period. Some respondents, too, found difficulties in accepting precisely the definitions set down by the committee. Nevertheless, the survey represented a major step forward.

All data were submitted in metric units. This was the outcome of initiatives taken by Metric Commission Canada in 1971, followed by the work of Sector Committee 8.1 (Forestry) and Sector Committe 8.2 (Wood Products). Members for the forestry committee were drawn from provincial and territorial forestry departments, forest industry and its associations, forestry schools, and the Canadian Forestry Service. The forest industry associations provided the membership for the wood products committee.

This publication presents a condensed version of the results of the 1976 national forest inventory together with some additional material relating to forest management and the status of our forest industries. In some instances, the totals given will not be equal to the sum of their parts. This stems from the accepted statisticians' policy of rounding to avoid implying greater precision for the figures than is warranted.

The publication is designed for the reader who wishes to achieve a good general knowledge of our forest resources and forest industries without being overwhelmed by statistics. Those wishing to explore the subject of the inventory in greater depth are referred to Information Report FMR-X-116, Canada's Forest Inventory--1976, by Murray G. Bowen. This is available from the Petawawa National Forestry Institute, Canadian Forestry Service, Chalk River, Ontario, K0J 1J0.

SOME IMPORTANT FOREST FIGURES

CANADA'S FOREST LAND	3 417 000 km^2
PRODUCTION FOREST LAND	3 141 000 km^2
RESERVED FOREST LAND	96 000 km^2
INVENTORIED PRODUCTION FOREST LAND	2 934 000 km^2
PRODUCTIVE FOREST LAND--STOCKED	1 745 000 km^2
PRODUCTIVE FOREST LAND--NON-STOCKED	240 000 km^2
UNPRODUCTIVE FOREST LAND	949 000 km^2
WOOD VOLUME	19 278 000 000 m^3
ANNUAL ALLOWABLE CUT--1976-77	276 000 000 m^3
WOOD HARVESTED-1976	132 000 000 m^3
AREA REGENERATED BY PLANTING--1976	1 235 km^2
WOOD VOLUME LOST TO INSECTS--1976	47 900 000 m^3
WOOD VOLUME LOST TO DISEASES--1976	40 400 000 m^3
WOOD VOLUME LOST TO FOREST FIRE--1976	11 000 000 m^3
AREA BURNED BY FOREST FIRE--1976	21 891 km^2
NUMBER OF FOREST FIRES--1976	10 358
FOREST INDUSTRIES EMPLOYEES--1976	288 000
FOREST INDUSTRIES SALARIES AND WAGES--1976	$4 064 000 000
FOREST INDUSTRIES EXPORTS--1976	$6 556 000 000

OUR FOREST LANDS AND WOOD PRODUCTION

CANADA'S FOREST LAND

The determination of our total area of forest land, defined as land whose primary use is for forestry and that is capable of producing a total wood volume of 30 m^3/ha or more, was a basic goal for the inventory-takers. However, the figure of 3 417 000 km^2 that emerged may only be regarded as the best estimate available at this time. The reason for this is that Quebec was in the midst of updating her forest land inventory at the time of the survey and had completed only 435 000 km^2 of her estimated total of 614 000 km^2. Similarly, Prince Edward Island was able to provide only an approximate figure for her forest land, which was set at 3 000 km^2. These estimated totals for both provinces were added to the known totals for the remaining provinces and territories to arrive at the figure for Canada.

For the first two charts on the opposite page, the figure of 3 417 000 km^2 has been adopted for Canada's forest land. However, for the third chart and for all subsequent references to forest land in this publication this figure has been reduced to 3 235 000 km^2. The difference of 182 000 km^2 represents those areas of Quebec and Prince Edward Island for which insufficient data were available.

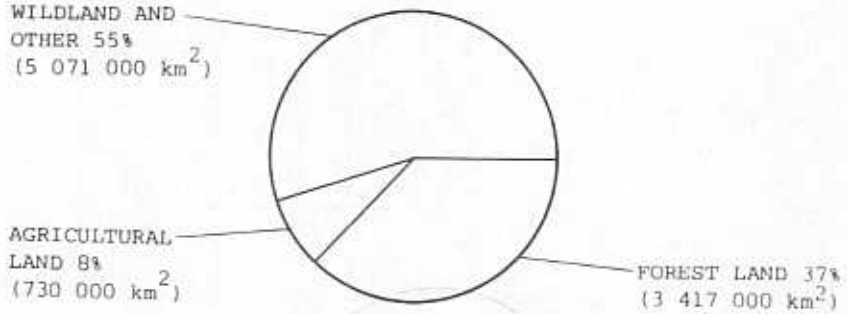
In considering the regional distribution of Canada's forest land, it is noteworthy that about 85 percent of it is south of the Yukon and Northwest territories. The provinces of Quebec, Ontario, and British Columbia together have 50 percent of our forest land, while the Prairie Provinces account for 22 percent. For Newfoundland the figure is 10 percent, and for the Maritimes 3 percent.

One of the most interesting facts to emerge with respect to ownership is that 94 percent of Canada's forest land belongs to her people as a whole and is administered by the provincial and federal governments.

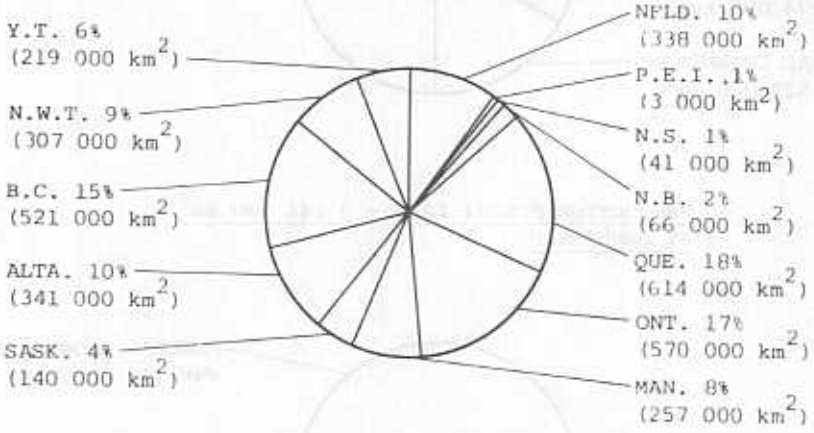
PRODUCTION AND RESERVED FOREST LAND

Production forest land should be carefully distinguished from <u>productive</u> forest land, which is discussed later. Production forest land is simply that area of forest land available for the growing and harvesting of forest crops. It amounts to 3 141 000 km^2. On the other hand, reserved forest land, which covers 96 000 km^2, is found in areas such as national and provincial parks, water conservation regions, and game preserves, where the growing and harvesting of forest crops has been prohibited by law.

