



CANADA

DEPARTMENT  
OF FORESTRY

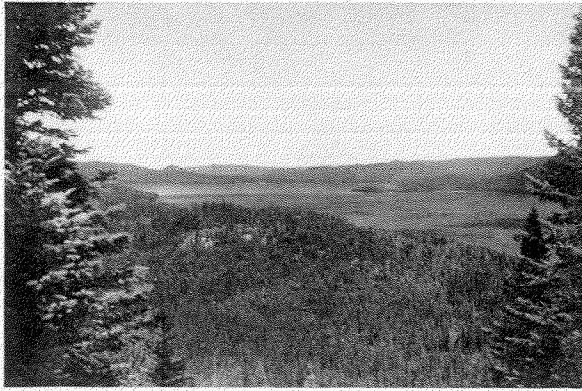
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ANNUAL REPORT

1962-63



*Manicouagan River, Lake St. Pierre, Québec.  
View from a mountain.*



DEPARTMENT OF FORESTRY  
OF CANADA

# ANNUAL REPORT

FOR THE FISCAL YEAR  
1962-1963

*PRICE: 75 cents*

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*Departmental Research Officers conducting a field demonstration on the application of a quality evaluation system for hardwood logs developed by the Forest Products Research Branch.*

THE HONOURABLE JOHN R. NICHOLSON, P.C., O.B.E., M.P.,  
*Minister of Forestry.*

SIR:

I have the honour to submit the third Annual Report of the Department of Forestry covering the fiscal year ended March 31, 1963.

In July, 1962, Canada's first federal Deputy Minister of Forestry, Dr. J. D. B. Harrison, D.C.M., M.Sc.F., LL.D., left the Department on retirement, after a lengthy and distinguished career which started in his native New Brunswick in 1924 and was devoted to service to the national and international forest communities. It was my great honour to succeed Dr. Harrison as Deputy Minister of Forestry and as Chairman of the North American Forestry Commission.

As a result of the general austerity program implemented in mid 1962, great difficulties were experienced throughout this fiscal year in continuing the vital organizational development of this newest department of Government and in maintaining existing research programs. Internally, the staff-recruiting restrictions were most damaging in their effect on the proper development of new programs of economic studies, public information and technical services, and on the establishment of a statistical analysis unit.

Activities of the Department are described in detail in the body of this Report. Several matters, however, are worthy of special mention.

Members of the Department participated actively in the First Dominion-Provincial Conference on Forestry and Forest Products Statistics held in March 1963. This conference, sponsored by the Dominion Bureau of Statistics and attended by representatives of the provincial governments, is a most significant step in the statistical record of our forest resources.

Work began on a study of timber resources and requirements as part of a joint regional study for the North American Forestry Commission in response to a request from the Food and Agriculture Organization of the United Nations to provide a World summary for the next World Forestry Congress.

Specific economic studies of interest included setting up an accounting procedure for farm woodlots; assessing the potential role of forestry in rural development for the Agricultural Rehabilitation and Development Act; the study of the forest economy of Prince Edward Island; recommendations for tax changes that would modify the taxing of income from timber growth; and study of the economics of privately-owned plantations.

In this, the first year of the consolidated, two-year Federal-Provincial Forestry Agreement that went into effect on 1 April, 1962, nearly \$7,500,000 was contributed to the provinces to assist in work on forest inventory, reforestation, fire protection, forest access, and stand improvement. The flexibility of this new agreement is proving helpful to the provincial authorities in developing sharable-cost programs. Additional funds totalling \$426,000 were also made available to the provinces of New Brunswick and Nova Scotia for special spruce budworm and stand improvement work respectively.



In co-operation with the National Film Board and various provincial forest authorities, a new 16 m.m., motion picture film entitled, "Aircraft in Forest Fire Control", was completed in both English and French and became available for loan to interested agencies throughout the country.

Forest research activities in silviculture, management, mensuration, tree biology, and forest fire control continued at the maximum scale possible with the facilities available. In addition, pilot-scale surveys of forest land are being conducted and land-type maps are being made by the Department in the western provinces in co-operation with the provincial authorities and other federal departments. This information is of great significance as a basis of land-use planning and forest management.

Research in the important field of forest soils was maintained and photo mensuration studies continued to show progress, particularly in the use of large-scale photography for forest inventory purposes.

Fire danger tables for the Northwest Territories were completed early in 1963 and a new type of fire danger index meter prepared for several provinces. Studies into the standardizing of methods of reporting fire-loss statistics, the development of fire-damage appraisal systems, and logging slash as a fire hazard continued.

The co-operative program of watershed research on the east slopes of the Rocky Mountains, involving this Department with various Alberta provincial government agencies and other federal departments, is proceeding smoothly. Research plans for the Marmot Creek watershed of the Saskatchewan River system have been formulated. This will be the first area in the system to be intensively studied as to climate, soils, geology, vegetation and hydrology.

New projects of particular interest include: the testing of planting methods for southern hardwood species in Ontario; the restocking of burned lands in Newfoundland; the use of prescribed burning in preparing seedbeds in Manitoba, and the study of lethal temperatures for important commercial species. Selective control of light through cutting practices is being investigated as a means of controlling weevil damage in white pine.

The Director of the Forest Research Branch headed the six-man Canadian delegation to the 8th British Commonwealth Forestry Conference, held in Nairobi, Kenya, from June 25 to July 28, 1962. The Superintendent of the Department's Forest Products Laboratory at Ottawa was also a member of the delegation as were representatives of the provincial forest authorities.

National forest insect and disease surveys, carried out during the year indicated some 3,600 square miles of Newfoundland forest heavily infested with the balsam woolly aphid. Although spruce budworm infestations persisted or intensified in northern parts of Western Canada, it was heartening to note a continuing decline of this pest in the pulpwood forests of Eastern Canada where the infestations have the greatest current impact on the pulp and paper industry. In the West again, indications are for a severe outbreak of forest tent caterpillar across a wide band of northwestern Ontario, Manitoba, Saskatchewan and Alberta. Over 150,000 square miles of trembling aspen and other deciduous species in these provinces have been defoliated.

The larch sawfly appears in serious intensities in Saskatchewan, Alberta, Northwest Territories and Quebec and the spruce budworm, the most serious insect pest of coniferous forests in Canada, continues its activities from Newfoundland to Vancouver Island and as far north as the Mackenzie River.

The Dutch elm disease continues to spread in Ontario, Quebec and New Brunswick.

In line with the Department's continued research into the development of improved chemical insecticides and operational aerial spraying techniques, further trials with Phosphamidon were sufficiently encouraging against spruce budworm in New Brunswick to justify its operational use in 1963. No injurious side effects on aquatic life occurred as a result of these Phosphamidon trials.

In biological control research, some degree of success was recorded against Douglas fir needlecast in British Columbia. New formulations of Phytoactin appear to have established a measure of control over needlecast in the East Kootenay region of the Province without injury to the trees.

Although staff reductions necessitated some curtailments in the program for forest products research as originally planned, emphasis continued to be placed on those areas of research which would contribute most to the improved industrial utilization of wood.

The first program of extramural research in forest products was initiated during the year, involving four universities undertaking selected research. Of special interest was the start of research concerned with the improvement of the fire-resistant properties of wood and wood products which included a co-operative program with the Western Red Cedar Shingle industry on a weather-resistant fire-retardant treatment for cedar shingles and shakes.