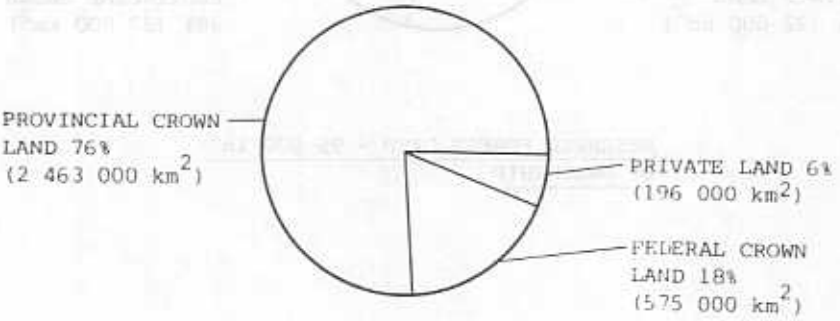
In the two charts on page 6, ownership of forest land in these two categories is depicted. The regional distribution of reserved forest land is of interest. About 89 000 km^2, or 93 percent of all of this land, is situated west of Ontario, mostly in national and provincial parks in Alberta and British Columbia.



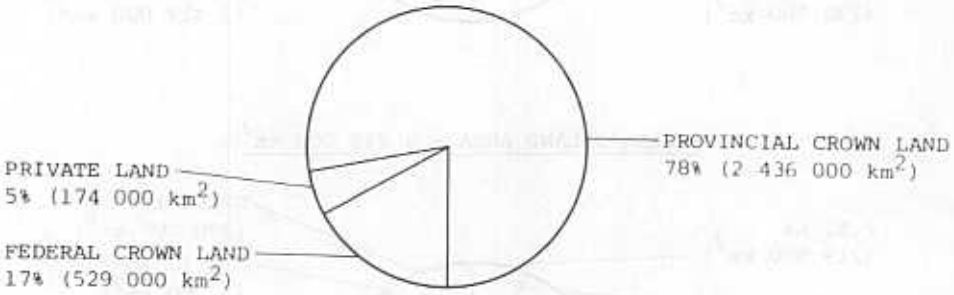
CANADA'S LAND AREA - 9 218 000 km^2



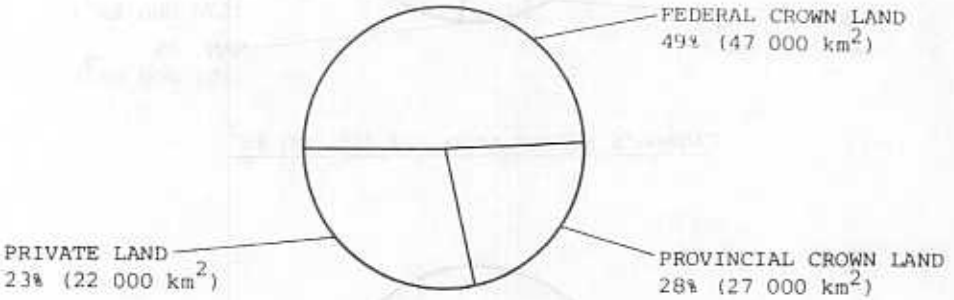
CANADA'S FOREST LAND - 3 417 000 km^2



OWNERSHIP OF FOREST LAND



PRODUCTION FOREST LAND - 3 141 000 km²
BY OWNERSHIP



RESERVED FOREST LAND - 96 000 km²
BY OWNERSHIP

FOREST INVENTORY COVERAGE

Through a survey process, a forest inventory (as distinct from a national forest inventory) seeks data on such items as forest area, forest health, timber volumes, and tree species for specific purposes such as planning, purchase, management, or harvesting.

Regional, management, operational, and reconnaissance types of forest inventory are all conducted in Canada. The regional inventory is extensive and detailed and is used for planning on a regional or provincial basis. It covers 59 percent of our inventoried production forest land. A management inventory is an intensive operation providing detailed information for the management of a specific unit, while an operational inventory provides data on a small area for forest-harvesting purposes only. Collectively, the management and operational types of inventory are applied to 25 percent of our inventoried production forest land. The reconnaissance survey, as its name implies, is extensive and exploratory in nature. Inventories of this type cover 17 percent of inventoried production forest land and are confined mainly to Newfoundland and the Yukon and Northwest territories.

In Canada, 2 934 000 000 km^2, or 93 percent of production forest land, has been inventoried. The remaining non-inventoried areas are found mainly in the Northwest Territories.

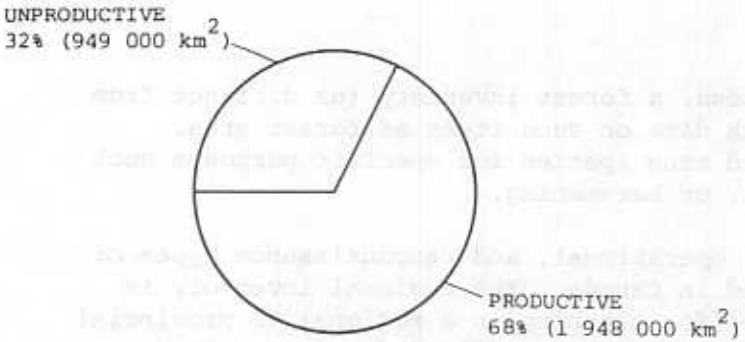
PRODUCTIVE FOREST LAND

Only 68 percent of our inventoried production forest land is capable of producing a merchantable stand within a reasonable length of time. This portion is referred to as productive forest land. Used in reference to trees or stands, the term "merchantable" means of a size, quality, and condition suitable for marketing under given economic circumstances, even if the trees or stands are in an area not immediately accessible for cutting. As the charts show (page 8), not all productive forest land is stocked with trees. Because of nature and for human reasons, regeneration following fires and harvesting is seldom as quick or as widespread as could be desired.

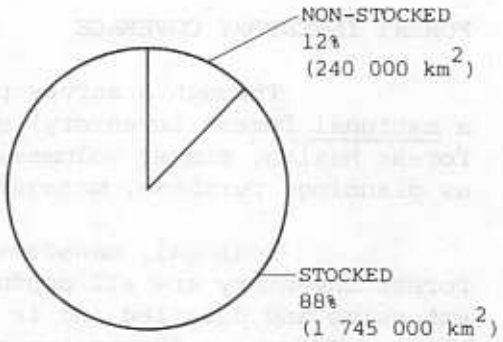
Stocked forest land constitutes 54 percent of forest land in Canada, 59 percent of inventoried production forest land, and 88 percent of productive forest land.

HOW MUCH WOOD DO WE HAVE?

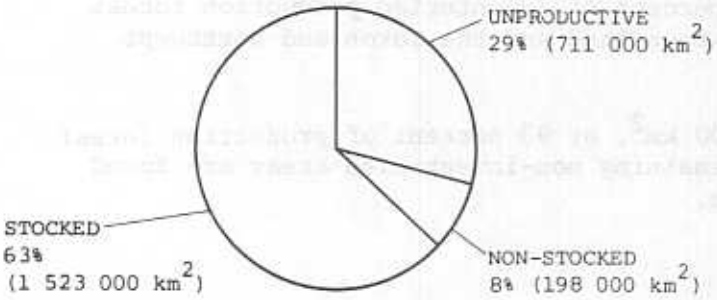
Despite conscientious efforts, the desirable goal of a national wood supply figure based on a common definition was not achieved in the 1976 survey. Most provinces submitted data for gross merchantable volume, but others used net merchantable volume or gross total volume. The resulting total, while less accurate than desired, nevertheless provides a useful estimate--one that will be refined and improved as standards are better



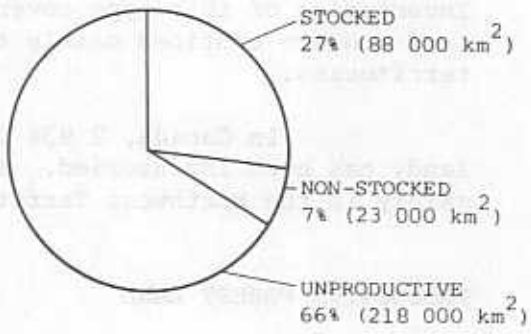
INVENTORIED PRODUCTION FOREST LAND - 2 934 000 km^2 BY PRODUCTIVITY



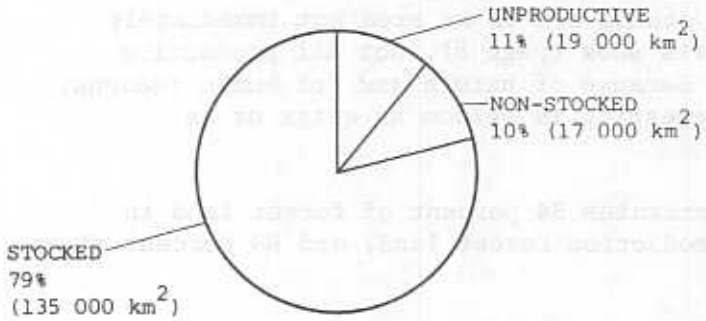
PRODUCTIVE FOREST LAND - 1 984 000 km^2 BY STOCKING



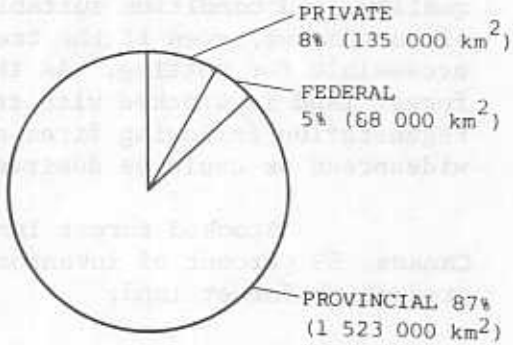
PROVINCIAL CROWN INVENTORIED PRODUCTION FOREST LAND - 2 432 000 km^2 BY PRODUCTIVITY



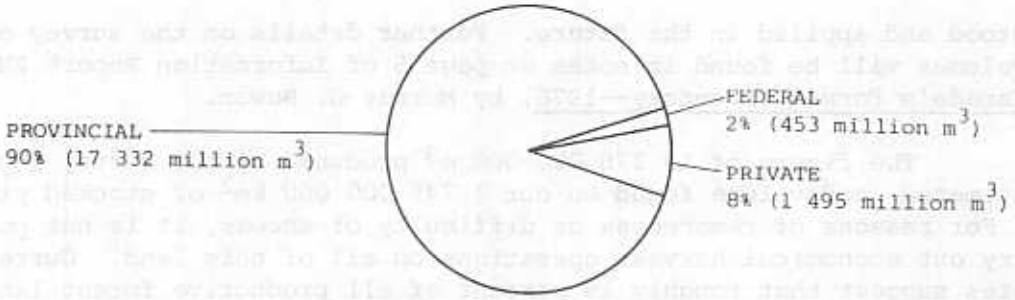
FEDERAL CROWN INVENTORIED PRODUCTION FOREST LAND - 329 000 km^2 BY PRODUCTIVITY



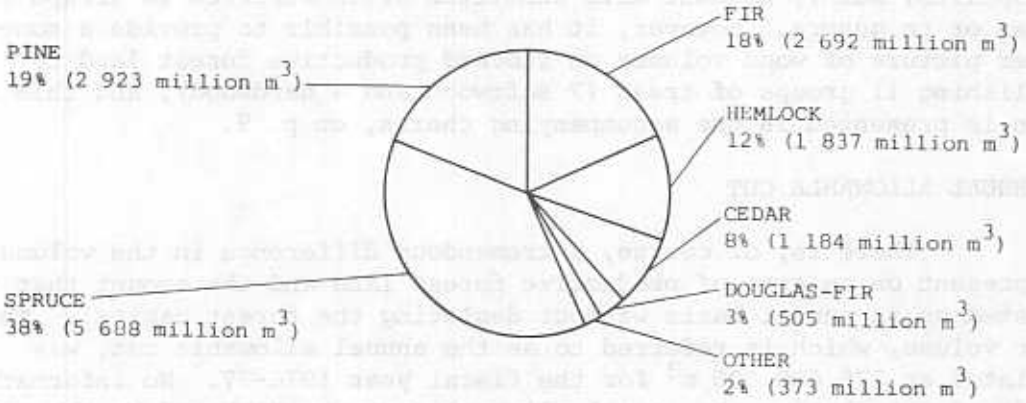
PRIVATE INVENTORIED PRODUCTIVE FOREST LAND - 170 000 km^2 BY OWNERSHIP



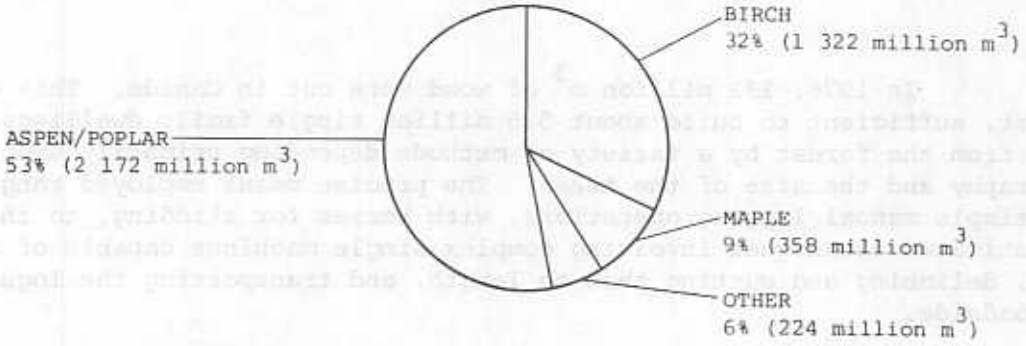
STOCKED PRODUCTIVE FOREST LAND - 1 745 000 km^2 BY OWNERSHIP