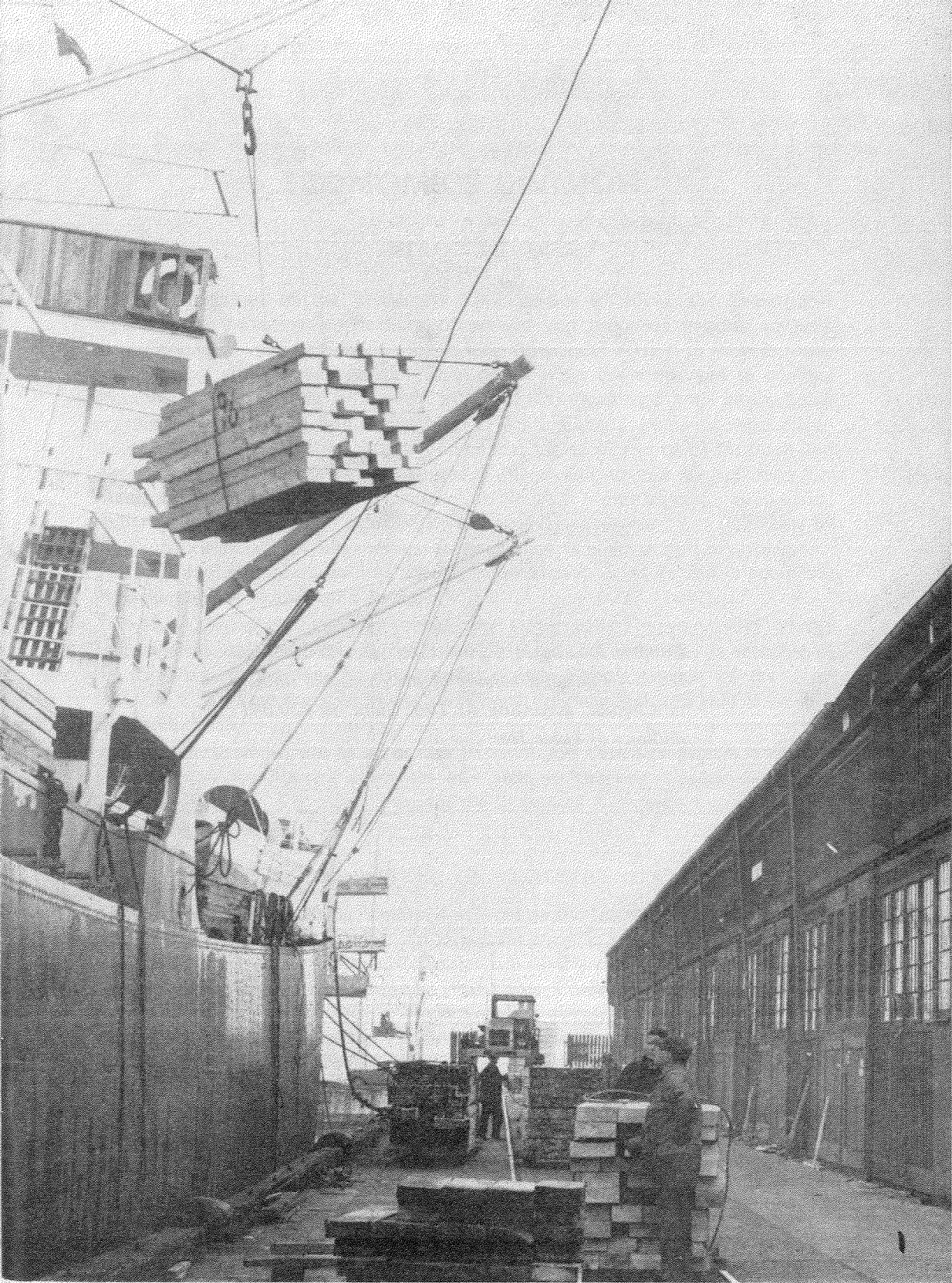
The Industrial Liaison Service officers are now active in all provinces and continue to bring effectively to the attention of the Department current industry problems and research needs.

During the year a total of 171 individual forest products research projects were undertaken at the Ottawa Laboratory and 62 at the Vancouver Laboratory.

Towards the end of the fiscal year, the much needed addition to the Administration building at the Petawawa Forest Experiment Station was completed and turned over to the Department. These new facilities provide a gross area of 5,780 square feet of space comprising offices, a library, drafting room, an herbarium and 1,100 square feet for a new soils laboratory. The expansion will do much to relieve the severely overcrowded conditions at the Station.

Your obedient servant,

L. Z. ROUSSEAU,  
*Deputy Minister.*



**ECONOMICS DIVISION**

*Lumber loading at Ogden Point Dock, Victoria, B.C. — The total volume of merchantable timber in Canada, according to 1962 data, is 720,041 millions of cubic feet.*

# ECONOMICS DIVISION

## INTRODUCTION

The functions of the Economics Division are to advise the Department regarding the economic implications of present and proposed policies; to keep the economic position of Canada's forest industries under review; to keep in touch with forestry and international developments in other countries; and to conduct economic studies relating to forestry in Canada. Co-operation with international organizations concerned with forestry and in which Canada maintains membership includes the preparation of quarterly and annual statistical reports to the Food and Agriculture Organization of the United Nations and to the Organization for Economic Co-operation and Development. A National Forest Inventory is compiled annually, from information supplied by provincial governments, and published by the Dominion Bureau of Statistics in a series entitled "Canadian Forestry Statistics". This information is also used in Canada's submission to FAO for use in compiling the quinquennial World Forest Inventory.

The Division continued to provide the Departmental representative on the Interdepartmental Food and Agriculture Organization Committee. A member of the Division represented the Department at the Fourth Session of the Joint FAO/ECE Working Party on Forest and Forest Products Statistics held in Geneva in March 1963.

Technical advice was given to the External Aid Office in providing courses of instruction for forestry graduates and students entering Canada under the Colombo Plan, the Expanded Program for Technical Assistance and the United Nations Special Fund.

## ADVISORY COMMITTEE ON FORESTRY STATISTICS

The staff of the Division continued to serve on the Interdepartmental Advisory Committee on Forestry Statistics. An important event in this field during the year was the First Dominion-Provincial Conference on Forestry and Forest Products Statistics held in Ottawa in March 1963. This Conference, sponsored by the Dominion Bureau of Statistics, brought together representatives of the provinces and several departments of the Federal Government to review and make recommendations on the collection of forestry statistics in Canada.

## SAMPLING OF PRIMARY FOREST PRODUCTION ON PRIVATE LANDS

The sampling of forest production on private lands was continued with the Division providing advice and assistance to the provinces and the Dominion Bureau of Statistics. Work in this field was extended in Ontario and the survey covered the entire province of Nova Scotia for the first time.

## NORTH AMERICAN FORESTRY COMMISSION

Arrangements for the Second Session of the North American Forestry Commission to be held in Ottawa in June 1963 were handled by a staff member of the Division as Rapporteur of the Commission.

### STUDY OF MARKETS FOR FOREST PRODUCTS

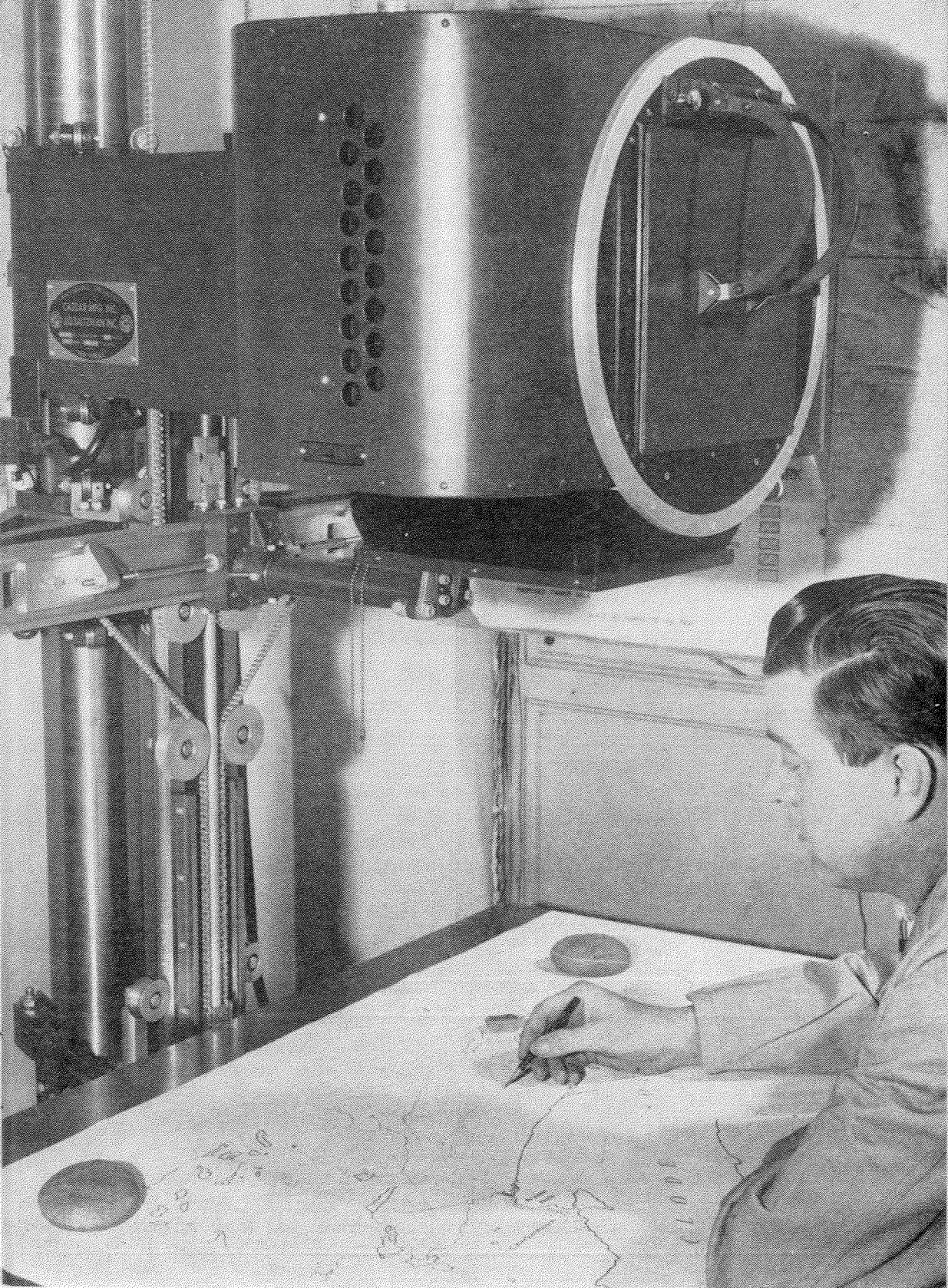
The Division began work on a study of timber resources and requirements as part of a joint regional study for the United States and Canada under the auspices of the North American Forestry Commission. The study was requested by the Food and Agriculture Organization to provide regional information to be included in a world summary of resources and requirements being prepared for the next World Forestry Congress.