OUR TOTAL WOOD VOLUME ON STOCKED PRODUCTIVE FOREST LAND - 19 278 million m^3 BY OWNERSHIP



SOFTWOOD VOLUMES ON STOCKED PRODUCTIVE FOREST LAND - 15 202 million m^3



HARDWOOD VOLUMES ON STOCKED PRODUCTIVE FOREST LAND - 4 076 million^3

understood and applied in the future. Further details on the survey of wood volumes will be found in notes on page 5 of Information Report FMR-X-116, Canada's Forest Inventory--1976, by Murray G. Bowen.

The figure of 19 278 000 000 m^3 produced by the survey represents the estimated wood volume found on our 1 745 000 000 km^2 of stocked productive land. For reasons of remoteness or difficulty of access, it is not possible to carry out economical harvest operations on all of this land. Current estimates suggest that roughly 19 percent of all productive forest land, both stocked and non-stocked, is economically inaccessible for harvesting.

WHICH TREES PRODUCE THE WOOD?

This is not an easy question to answer in terms of individual tree species, mainly because data submitted often referred to groups of species or to genera. However, it has been possible to provide a somewhat broader picture of wood volumes on stocked productive forest land by establishing 11 groups of trees (7 softwood and 4 hardwood), and this information is presented in the accompanying charts, on p. 9.

THE ANNUAL ALLOWABLE CUT

There is, of course, a tremendous difference in the volume of wood present on an area of productive forest land and the amount that can be harvested on an annual basis without depleting the forest capital. The latter volume, which is referred to as the annual allowable cut, was calculated at 276 000 000 m^3 for the fiscal year 1976-77. No information on methods of calculating the annual allowable cut was gathered by the survey, but it is known that these vary considerably among the provinces and territories.

THE FOREST HARVEST

In 1976, 132 million m^3 of wood were cut in Canada. This great harvest, sufficient to build about 5.5 million single family dwellings, was taken from the forest by a variety of methods depending primarily upon topography and the size of the trees. The precise means employed ranged from simple manual logging operations, with horses for skidding, to the most sophisticated techniques involving complex single machines capable of felling trees, delimbing and cutting them to length, and transporting the logs to the roadside.

Across Canada forest harvesting methods can be broadly divided into two classes: cable logging and ground operations. The cable-logging system is used to overcome problems of logging in mountainous terrain, and, because of this, it finds an almost exclusive application in British Columbia. It consists in highlead and skyline logging. Both of these approaches rely on spar trees or metal masts to support cables that lead from a centrally located winch to anchor points at the limit of the area to be logged. Once

trees are felled and bucked (cut to log length), the logs are attached to the cable and winched into the loading zone or landing. In highlead operations, the logs are dragged along the ground, whereas, in the skyline technique, they are lifted into the air and transported to the landing by a carriage operating along the main cable.

British Columbia harvested 32 million m^3 of wood by cable-logging methods in 1976 and a further 38 million m^3 by ground operations. This makes a total harvest for the province of 70 million m^3, or 53 percent of the national figure.

In ground operations, which are employed on easier country across Canada, there are three logging approaches available: shortwood, tree-length, and full-tree. In the shortwood system, a mechanical harvester fells, delimbs, tops, and bucks the trees and finally piles the logs into its own special cradle for forwarding to trucks at nearby haul roads.

In the tree-length system, trees are felled, delimbed, and topped by power saw and then delivered by rubber-tired or tracked skidders to a landing where they are either reduced to shorter lengths or loaded directly onto trucks for transport to the mill.

The full-tree logging system is somewhat similar to the tree-length method except that, after felling, whole trees are skidded to the roadside. At this point delimbing takes place, and possibly slashing to shorter lengths, before shipment to the mill. Where wood is destined entirely for pulping, a roadside machine is sometimes used to convert the tree directly into chips.

A comparison of the three ground logging systems reveals that productivity is greatest for the shortwood method although it requires the greatest capital outlay per unit of wood produced. Tree-length logging, on the other hand, offers lower capital requirements but has the disadvantages of lower productivity and higher labor needs. The full-tree system falls between the other two.

In the 1976 ground operations, which gave 100 million m^3, tree-length logging accounted for 68 million m^3 while the other two systems brought in 16 million m^3 each. From 1972 to 1976, however, the figures for the full-tree operation increased fourfold. In recent years, too, there has been an increase in full-tree chipping and a falling off of production in the shortwood method.

THE CHALLENGE OF FOREST MANAGEMENT

Forest management in Canada is concerned essentially with the regeneration and improvement of our forests. It covers such activities as preparation of sites for the establishment or reestablishment of stands, the collection and handling of tree seed, the planting of seedlings, and the application of forest thinning techniques.

Responsibility for forest management varies considerably across the country. Generally, private forest land is managed by the owner, but there is a trend towards increased provincial assistance for management, especially on small woodlots. In most provinces, some or all of the provincial productive forest land is leased or licensed for harvesting operations. Responsibility for forest management on such leased or licensed land may reside either with the Crown or with the operator, depending upon the policy of the province concerned. In cases where forest land is neither leased nor licensed, the province retains full responsibility for management.

In seeking figures to present an accurate picture of our Canadian forest management situation, the inventory-takers were confronted with a formidable task. Data were scattered widely through many reports of provincial, federal, and forest industry agencies, and, inevitably, inconsistencies and information gaps appeared. In a great many cases, too, the types of data sought were simply unavailable. This was particularly true for forest management operations conducted by industry.

Despite the difficulties encountered in data collection, tables were prepared by using all available material. While the results must necessarily be viewed as incomplete, they do provide a valuable means for assessing our forest management situation. In summary, it was learned that the provinces of Canada in 1976 carried out site preparation on 1 170 km^2, planted 115 million tree seedlings, regenerated 735 km^2 by planting, and thinned 385 km^2 of forest. The cost to the provincial governments for this work, plus the cost of collecting and handling tree seed, came to about $45 million. For its part, forest industry carried out site preparation on 128 km^2, planted 70 million tree seedlings, regenerated 500 km^2 by planting, and thinned 28 km^2 of forest. The cost to industry for these operations and for the collecting and handling of tree seed totalled approximately $10 million. It should be reemphasized, however, that data from forest industries were unavailable in many cases. When it is realized that some 8 800 km^2 of forest land were cut over in 1976, it becomes clear that our area of non-stocked productive forest land is increasing.

With projected increases in demand for our forest products and the ultimate limits imposed by allowable cuts, it seems plain that forest management in general, and regeneration in particular, are in need of major improvement.

Increasing concern for our future timber supply has been expressed in the Pearse Report in British Columbia (1976), the Armson Report in Ontario (1976), and the Reed Report (1978), which covers the country as a whole. The matter has also been of direct concern to the Canadian Council of Resource and Environment Ministers' Task Force on Forest Policy (1976), the Canadian Forestry Association's National Forest Regeneration Conference (1977), and others.

It is encouraging to note that several positive steps have already been taken to help meet the formidable challenge that has been posed for forest management. The Ontario Ministry of Natural Resources hired Professor K.A. Armson to implement certain of the recommendations of his report, and in British Columbia a new Forestry Act has come into force incorporating many of the findings of the Pearse Report. Work on preparation of a national forest policy is in progress. This involves both federal and provincial agencies.

OUR FOREST LOSSES

THE TOLL OF FOREST PESTS

It has been estimated that during 1976 Canada lost 88 million m^3 of gross merchantable wood volume to forest insects and diseases. This huge figure looks even more dramatic when placed alongside that of 132 million m^3--the volume harvested from our forests in the same year.

To put these losses into clear perspective, however, it should be remembered that, historically, insects and diseases, along with fire and windstorms, have always taken their toll of forests. This process has simply been an integral part of the slow, natural pattern of forest change. In the early days of Canadian settlement, when human demands on the forest were slight, such inroads were of little consequence. But, in this century, man has necessarily entered into more serious competition with nature's harvesting methods by virtue of his greatly increased demand for wood.

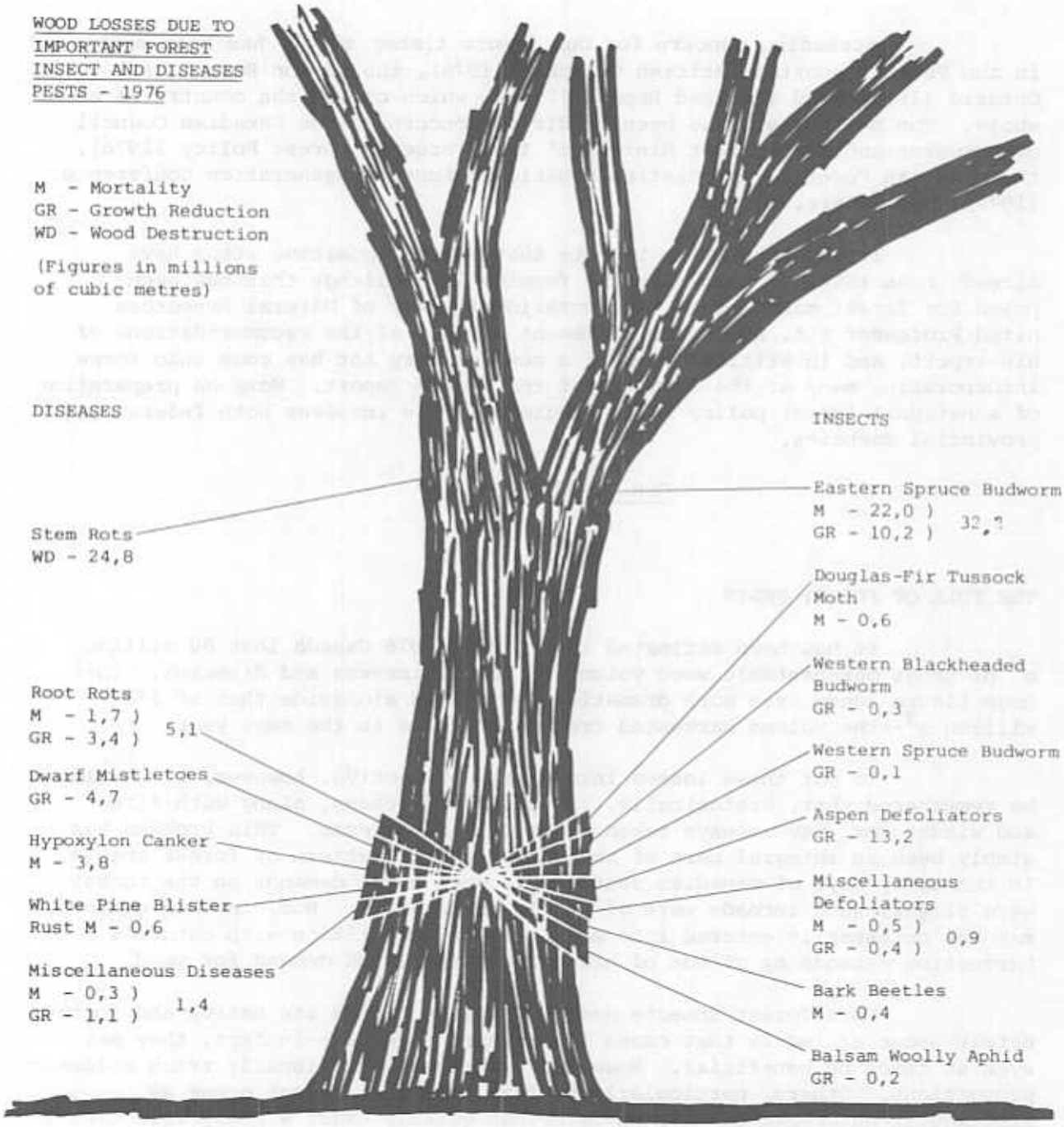
Most forest insects and diseases in Canada are native and fortunately occur at levels that cause little harm to trees--in fact, they may even at times be beneficial. However, some pests occasionally reach epidemic proportions. Others, particularly certain diseases, do not occur as spectacular outbreaks but may nevertheless quietly exact a heavy toll of wood. Introduced pests can be especially damaging because natural factors that prevent them from reaching problem levels in their native habitat may well be absent.