### ECONOMICS OF PLANTATIONS

Work on a number of specific projects by officers of the Division was continued and included the setting up of an accounting procedure for farm woodlots, a study of the potential role of forestry in rural development for purposes of the Agricultural Rehabilitation and Development Act, a study of the forest economy of Prince Edward Island, a study of recommended tax changes that would modify the taxing of income attributable to timber growth, and a study of the economics of a privately owned plantation.

Summary economic data of forestry and the forest industries of Canada are given in Tables 1 to 4 of the Appendix.





**ADMINISTRATION BRANCH**

*Transferring forest detail from air photographs  
to a base map with an auto-focussing projector.*

# ADMINISTRATION BRANCH

## INTRODUCTION

Briefly stated, the Administration Branch includes those units of the Department which are not engaged in scientific research or economic studies. It is composed of five divisions; namely, Provincial Agreements, Forest Management, Information and Technical Services, Personnel Services, and Administrative Services. The first two are operating divisions, being concerned respectively with the administration of federal-provincial cost-sharing agreements, and with forest surveys and other aspects of forest management on federally administered lands. The third includes both operating and servicing functions, in that as well as providing a program of public information in forestry it provides library, editorial and technical services (such as drafting) to the Department. The last two divisions, as their names imply, are essentially servicing elements for the Department as a whole.

Under the federal-provincial forestry agreements nearly \$7,500,000 was contributed to the provinces by the Government of Canada in 1962-63 with respect to provincially administered programs of forest inventory, reforestation, fire protection, forest access, and stand improvement. In addition, some \$190,000 was paid toward the cost of the aerial spraying operation against the spruce budworm in New Brunswick, and \$236,000 in support of a special program of stand improvement, designed to provide work for unemployed coal miners in Nova Scotia.

Further progress was made in the preparation of forest maps for the Northern Territories, and inventory surveys were conducted on a number of Indian Reserves in the Maritime Provinces. Revenue from timber sold at Camp Gagetown, N.B., since the Camp was established in 1954, now exceeds \$300,000. Co-operation with the External Aid Office in administering forest surveys carried out by Canadians in other countries under technical assistance programs is assuming increasing importance as a forest management activity.

Information and Technical Services have been seriously affected by restrictions on staff recruitment and funds. Nevertheless a good start has been made, with the facilities available, in developing an information program designed to impress upon the people of Canada the importance of the forest resources to our national well-being.

## PROVINCIAL AGREEMENTS

The Provincial Agreements Section administers the federal-provincial forestry agreements which provide federal financial assistance to the provinces in five fields of forestry work. This assistance program was initiated in 1951 in the fields of forest inventory and reforestation; in 1957 forest fire protection was included

and in 1958 the construction of forest access roads. In 1962 new agreements were entered into with the provinces covering the same four fields of work and also including stand improvement operations. Under the new agreement, which covers a two-year period terminating on March 31, 1964, a total of \$7,910,000 of federal funds is provided annually and this sum is allocated among the provinces pro rata with their productive forest areas.

#### FOREST INVENTORIES\*

Under the terms of the present agreements, assistance is available to the provinces for reconnaissance, provincial, maintenance, and management type inventories. The Federal Government pays half the cost of the approved inventory work being done in the seven participating provinces.

At the present time most provinces are involved in management type surveys designed to provide information for relatively small areas in sufficient detail for the preparation of sustained yield management plans. In addition each province is maintaining its overall provincial inventory by incorporating the detailed management data into the provincial summaries and also adjusting these summaries from growth and depletion records.

#### REFORESTATION\*\*

All provincial reforestation work carried out on Crown lands or public authority lands under the control of the Province for reforestation purposes, is sharable. The Federal Government reimburses the provinces to the extent of \$15.00 per thousand trees planted, \$4.00 per acre seeded with ground preparation, and \$2.00 per acre seeded without ground preparation. In addition, the Federal Government pays one-quarter of the cost of establishing and operating new nurseries. In the case of Prince Edward Island, 50 per cent of the cost of reforesting lands unsuitable for agriculture is contributed.

In 1962-63 payments were made to seven provinces for the planting of over 36 million trees on 56,000 acres. Four provinces claimed assistance for seeding operations on 9,000 acres and in addition new nurseries were contributed to in three provinces. Since 1951 the Federal Government has shared in the planting of 178 million trees and the seeding of approximately 22,000 acres. Fifteen new nurseries have been constructed under the agreements.

#### FOREST FIRE PROTECTION\*

All provinces in 1962-63, participated under the fire protection section of the agreements. The Federal Government shares in provincial capital expenditures for the improvement of prevention, detection, and suppression facilities and also shares in the hiring of aircraft required for protection purposes. It is interesting to note that since the implementation of fire protection assistance in 1957 there has been a continued trend towards increased use of aircraft by the provinces.

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\*see Appendix, Table 5.

\*\*see Appendix, Tables 5 and 6.

Several provinces have purchased aircraft and helicopters under the agreements to be used for patrol, transportation, and water dropping purposes. Other provinces have adopted the policy of chartering aircraft during the fire season. Out of a total of \$2,126,400 paid to the provinces in 1962-63, more than one-third was claimed for aircraft charter.

#### FOREST ACCESS PROJECTS\*

Under the provisions of the agreements the provinces may not claim more than 60 per cent of their allotments for other than forest access projects. In effect, a province may claim its entire allotment for access projects, but must claim a minimum of 40 per cent for this form of work if it wishes to claim its entire share of the federal funds. The requirements for improved access vary between regions; some provinces have not met the minimum requirement of 40 per cent while others have far exceeded it.

In 1962-63 nine provinces claimed a total of more than \$3.5 million for forest access projects, representing 50 per cent of their expenditures. Construction was undertaken on 149 roads and 10 airstrips. The majority of the roads serve to open up hitherto inaccessible forest areas for extraction purposes; in all cases they serve to provide more rapid access for fire protection. The airstrips are primarily for protection purposes.

#### STAND IMPROVEMENT OPERATIONS\*

Only six provinces claimed under the stand improvement section of the agreements as in most cases expenditures in other fields of work were sufficient to utilize the available federal funds. This form of work is 50 per cent sharable and the total federal contribution amounted to \$225,000. Sharable projects include cleaning, thinning, pruning, and release operations designed to promote increased growth of a stand or improve individual tree quality.