Over the years we have lacked a precise knowledge of the magnitude of our wood losses caused by forest pests. In 1976, an attempt was made to rectify this situation. Data were collected and national figures for wood loss were produced as a result of a cooperative undertaking by the Forest

WOOD LOSSES DUE TO IMPORTANT FOREST INSECT AND DISEASES PESTS - 1976

M - Mortality
GR - Growth Reduction
WD - Wood Destruction

(Figures in millions of cubic metres)



	Mortality	Growth Reduction	Wood Destruction	Total
Insects	23,5	24,4		47,9
Diseases	6,4	9,2	24,8	40,4
Total Wood Losses	29,9	33,6	24,8	88,3

Insect and Disease Survey of the Canadian Forestry Service and provincial forest inventory units. While these figures are based to some extent on assumptions and limited material, those involved in the work are confident that improved sampling procedures and forest inventories will yield more reliable data in the near future.

In the following sections, background information is presented on some of the more important insects and diseases covered in the accompanying illustration.

Insect Pests

Among the forest pests surveyed in 1976, the spruce budworm proved to be by far the most destructive. Losses attributed to these insects, which feed mainly on balsam fir and red and white spruce, surpassed those caused by the serious stem rot diseases. The eastern spruce budworm defoliated trees on an area in excess of 51 million ha in eastern Canada. The trees actually killed by the pest represented a loss of wood equal to about 42 percent of the 1976 harvest in the six eastern provinces.

Western spruce budworm attacks reached epidemic proportions, mainly on Douglas-fir growing on 200 000 ha in southwestern British Columbia. While this produced some mortality in small, widely scattered patches, it was generally low, even in stands that had suffered defoliation for several consecutive years. However, extensive top killing and reduced diameter growth resulted in wood losses estimated at 100 000 m^3 for 1976.

In western Canada, the Douglas-fir tussock moth proved to be the most damaging of insect defoliators of conifers in 1976. Severe tree mortality, the culmination of a three-year outbreak, occurred on extensive areas of Douglas-fir. Of the depletion ascribed to this insect in 1976, tree mortality accounted for 632 000 m^3 and growth reduction for 9 000 m^3.

The western blackheaded budworm, which feeds on hemlock and other conifers mixed with hemlock, caused no mortality in 1976, but the average annual growth reduction attributed to the pest in British Columbia forests was estimated at 309 000 m^3.

Canadian hardwoods are by no means free from the onslaught of insect pests either. Defoliators, such as the forest tent caterpillar and the large aspen tortrix, claimed an estimated 13.2 million m^3 of wood in 1976. These insects occur across Canada on a number of hardwood species, but the leaves of trembling aspen are their preferred food. Despite the fact that these pests frequently cause complete defoliation by early summer, the trees usually produce new foliage later in the same year. Although outbreaks may be spectacular--in the past few decades some have covered up to 250 000 km^2--there is rarely any appreciable tree mortality. The striking losses occur as growth reduction, which will likely assume much greater significance with any future intensification in the utilization and management of these hardwood species.

Disease Pests

Over the long term, stem rots, caused by a number of different fungi, have resulted in more wood loss than any other cause. These diseases occur throughout the country and readily infect any trees offering damaged tissue as a point of entry. The severity of the problem depends upon such factors as tree species, tree age, and stand history.

Root rots, which affect both hardwoods and softwoods, are also caused by a number of fungi, but in 1976 they resulted in only about 20 percent of the losses attributable to the stem rots. Severely rotted root systems cause growth reduction, dying back of treetops, or tree mortality. Mortality also results when trees with decomposing roots are felled by wind. Many root-rot fungi attack stands that have been weakened by other agents, but others again are more virulent and infect apparently healthy trees.

Dwarf mistletoes are parasitic flowering plants that survive only by taking their nutrients directly from living conifers. In western Canada, the greatest damage is sustained by lodgepole pine, jack pine, Douglas-fir, western hemlock, and western larch. In eastern Canada, black spruce is affected. Dwarf mistletoes cause significant wood loss by reducing tree growth.

Hypoxylon canker, a fungus known to exist from British Columbia to Labrador, causes severe damage to trembling aspen and moderate damage to largetooth aspen over most of this range. It has not yet been reported on the Island of Newfoundland. Hypoxylon cankers bring about mortality by girdling the main stem of the trees and account for an annual wood volume loss of close to 4 million m^3. A portion of this mortality takes place in heavily stocked stands, and it may, in fact, serve as a beneficial thinning. As in the case of the aspen defoliating insects, these losses can be expected to assume greater significance as the utilization and management of these tree species intensifies.

THE TOLL OF FOREST FIRES

In Canada, the volume of wood destroyed by forest fires is determined in different ways and to different degrees of accuracy by each forest fire control agency. For 1976, about 5 million m^3 of wood were reported as destroyed on inventoried production forest land in the provinces. However, this figure takes no account of Prince Edward Island, New Brunswick, Quebec, and Ontario, for which data were unavailable. Similarly, the figure of 6 million m^3 relating to wood losses on federal inventoried production forest lands is low because information was lacking for the national parks. For the country as a whole, it can be stated that <u>at least</u> 11 million m^3 of wood were consumed by forest fires in 1976.

When the number of forest fires and the forested areas burned are considered, however, the information available is more precise. In 1976, 9 849 fires burned the forest on 14 944 km^2 in the provinces, while on federally administered lands 509 fires destroyed stands on 6 947 km^2. The national total for the year came to 10 358 fires covering 21 891 km^2.

For 1976, the occurrence of forest fires was below average for British Columbia; average in Alberta, Prince Edward Island, and federal jurisdictions; but above average for the rest of the country.

For Newfoundland, 1976 was a bad fire year. Fourteen percent of the area burned was productive forest land.

Nova Scotia suffered her worst damage since 1947. One fire alone, in the month of June, accounted for 77 percent of the total area burned.

June also proved to be a bad month for New Brunswick. In the first three weeks of that month, 130 fires burned about 41 km^2 and forced closure of the forest to the public for a period of three days. The total area burned was more than double the 10-year average for the province.