In 1962-63 the Federal Government continued to share, under a special agreement, in a program of stand improvement work in Nova Scotia designed to provide employment for miners on Cape Breton Island affected by the closure of several coal mines. Under this special agreement, the Federal Government contributed \$236,000 in 1962-63 and employment was provided for approximately 150 men.

#### AERIAL SPRAYING OPERATIONS — NEW BRUNSWICK\*\*

To prevent widespread mortality, a spraying operation against the spruce budworm was again carried out in 1962. This program was initially planned to cover about one million acres, however, when the operation was underway, an additional area of 365,000 acres was found to contain a dangerously high insect population. This area was then added to the spray program.

All spraying operations are conducted by a provincial Crown corporation — Forest Protection Limited. The Federal Government contributes one-third of the

\*see Appendix, Table 7.

\*\*see Appendix, Table 8.

cost and the remainder is shared equally between the province and industry. The federal contribution in 1962-63 amounted to \$190,000.

Post-spray surveys in 1962 indicated a general decline in egg-mass population, however, areas totalling 400,000 acres in central and eastern New Brunswick have residual populations sufficient to cause severe defoliation in 1963. It is proposed to continue spraying operations on this area in 1963.

## FOREST MANAGEMENT

### FOREST INVENTORY IN THE TERRITORIES

There were no field surveys in the Territories during the summer of 1962.

Following the site and growth observations on the Upper Liard river during the summer of 1961 about 1,250 square miles have been mapped on a scale of 20 chains to the inch, incorporating five site productivity classes in addition to forest cover and merchantability classes. This type of mapping is the basic step towards management of these northern forests.

About 52,000 square miles of the reconnaissance forest cover mapping of the Yukon Territory has been completed on the topographic 1:250,000 series and lithographing 10 of these map sheets is now underway.

### FOREST INVENTORY — NATIONAL PARKS

Forest cover mapping of the 1,000 square mile Riding Mountain National Park is more than half completed, with 25 of the 40 new map sheets at a scale of 20 chains to the inch now available.

Forest cover maps at a scale of 40 chains to the inch were prepared of all of the Mountain Creek watershed and portions of the Beaver Creek watershed, Glacier National Park to appraise existing timber berths along the new Trans-Canada highway.

### FOREST INVENTORY — INDIAN RESERVES

Maps and plot summaries were completed for the most important of the eight Indian reserves in Ontario cruised during the summer of 1961. A report was prepared for Indian reserve #30, Christian Islands, emphasizing the possibility of income from tourists, use of the excellent beaches, charcoal burning and pulpwood sales from inferior quality hardwoods in addition to timber quantities and cutting possibilities. Reports of this type are needed on all reserves surveyed.

Eight Indian reserves in New Brunswick and two in Nova Scotia were surveyed during the summer of 1962.

### CAMP GAGETOWN

Fire crews of the four districts now compete annually in a set course of pump starting, hose laying, and fire line construction. This friendly rivalry in



addition to the regular fire drills helps to maintain morale and efficiency. In the annual fire-prevention week a demonstration of smoke detection and reporting was made by amplifying 3-station radio conversation over a public address system and plotting the bearings on a map as reported.

Porcupines are damaging merchantable timber. Following a concerted program initiated by the New Brunswick Department of Lands and Mines, 93 porcupines were shot. White pine weevil spraying as recommended by the entomologists was started on a small scale. Blister-rust is not very severe and risk of infection is said to be reduced by pruning so this will also be done when possible.

New road construction amounted to 12.0 miles, improved for truck hauling 32.4 miles. The winter works program slowed down as a result of the heavy snow which closed off certain branch roads. Some 300 cords of pulpwood were cut in stand improvement projects.

In spite of the heavy snowfall and bad weather early in the winter the total cut amounted to 11,000 cunits, only 2,000 short of the record last year. The cut included 1.1 million fbm of saw logs, 8,100 cords of pulpwood, (the highest yet) 1,200 cords of fuelwood, 1,340 poles and 140 cords of spoolwood. Christmas tree cutting picked up with 5,000 bundles. Christmas tree cutters are considering balsam fir culture to compete more advantageously in this market. Total sales, including semi-manufactured wood and stumpage amounted to \$51,686.00.

#### OTHER MILITARY AREAS

Thinning by permit in the 30-year old pine plantations at Camp Borden produced 1,100 cords of pulpwood and 200 poles. Cutting every other row yields about 11 cords per acre. A stand of mature elm growing on the river flats logged by two timber sale operators produced 531,500 fbm of lumber. The firing range was closed in December and January to permit logging through co-operation of the Camp Commander.

Pulpwood selection cutting by permit as planned for the McGivney Ordnance Depot in New Brunswick had to be deferred because of excessive snow depth. A single permit for 5 thousand fbm at the Newcastle Rifle Range was completed.

#### TIMBER PRODUCTION ON FEDERAL LANDS

The total volume of wood cut on Federal lands in 1961-62 amounting to 293,988 cunits was down 5% from last year. Indian reserves accounted for 73% of the total, saw and veneer logs for 44% (64.3 million fbm) mostly from B.C. and Alberta, pulpwood 19% (65,600 cords) mostly from Ontario, fuelwood 30% mostly from the west, and other roundwood 7%. Tables 9 and 10 in the Appendix show the quantity of wood cut in the last two years by federal agency and product.

#### OVERSEAS SURVEYS

As mentioned in the 1962 report the Department is acting as advisor to the External Aid Office in overseas surveys. The field work in the 969 square miles of the Chittagong Hill Tracts, East Pakistan, was completed in January 1963.

The survey crews, mostly Pakistani personnel being trained in Canadian methods, have established about 4,600 half acre plots for stand and volume data. Compilation has been completed for one of the two forest reserves.

The forest survey on the Island of Dominica, B.W.I., was completed in June. The possibilities for a veneer and saw mill are being explored by the Government of Dominica to utilize the considerable quantity of timber indicated by the survey. A dozen logs of gommier, the most important species, were brought to Canada, peeled and the plywood samples show a very pleasing light coloured grain. Arrangements are being made for a comprehensive market test.

A survey of the 4,000 square mile Kenya forest began in January 1963. Two Canadian firms are making the survey which is also being used to train local men in inventory methods. As a result of the feasibility study recommended by the Department a year ago it was much easier to draw up the contract and decide what had to be done.

#### PUBLICATIONS

No publications were issued this year but papers on Point Sampling and Forest Survey in Canada are underway.

#### INFORMATION AND TECHNICAL SERVICES

This fiscal year marked the real beginning of operations for this new division, incorporating the existing functions of departmental library services, editorial services, mapping and draughting services, and including a new public information section. Restrictions on the hiring of the specialized staff required to meet the need for expansion of these services had a profound effect on the rate of development of the division during the year. The art and graphic section, planned as part of the division, remained completely without staff and serious staff deficiencies in three of the other four sections had their effect. In spite of this, however, some basic progress was made.

#### PUBLIC INFORMATION

In the areas of press, radio, and television liaison during the year, 37 formal items in both English and French were released on such subjects as federal-provincial forestry agreements, forest spraying operations and insect and disease control, forest fire statistics and research, the industrial liaison service, and various other categories of departmental work. The high level of interest in national forestry matters amongst the communication media was manifest by the wide coverage afforded this material. The Department is most appreciative of this co-operation.

Arrangements were made with various television stations to feature senior members of the Department on resource programs and particularly wide coverage was given a special fire-suppression film clip prepared in co-operation with the National Film Board. Also in co-operation with the National Film Board and various Provincial forest authorities, a new, 16 m.m. sound, colour motion

picture production "Aircraft in Forest Fire Control", was completed in both English and French. In addition, a new one-minute film clip in English and French, on fire suppression for circulation to T.V. and theatre outlets during the 1963 fire season was completed. A start has been made on the development of a Departmental film lending library for the use of the forestry community, schools, and all interested groups.

Over 60,000 copies of various lay publications on forestry were distributed in response to requests received, plus 41,000 copies of research and technical publications directed specifically to the forest industry and profession in Canada and abroad.

Special displays were prepared for use at the World Meteorological Conference in Toronto, for display in downtown Ottawa in conjunction with the White Pine Bureau of the Canadian Lumbermen's Association, and for use at a large Agricultural Exhibition in England.

As in the past, 15,000 copies of the prize-winning forest fire prevention poster were prepared from the original design sponsored by the Canadian Forestry Association, and displayed with the co-operation of the Post Office Department across Canada.

Considerable co-operative effort was directed towards assisting the Canadian Wood Development Council with National Forest Products Week, and the Canadian Forestry Association with National Forest Conservation Week.

During the year, the Section received and dealt with a total of 3,676 individual written enquiries from the public, an increase of some 25 per cent over the previous year.

#### DEPARTMENTAL LIBRARY

During the year, the supervising librarian completed a preliminary tour of examination of the 12 regional libraries located at Departmental field establishments across Canada. As a result, plans are now underway to introduce greater co-ordination of library administration for the purpose of improving service.

Work has started on the compilation of a union catalogue of books for the whole Department and preliminary effort is being directed towards the setting up of an automatic circulation system of periodicals to research staff of the Department across the country.

It continues to be necessary for the Central Departmental Library in Ottawa to receive major assistance, which is gratefully acknowledged, from the library staffs of the Department of Agriculture and the National Research Council.

#### MAPPING AND DRAUGHTING

During the year work was completed on a map of Camp Petawawa and the Forest Experiment Station area, to be lithographed in colour, and a special map for the 1961-62 Departmental annual report. Also, mapping work continues on forest inventory work of the Riding Mountain National Park, Upper Liard and Lower Slave River areas, a forest vegetation map of Labrador, a revision of the forest classification map of Canada, and the revision of the Pulp and Paper Industry map of Canada.

In addition, a large number of special draughting and design projects were undertaken in the form of statistical, organization, personnel, and functional charts, area grids, and publication covers, plus the designing of public displays and crests.

The reproduction unit of the Section handled some 600 orders for photo-reproduction during the year and introduced new time- and money-saving procedures that were officially recognized by the Civil Service Suggestion Award Organization.

#### EDITORIAL

Consistent with the departmental policy to expand services in both French and English, all Departmental publications and most articles submitted to scientific journals now include a summary in the other language. Public response to this innovation has resulted in increased distribution and use being made of these published works.

Administrative procedures have been streamlined, and the eight different types of Departmental publications previously issued by the branches are now issued as a single series. All such publications now bear a Department of Forestry Publication Number as well as the manuscript contribution number. In the case of each French edition the Department Number is suffixed with an "F" i.e. 1000F.

Table 11 in the Appendix indicates the volume and diversity of publication activity during 1962-63.

#### PERSONNEL SERVICES

Personnel Services is responsible for advising and assisting in formulating and administering personnel policies, regulations, and procedures in consultation with Departmental officers, to ensure the adequacy of recruitment, promotion and reclassification programs and to administer staff pay, leave, attendance, and employee benefits.

A total of 101 appointments were made during the fiscal year, 22 of which were professional appointments; this was accompanied by 108 separations, 27 of them being in professional classes. A total of 158 promotions were also made, including 46 professionals.

The Departmental establishment comprised 1,108 full-time and 411 seasonal positions for an over-all total of 1,519 positions. Austerity measures imposed in June resulted in a total staff strength of 992 full-time employees at the close of the fiscal year.

#### ADMINISTRATIVE SERVICES

The "Administrative Services" division is responsible for the development, co-ordination and direction of financial, purchasing and property management activities and procedures as well as the general administration services required at both the Departmental and Branch level. Its main rôle is that of servicing the Research Branches in their administrative requirements and developing and

co-ordinating administrative policies and procedures on a consistent departmental basis.

During 1962-63 progress was made in development and application of administrative policies and practices.

Under a Chief, Administrative Services, the division is organized into four sections, on a functional basis:

1. *Financial Services*: responsible for the administration and co-ordination of the Department's financial operations covering such areas as development and implementation of financial policies, estimates, budgetary control and revenues, management accounting and financial reports, and administration of regulations having financial content.

2. *Purchasing*: concerned with all purchasing and procurement activities in the Department including the development of policies and procedures governing procurement both at Headquarters and in the field.

3. *Property Management*: responsible for all aspects of property management, with particular emphasis on the development of Departmental accommodation requirements. The section is also responsible for internal space management, maintenance and operation of buildings, acquisition of land, and control of Departmental stores including inventories and disposal. The section provides liaison with the Department of Public Works for construction and major renovation projects and carries the immediate responsibility for normal maintenance.

4. *General Administration*: responsible for the normal administration and general "housekeeping" associated with departmental activities, including the Central Registry, mail, messenger and other communication services, stenographic services, administrative co-ordination of travel, etc.



**FOREST RESEARCH BRANCH**



*Seedlings prepared for bullet planting. — The high cost of planting has resulted in extensive research and experimentation in new planting methods.*

# FOREST RESEARCH BRANCH

## INTRODUCTION

The research conducted by this Branch contributes to the development of Canadian forestry in two ways: firstly, by providing basic information on the characteristic occurrence, growth, development and behaviour of tree species throughout the wide range of forest types and environmental conditions in the various forest regions of Canada; and secondly, by developing and testing new or improved methods for use in forest management and forest fire control. Results are made available through publications, instructions, training, technical assistance, demonstration of new or improved methods and practices. Many of the studies are conducted in co-operation with other Federal departments, provincial forest authorities, other research agencies, universities and industrial companies.

The research program of the Branch is conducted through seven district offices located at Victoria, British Columbia; Calgary, Alberta; Winnipeg, Manitoba; Richmond Hill, Ontario; Quebec, Quebec; Fredericton, New Brunswick; and St. John's, Newfoundland. Most of the staff of the Branch are located at these district offices and at the Petawawa Forest Experiment Station, Chalk River, Ontario. In addition, a group of Research Officers at Ottawa deals with the specialized aspects of research in forest fire and in forest inventories.

During the past year, the Forest Research Branch establishment was composed, on a full-time basis, of 110 research officers assisted by 72 technicians and a supporting administrative, clerical, labour and maintenance staff of 102. In addition, there was a seasonal staff of 191 composed of students, technicians and labourers, to assist in various aspects of the field program and maintenance.

This Report deals only with some of the more important highlights of the research program for 1962-63. Details of the program may be found in the Annual Report of the Forest Research Branch for the year ended March 31, 1963.

## SILVICULTURE AND MANAGEMENT

The objective of research in silviculture and management is to provide the basic information necessary for the continuous production of sufficient forest products to sustain an efficient and competitive forest industry while maintaining or improving the productive capacity of the forest land. The immediate problems to be solved in achieving this goal are the inadequate reproduction of preferred species and the limited availability of high quality wood. While substantial progress has been made through the development of methods of seedbed preparation, seed supply manipulation, planting techniques, thinning and pruning schedules and early recognition of quality trees, it is evident that a deeper knowledge of the

influence of variable annual climate and local environmental complexes is required. Silvicultural research in the Department is being directed toward such refinements. New techniques of planting younger seedlings with a minimum of disturbance to the plant are being tested. Selective methods of seedbed preparation are under investigation. More intensive regimes of thinning are being studied. Methods of selection and stimulation of growth in high quality trees are receiving attention.

The results of current research indicate the overwinter mortality of seedlings is greater than hitherto suspected and that flooding for short periods as a result of unsatisfactory methods of seedbed preparation can be a local problem. High temperatures have been identified as an important cause of seedling mortality in mountainous topography, Low soil temperatures inhibiting root development of seedlings have been noted in some eastern Canadian forests. Investigations have been undertaken to develop corrective measures for such conditions.

New projects of particular interest include: the testing of planting methods for southern hardwood species in Ontario; the restocking of burned lands in Newfoundland; the use of prescribed burning in preparing seedbeds in Manitoba, and the study of lethal temperatures for important commercial species. Selective control of light through cutting practices is being investigated as a means of controlling weevil damage in white pine.

The synthesis of results on a national basis of numerous old projects on various subjects is being carried out as an initial step in developing strong nation-wide research programs for the major forest cover types.

## MENSURATION

Research in forest mensuration is designed to provide methods of measuring and analyzing growth and yield data for significant forest conditions. The analysis of long-term growth data from the Maritime Provinces indicates an appreciably higher growth potential under intensive management than is currently being utilized. Tables indicating recoverable volumes of wood for individual plantation grown red pine were developed. Yield and growth tables were prepared for black spruce stands in Manitoba and Newfoundland. A formula method of calculating stand growth elements from tree volume equations and individual tree measurements was developed. New studies of individual tree growth characteristics were initiated and a test of the applicability of the Bitterlich angle method of stand volume determination is being initiated in Alberta.