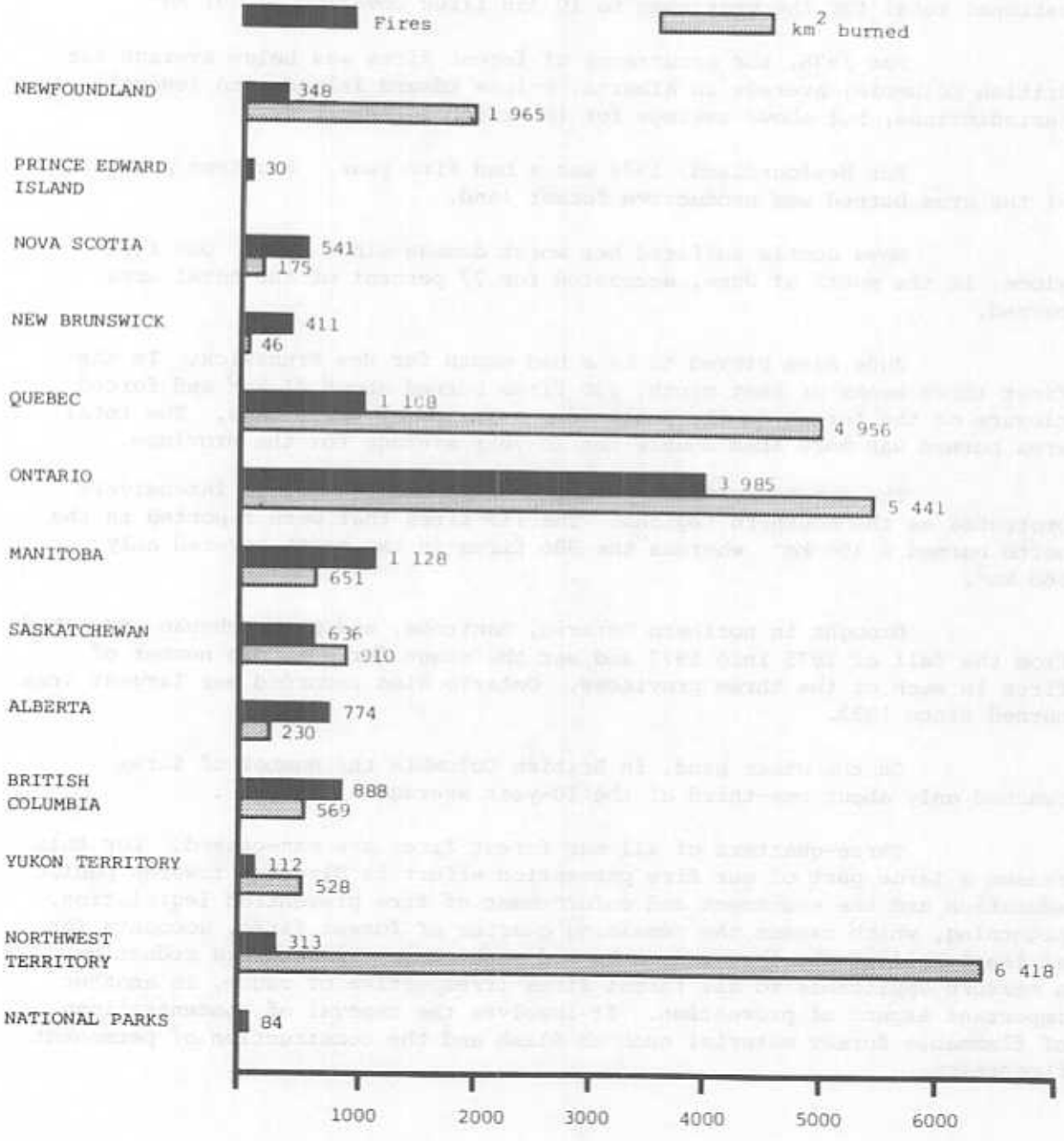
The remote northern portions of Quebec are not as intensively protected as the southern regions. The 112 fires that were reported in the north burned 4 396 km^2, whereas the 996 fires in the south covered only 560 km^2.

Drought in northern Ontario, Manitoba, and Saskatchewan stretched from the fall of 1975 into 1977 and set the stage for a record number of fires in each of the three provinces. Ontario also recorded her largest area burned since 1923.

On the other hand, in British Columbia the number of fires reached only about one-third of the 10-year average.

Three-quarters of all our forest fires are man-caused. For this reason a large part of our fire prevention effort is directed towards public education and the enactment and enforcement of fire prevention legislation. Lightning, which causes the remaining quarter of forest fires, accounts for at least half of the forest area burned each year. Fire-hazard reduction, a measure applicable to all forest fires irrespective of cause, is another important aspect of prevention. It involves the removal of concentrations of flammable forest material such as slash and the construction of permanent firebreaks.

FOREST FIRES AND AREAS BURNED - 1976



FOREST PRODUCTS IN OUR ECONOMY

Canada's forest products industries once again played a leading role in the economy in 1976. Collectively, they achieved higher shipment values, brought in more export earnings, employed more people, and paid out more in salaries and wages than any other commodity-manufacturing sector in the country.

In 1976, our shipments of forest products were valued at $13.2 billion and our exports came to $6.5 billion. Just over 288 000 people were employed directly by forest industries and they earned in excess of $4 billion. Indirect employment associated with the forestry sector provides at least another 600 000 jobs.

As further evidence of the importance of our forest industries, it is interesting to note that forest products account for 60 percent of all materials used in industrial packaging. In our printing and publishing industries, 60 percent of supplies come from the forest products sector, while a check of all railway cars loaded in Canada for foreign destinations would reveal that about 13 percent contain forest products. Forest industries, collectively, are the largest industrial consumers of both water and energy.

For all their tremendous national significance and economic potential, however, the forest industries are by no means free of problems. Low profits after taxes have been a matter of major concern. For 1975, after-tax profits on capital were only 0.2 percent for the wood industries and 6.7 percent for the paper and allied industries. At the same time the figure for all manufacturing industries was 9.4 percent. Our Canadian forest industries also showed lower profitability than their United States counterparts.

Selling prices in the wood industries in 1976 were 67.9 percent over 1971 levels. For the paper industries the increase over the same period was 82.8 percent. These figures compare with 61.6 percent for all manufacturing. This indicates a rise in real prices of forest products. Wood products face a wider range of substitutes than those derived from wood pulp, and their prices therefore show a greater degree of responsiveness to fluctuations in demand as opposed to costs.

OUR FOREST HARVEST UTILIZATION

The primary utilization of our 1976 forest harvest of 132 million m^3 shows that about 70 percent of this volume was logs and bolts destined mainly for sawmills and plywood and veneer plants. A further 26 percent was pulpwood, and the remainder was made up of fuelwood and miscellaneous items such as fence posts and utility poles.