An increasing volume of field data has intensified the use of data processing facilities and has led to the application of machine methods to a wider range of mensurational problems.

## TREE BIOLOGY

The study of the biological characteristics of trees important to Canadian forestry is a continuing program. Research on the seed production of conifers has confirmed that root pruning induces flowering in spruce and that certain nitrogenous fertilizers can have an appreciable and continuing effect on cone production

of Douglas fir. Physiological reasons for these observations are being sought in studies of growth-promoting and growth-inhibiting substances, and of stored food reserves, in buds, needles, twigs and bark.

Tree improvement work is centred at the Petawawa Forest Experiment Station, but with co-operators in all the districts. The aims of the program, focussed on the spruces and two-needled pines, are to determine what geographic variations of growth rate and form exist, to select and breed trees of good quality adapted to specific Canadian conditions, and to develop useful tree breeding techniques. Extensive provenance tests of white spruce and pine, and many hybridization trials with these and other species, are underway. For example, a promising cross between black spruce and red spruce has been produced, which shows a superior growth rate compared with either parent.

Various ecological investigations of native trees have continued from Newfoundland to British Columbia, with particular attention to the influences of fluctuating temperature, light and moisture on survival of seeds and seedlings. Recognition of the importance of the below-ground parts of trees has led to studies of the rooting habits of spruce, aspen, sugar maple and yellow birch. Total solar radiation was measured under canopies of fir and pine, and in experimental shelters the growth of twenty species was examined in relation to four levels of light intensity. An interesting finding has been that so-called "intolerant" trees continue to grow rapidly in the shade so long as they are not exposed to root competition from neighbouring plants. Soil moisture regime, known to be a critical factor for forest regeneration, was the subject of several experiments both in the field and in controlled-moisture tanks in the greenhouse.

New information on the taxonomy of forest species was collected, contributing toward preparation of a key to the tree seedlings. In addition to studies of native varieties of poplar, an examination of one of the birch complexes was begun.

## FORESTS AND FOREST LAND

The inventory of forest land and of its potentialities for the production of forest products is increasingly important in Canada. In co-operation with provincial forestry organizations and other Federal departments, pilot-scale surveys of forest land are being made by the Research Branch in the western provinces. Landtype maps have been prepared for several areas as a basis for land-use planning and forest management.

A classification of forest types of Newfoundland was completed, and a five-year survey of the forests of Labrador was summarized for publication. In southern Manitoba and in southern Quebec, descriptions of important habitat types and forest communities were also completed. At several Research Stations new "Natural Areas" of scientific and aesthetic value were established; on these, studies of forest development and succession were initiated.

Research in the important field of forest soils has expanded, stimulated by public interest in the forestation of abandoned farm land and in plantation management. Basic studies of the long-term effects of trees on soils have continued, as have examinations of the effects of fertilization regimes on conifer seedlings in

nurseries. Characteristics of some podzolic soils in Newfoundland, Ontario and Quebec have been studied, and in Alberta a special project was completed relating tree growth and soil sites through the use of multiple regression techniques.

The program of watershed research on the east slopes of the Rocky Mountains is co-operative between the Forest Research Branch and other Federal and provincial government agencies; it is designed to safeguard the water resources of the Saskatchewan drainage basin. Co-ordination of the joint program is proceeding smoothly, with formulation of research plans for the Marmot Creek watershed, the first area to be intensively studied as to climate, soils, geology, vegetation and hydrology.

### FOREST INVENTORIES

Research in the field of photo mensuration showed continued progress with the greatest advances being made in the use of large-scale photography. The use of faster shutter speeds up to 1/3,000 sec. has resulted in greater negative sharpness permitting high quality enlargements on a scale of 25 feet to one inch. Methods were developed to control the photo scale in determining sample plot boundaries on the photos. Averages of tree height measurements made on the photos showed an accuracy of  $\pm 6$  inches when checked by field measurement. Further work will attempt to determine individual tree and sample plot volumes from photo measurements of tree height and crown factors. Large-scale photographs in colour were also used to assist in the detection of balsam fir "die-back".

### FOREST FIRE CONTROL

Adequate protection of forests against fire is essential not only to conserve the resources, but also to encourage good forest management by providing security against destruction, by fire, of improvements and other investments made in the forests by governments and industries.

Research in the field of forest fire danger rating continues to be a most important phase of the work. Fire danger tables for the Northwest Territories were completed in time for use at the outset of the 1963 fire season. A new, circular, slide-rule-type fire danger index meter was prepared and published for one province, and prepared in unpublished form for several other provinces. The development of a mechanical fire danger meter, being undertaken in co-operation with the National Research Council, continues to progress.

Advancement was made towards standardizing methods of reporting forest fire loss statistics, data that provide essential information for operational and research groups alike. Long-term studies of fire damage appraisal systems were started with a view towards developing an economically sound appraisal method that would be acceptable to all provinces.

The relative flammability of spruce, balsam and Scots pine when used as Christmas trees was investigated and the publication describing the results (and telling how to make all Christmas trees practically nonflammable) proved to be so popular that three printings were used. Additional work is now being done on the subject to complete the proposed program.

The importance of logging slash as a fuel for forest fires is well recognized; an increasing amount of research effort is now being devoted to the subject, and field work for a major project on it (in British Columbia) was completed. Analyses of the field data indicate, among other things, that the effect of slope angle on slash moisture, over a wide range of slopes, was not of practical significance.





**FOREST ENTOMOLOGY  
AND PATHOLOGY BRANCH**

*Dead Western Hemlock Showing Dwarf Mistletoe.  
—Insects and tree diseases are the cause each  
year of considerable losses in Canadian forests.  
Research, surveys and preventative measures mi-  
nimize and eliminate these scourges.*

# FOREST ENTOMOLOGY AND PATHOLOGY BRANCH

## INTRODUCTION

The Forest Entomology and Pathology Branch conducts forest insect and disease research and surveys throughout Canada. The Branch also provides technical advisory services to provincial forestry departments, industrial firms and associations, private owners and other agencies concerned with control of insects and diseases affecting forests, woodlots and shade trees. Details of the Branch program may be found in the Annual Report, Forest Entomology and Pathology Branch, for the year ended March 31, 1963.

Research, surveys, and advisory services are closely inter-related activities that are performed by specially trained staff at regional laboratories located at Corner Brook, Newfoundland; Debert, Nova Scotia; Fredericton, New Brunswick; Quebec, Quebec; Maple (Toronto) and Sault Ste. Marie, Ontario; Winnipeg, Manitoba; Saskatoon, Saskatchewan; Calgary, Alberta; and Vernon and Victoria, British Columbia. In addition to the work of the regional laboratories, investigations in cytology and genetics, bioclimatology, and chemical control of wide general interest and applicability, are carried out by three subject-matter sections located at Sault Ste. Marie, Victoria and Ottawa, respectively. Fundamental studies in insect pathology are carried out by the Insect Pathology Research Institute, at Sault Ste. Marie, which also co-operates with regional laboratories in problems relating to the use of insect pathogens as biological control agents. The Statistical Research Service collaborates with all three research branches of the Department in the application of mathematics, statistics and electronic computer techniques toward the solution of complex research problems. The whole program of the Branch is directed and co-ordinated on a national scale by Branch Headquarters in Ottawa.

The establishment of the Branch in the fiscal year 1962-63 comprised 180 professional employees, 304 other year-round employees, and 162 seasonals, for a total of 646. Headquarters functions were performed by nine professional and seven other year-round employees. Under the co-operative research fellowship program sponsored by the National Research Council, three postdoctorate fellows were associated with the Forest Entomology and Pathology Branch in the fiscal year 1962-63. One Japanese "fellow" concluded a two-year research project with the Cytology and Genetics Section at Sault Ste. Marie; a Yugoslav "fellow" completed the first year of a two-year research project on insect population dynamics at the Fredericton laboratory; and a Japanese "fellow" completed the first year of a two-year project on tree rusts at the Victoria laboratory.

The work programs undertaken by the Branch are based on careful reviews of forest insect and disease problems in the different regions of Canada, continuing appraisals of the need for additional information to be obtained through surveys and research, and periodic consultations with provincial forestry departments, industry, and other Federal departments and agencies.

Because of the affinities between entomological and pathological problems in Forestry and in Agriculture, members of the Forest Entomology and Pathology Branch maintained close contacts with their counterparts in the Department of Agriculture, especially in relation to taxonomic services provided by institutes of the Research Branch of the latter department, and in relation to biological control of insect pests through the introduction of parasites and predators. In the field of chemical control, the Branch continued its collaboration with the Fisheries Department, the Fisheries Research Board and the Canadian Wildlife Service, though the Interdepartmental Committee on Forest Spraying Operations, which reviews forest insect infestations requiring direct control action, promotes research projects aimed at discovery of control measures less hazardous to fish and wildlife, and recommends the adoption of results of such research in large-scale control operations. Increased co-operation on forest insect and disease problems on a continental scale is one of the objectives of the newly established North American Forestry Commission, operating under the aegis of the Food and Agriculture Organization. A Working Group on Forest Insects and Diseases was set up in 1961 with membership drawn from Canada, the United States and Mexico, to arrange for greater exchange of information and for co-operative effort, wherever possible, in research, control, and quarantine procedures. Two senior officers of the Forest Entomology and Pathology Branch participate in the activities of the Working Group, which met in Ottawa in April and in Washington in October of 1962, and laid the foundations for an analytical review of the major problems in forest entomology and pathology, and quarantine services related thereto, that are of mutual concern to two or more of the three member countries. In the realm of wider international co-operation on forest insect and disease problems, members of Branch Headquarters participated in the work of two study groups set up by the International Union of Forest Research Organizations aimed at reducing hazard from insects and tree diseases involved in the movement of tree species among different continents.

#### FOREST INSECT AND DISEASE SURVEY

The Forest Insect and Disease Survey handled 26,000 insect collections and 10,000 disease collections at regional survey centres in 1962. To complement the biological data derived from the collections, ground and aerial surveys were carried out to obtain information on areas of outbreaks and to assess the degree of hazard in cases where control measures might be warranted.

An intensive balsam woolly aphid survey including both ground and aerial observations was conducted over most of the forest areas of Newfoundland. The work involved close operation between the Forestry Division of the Provincial Department of Mines, Agriculture, and Resources, the pulp and paper industries, and the Forest Entomology and Pathology Branch. The survey discovered two

additional infestations and disclosed that the insects were present over an area of 3,600 square miles or approximately 20 per cent of Newfoundland's forests.

Spruce budworm infestations continued with some intensification in northern Manitoba and Saskatchewan and along the Slave, Liard, and Mackenzie rivers in northern Alberta and the Northwest Territories. In British Columbia numbers increased along the Alaska Highway and in the Kitimat area. Infestations in New Brunswick and Quebec continued to decline.

Outbreaks of the forest tent caterpillar expanded in many parts of the country. The most serious of these extended in a wide band across northwestern Ontario, Manitoba, Saskatchewan, and Alberta. In these provinces, trembling aspen and other deciduous hosts were defoliated in an area totalling roughly 150,000 square miles. Severe outbreaks are expected to continue through the central provinces in 1963.

Severe infestations of the larch sawfly persisted in Saskatchewan, Alberta, the Northwest Territories, and central Quebec. Population levels continued to decline in Ontario and were the lowest recorded in the past decade.

The Dutch elm disease continued to spread in Ontario, Quebec and New Brunswick. The disease progressed northward for about 50 miles on a broad front in Ontario, and was found in two additional counties in Quebec and in an additional one in New Brunswick.

Increases in the incidence or distribution of white pine blister rust were recorded in Ontario, Manitoba, and Alberta. The disease threatens to destroy limber pine stands in Alberta. This species has little commercial value, but it occurs on sites unsuited to any other tree species and has a significant effect on watershed stabilization.

The dying of balsam fir over large areas continued to attract considerable attention in Ontario, Manitoba, and Saskatchewan. A complex of factors including adverse weather conditions appears to be involved in this mortality.

## RESEARCH PROGRAM

Programs of basic research on forest insect and disease problems are essential to establish adequate foundations for effective preventive or control measures. A very substantial part of these programs is conducted at the regional laboratories, where a combination of research, experimentation, and surveys is prerequisite to sound consultative and advisory services on control programs undertaken by the provinces and industry. As noted earlier, research in the highly specialized fields of cytology and genetics, insect pathology, bioclimatology, chemical control, and mathematical statistics and electronic computing, is conducted by subject-matter sections. Physiological studies are carried out to provide a fuller understanding of the physical and biotic requirements of pest species, and their interrelationships with their host trees. Studies of the population dynamics of certain pest species are being continued to discover the causes of population fluctuations from generation to generation. Investigations of the importance of native and introduced parasites and predators, climatic influences, characteristics of the forest stand,

and of insecticides, as factors affecting regulation of pest populations, are particularly revealing when they are incorporated as integral segments in more comprehensive studies of the population dynamics of the pest species.

The results of these programs of research are made available in Departmental reports and publications, and in notes and papers published in technical and trade journals. They are also reviewed in conferences for the exchange of new information, and serve as the basis for workshop discussions on control programs. A few of the highlights are brought out in the following paragraphs on important insect and disease problems.

#### SPRUCE BUDWORM

The spruce budworm is the most serious insect pest of coniferous forests in Canada, and occurs from Newfoundland to Vancouver Island, and north to the Mackenzie River in the Northwest Territories. Surveys of infestations are carried out annually throughout the range of budworm occurrence, but most of the recent intensive research on the problem has been conducted in the eastern provinces, particularly New Brunswick and Quebec. The results of long-term studies of the population dynamics during epidemics have been published, and comparable studies during the endemic phase are now in progress in the Green River area of New Brunswick. Especial attention is being directed to the influence of vertebrate and invertebrate predators during the endemic phase. In 1962, about 1.4 million acres of infested forest in central New Brunswick were sprayed with DDT at  $\frac{1}{4}$  pound per acre. About 30 per cent of the sprayed area was treated a second time to attain satisfactory control in areas of mixed balsam fir and red spruce. The cold wet weather of 1962, increased incidence of natural parasitism, and the budworm mortality resulting from the spray program led to a further reduction of the heavily infested area to about 360,000 acres in the fall of 1962, the lowest acreage since the early 1950's. Further trials with the insecticide Phosphamidon gave sufficiently encouraging results against the budworm, without injurious side-effects on aquatic life, to justify its operational use in the spray program of 1963. As a result of the sustained control program since 1952, the forest has come through the outbreak without serious timber mortality, in marked contrast with the consequences of earlier outbreaks in New Brunswick, and almost concurrent outbreaks in central Quebec and Ontario.

#### DECAYS AND ROOT ROTS

Decays and root rots cause extensive losses in Canadian forests. Earlier extensive Branch surveys of decay incidence in important timber species have largely been taken over by provincial forestry personnel, with advice and guidance being supplied by the Forest Entomology and Pathology Branch. Thus, research officers of the Branch are freed to concentrate on basic studies of decay development and ecological relationships. Studies of red heart rot in balsam fir have shown that infections are established through fresh wounds on living stems and branches and rarely through dead branches or branch stubs. These studies verify that stand history (fire, logging, weather, etc.) along with other factors of age and site must be considered in determining management procedures to reduce the significance

of decay losses. Living tissues exposed through untimely pruning of living branches could become important entry courts for red heart decay. In some timber species and localities, direct losses from trunk decays are less important than tree mortality or windthrow resulting from root and butt rots. Research on root rots is being undertaken in Ontario, Saskatchewan, and British Columbia, as a guide to forest management practices.

#### BALSAM WOOLLY APHID

Infestations of the balsam woolly aphid, which occur in a limited area in southwestern British Columbia, and extensively in the Atlantic Provinces, have become much more serious in Newfoundland during the past two years and are regarded as a primary threat to long-term economic production of balsam fir pulpwood in that Province. Rather small infestations in the southeast portion of Newfoundland have been relatively static, but in western Newfoundland there has been continued enlargement of the infestation which now occupies some 3,000 square miles. Scattered infestations have been recently discovered in the central part of the Province.