A remarkable change in the nature of the total wood fiber intake of the pulp and paper industry has occurred over the last 26 years. In 1950,

only 2 percent of fiber input consisted of wood residue materials, the balance being provided by pulp and paper roundwood. By 1976, however, the use of wood residues such as chips, slabs, and sawdust had increased to a spectacular 45 percent of the mix. Changes of this type, brought about largely by innovations in pulping technology and the integration of sawmill and pulpmill facilities, are permitting the allocation of solid wood to higher value uses. This is particularly true in British Columbia.

FOREST PRODUCTS OUTPUT

The output of forest products in 1976 increased significantly over the levels attained in the previous year. Improved production in the wood products industries reflected a strong domestic demand for new residential construction, which reached a record high with 273 000 housing starts. The continuation of strong export markets for forest products, especially in the United States, also had a favorable influence on production.

Increases in the output of softwood lumber in 1976 amounted to 35 percent over 1975 figures. Hardwood lumber output increased by 19 percent and softwood and hardwood plywoods saw gains of 7.8 percent and 5.2 percent respectively. Despite the advances made by hardwood lumber and the plywoods, Canada still remained a net importer of these items. Between 1975 and 1976 market demand and improved plant capacity led to a 43 percent production increase in particleboard, and exports of this product, destined mainly for the United States, increased by 250 percent.

For pulp and paper products there was also a notable improvement in production from the low levels that existed in 1975. Newsprint output increased by 15 percent, other paper and paperboard by 22 percent, and woodpulp by 19 percent. The volume of building board produced showed an increase of 12 percent, largely in response to heightened activity in domestic construction.

EXPORTS

Exports of forest products in 1976 were generally higher than in 1975. An exeeption was plywood, where exports declined as more of this commodity was diverted to fill heavy domestic requirements.

The main reason for our improved export performance was a marked increase in industrial production and residential building activity in two of our principal foreign markets, namely the United States and Japan.

The value of Canada's exports of all forest products in 1976 came to $6.5 billion. The largest export earners were woodpulp worth $2.2 billion, newsprint valued at $2.0 billion, and softwood lumber at $1.6 billion. Exports of woodpulp, newsprint, and lumber accounted for 34, 87, and 62 percent respectively of our production of each of these commodities. In each instance, the largest single market for these leading export items was the United States.

PRODUCTION COSTS

A study of the leading forest products manufacturing industries for the 1971 to 1975 period revealed that the cost of wood delivered to the mills accounted for about 45 percent of all manufacturing costs. The next most important charge was labor, which was responsible for about 25 percent. Energy, materials and supplies made up the balance. In the logging industry, by comparison, labor represented 55 percent of all operating costs.

For the forest industries as a whole, the costs of delivered wood and labor are the most critical determinants of international competitiveness. In recent years, the competitive advantage of our forest products industries has been seriously eroded by the increased cost of wood. Pulpwood costs, for example, jumped by 63 percent between 1971 and 1975. In large measure, wages and salaries, and machinery and equipment prices, are set by other sectors in our economy. To reduce costs, and to improve our competitive position in international markets, attention is being concentrated on more efficient use of labor and capital.

In our sawmills, better methods of handling small logs are being introduced, advanced process control equipment is being installed, and there is a continuing integration of operations with pulpmills yielding many economic benefits. In pulp manufacture, as indicated earlier, there is a marked increase in the use of wood residues in place of costly roundwood. For plywood and veneer plants, experiments are proceeding on less costly adhesives and cheaper types of plywood core stock. In paper manufacture, changes are being made to speed drying processes, and newsprint is being produced in thinner sheets. These, and a variety of other cost reduction measures, are being introduced in many areas of forest industry.

BIBLIOGRAPHY

Alberta Department of Energy and Natural Resources. 1977. Annual Report, March 31, 1977. Edmonton, Alta.

Armson, K.A. 1976. Forest Management in Canada. Ontario Ministry of Natural Resources. Toronto, Ont.

Bowen, Murray G. 1978. Canada's Forest Inventory--1976. Information Report FMR-X-116, Forest Management Institute. Ottawa, Ont.

British Columbia Forest Service. 1977. Annual Report 1976. Ministry of Forests. Victoria, B.C.

Canadian Committee on Forest Fire Control. 1977. Reports presented to Annual Meeting. Ottawa, Ont.

Canadian Council of Resource and Environment Ministers' Task Force on Forest Policies. 1976. Forest Policies in Canada. Volumes I, II, and III. Ottawa, Ont.

Canadian Forestry Association. 1977. National Forest Regeneration Conference Report. Quebec City, Que.

Canadian Forestry Inventory Committee. 1978. A Guide to Canadian Forest Inventory--Terminology and Usage. 2nd ed. Edited by G.M. Bonner. Canadian Forestry Service, Environment Canada. Ottawa, Ont.

Dobbs, R.C., D.G.W. Edwards, J. Konishi, and D. Wallinger. 1976. Guideline to Collecting Cones of B.C. Conifers. B.C. Forest Service, Canadian Forestry Service. Joint Report No. 3. Victoria, B.C.

Federal-Provincial Parks Conference. 1976. Parks Today and Tomorrow, a Challenge. Proceedings, Department of Tourism and Renewable Resources, October 19-22. Regina, Sask.

Federal-Provincial Parks Conference. 1977. Park Classification System, National and Provincial Parks, October 3-7. St. John's, Nfld.

Gierman, D.M. 1977. Rural to Urban Land Conversion. Occasional Paper No. 16. Lands Directorate, Fisheries and Environment Canada. Ottawa, Ont.

Manitoba Department of Renewable Resources and Transportation Services. 1977. Annual Report, March 31, 1976. Winnipeg, Man.

New Brunswick Department of Natural Resources. 1977. 140th Annual Report, March 31, 1977. Fredericton, N.B.

Nova Scotia Department of Lands and Forests. 1977. Annual Report, March 31,

1977. Halifax, N.S.

Ontario Ministry of Natural Resources. 1977. Statistics 1976. Toronto, Ont.

Pearse, P.H. 1976. Timber Rights and Forest Policy in British Columbia. Report of the Royal Commission on Forest Resources. Victoria, B.C.

Prince Edward Island Department of Agriculture and Forestry. 1976. Annual Report, 1976. Charlottetown, P.E.I.

Quebec Ministère des Terres et Forêts. 1975. Rapport Annuel 1974-1975. Quebec City, Que.

Reed, F.L.C., and Associates Ltd. 1978. Forest Management in Canada, Volumes I and 2. Information Reports FMR-X-102 and FMR-X-103 resp., Forest Management Institute. Ottawa, Ont.

Rowe, J.S. 1972. Forest Regions of Canada. Publication No. 1300, Canadian Forestry Service, Department of the Environment. Ottawa, Ont.