Attempts at biological control of the woolly aphid through introductions of predacious insects have been continued. Three species of introduced predators have become established in Newfoundland, four species in New Brunswick, and two species in British Columbia. Although it is too early to assess the value of these predators as control agents, results to date are somewhat encouraging and the program of introductions is being continued. The protection afforded to the aphids by their waxy coating, and the potentiality of serious "gout" developing as a result of attack by even relatively small numbers of aphids, are factors that militate against the use of conventional insecticides. However, exploratory studies on the use of several systemic insecticides are being carried out in 1963, utilizing applications from ground-based equipment. Basic biological studies of the aphid and studies of tree and stand deterioration following aphid attack are being intensified.

#### DUTCH ELM DISEASE

Prompt removal of dead and dying elms and spraying with DDT to control the beetle vectors will markedly reduce the incidence of the Dutch elm disease. However, work is in progress to obtain information on the effectiveness of sanitation programs and of DDT spraying alone or in combination. Basic studies on the physiology of the causal fungus, the browning reaction that interferes with translocation in infected trees, and chemotherapy are being continued to find effective direct control measures. Recently, substances under test in Ontario have yielded results sufficiently encouraging to warrant expanded experimentation under greenhouse and field conditions. Studies in co-operation with the Department of Agriculture are directed toward the selection of resistant elms. Two elms resulting from irradiated seeds have remained disease-free despite annual inoculations with the causal fungus during the past seven years. Cuttings from these two trees have remained free of the disease following a number of inoculations. European elm

hybrids, resistant to the disease, are being propagated and tested for winter hardiness and resistance to native diseases.

#### DOUGLAS FIR BEETLE

Intensive studies on the biology and dispersal processes of the Douglas fir beetle in the southern interior of British Columbia have been combined with investigations of the population production capacity of different forms of logging slash, the resultant creation of beetle hazard, and the feasibility of effecting significant population reduction through the use of trap logs which are removed before maturing of the beetle brood. Some of the results of these studies have been employed in practical logging operations in the region, and have been incorporated in the terms of contract of relevant timber sales administered by the British Columbia Forest Service.

#### BLISTER RUST AND NEEDLE CAST

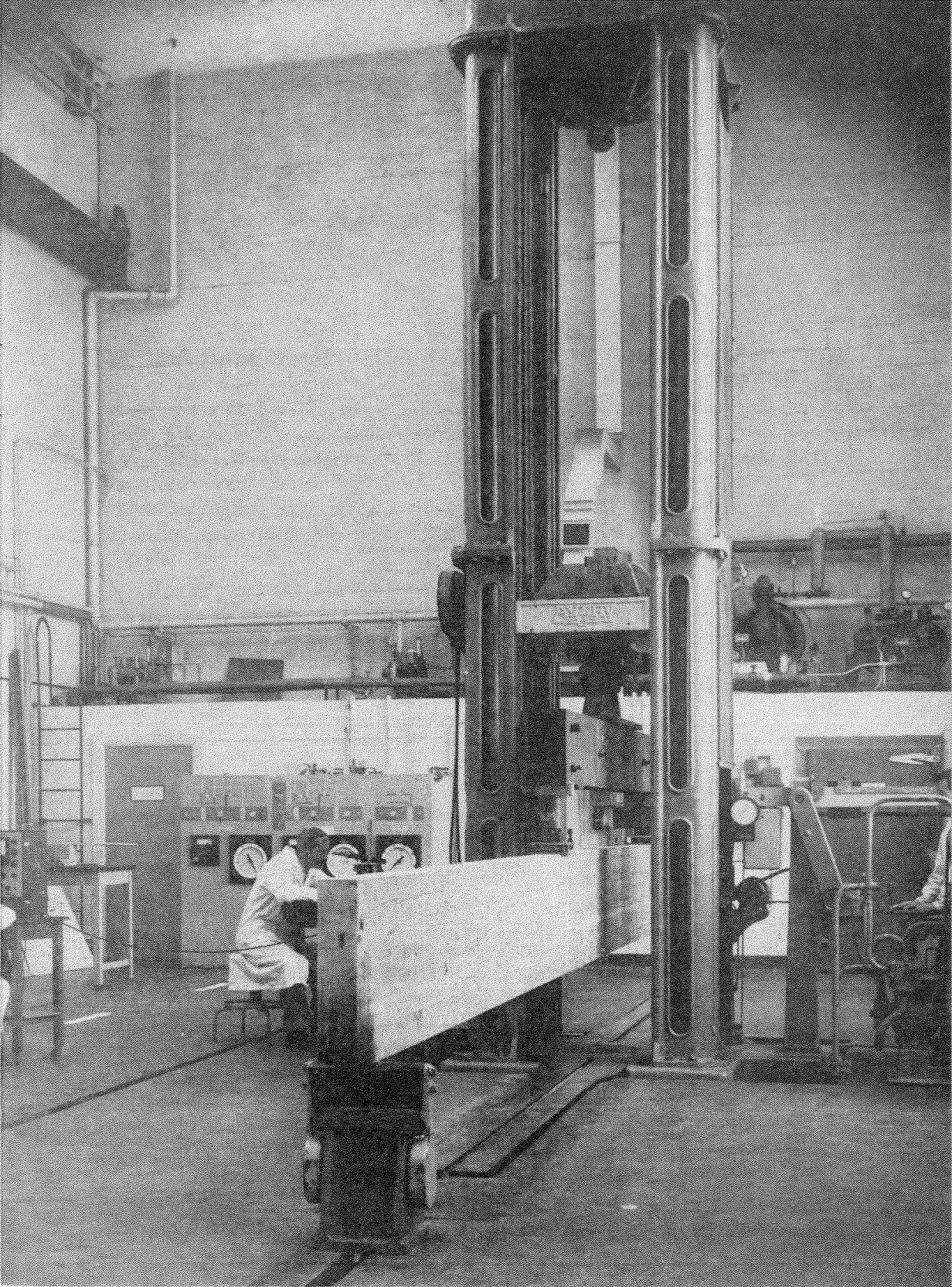
Studies are in progress to determine the effectiveness of systemic fungicides in the control of the white pine blister rust and the *Rhabdocline* needle cast of Douglas-fir. Phytoactin, and acti-dione and several of its derivatives are being applied as stem and foliar applications for white pine blister rust. In 1962, new formulations of these substances were applied as basal and foliar sprays in different concentrations and in several solvent-carrier combinations. Although earlier results were not encouraging, it appears that a measure of control is now being achieved under certain conditions. In experiments with Phytoactin on *Rhabdocline*-infected Douglas fir trees, in the East Kootenay region of British Columbia, needle cast was reduced to an acceptable level without injury to the trees.

#### PLANTATION AND REFORESTATION PROBLEMS

The increased emphasis on plantations and reforestation programs has been accompanied by a number of serious insect and disease problems. Some of the pest problems are caused by native species that flourish best under plantation conditions, while other pest species have been introduced from other continents. The latter include the European pine sawfly and the European pine shoot moth which occur in southwestern Ontario on Scots and red pine. Comprehensive studies of the biology and factors influencing population regulation are underway for both these species. Three native weevils, the pine root collar weevil, pales weevil, and northern pine weevil, are of concern to plantation owners in southern Ontario and southeastern Manitoba. Research studies are presently directed towards control through chemicals and improved cultural and management practices. Another species, the plantation weevil, has since 1961 been recognized as the cause of heavy losses of young transplants in the coastal area of British Columbia. Surveys to detect high hazard areas are in progress, paralleling studies on the biology of the weevil and chemical control through the use of seedling dips prior to planting, or of poison bait after planting. Plantation projects in southern Manitoba have been curtailed because of white grubs attacking the transplants. Studies of the species involved and their complex life cycles are in progress along with the testing of various cultural control methods.



*Fomes annosus* root rot was discovered in plantations in southwestern Ontario in 1955 and since that time has continued to spread in this area. Although its distribution is relatively restricted, it is regarded as a potentially dangerous pathogen on the basis of its destructiveness in Europe and the United States. Intensive surveys are being made to follow its spread, and studies are in progress to provide the necessary background for the development of biological and chemical control measures. Root rot caused by *Armillaria mellea* occurs in a number of Douglas fir plantations in British Columbia and plot studies have demonstrated that disease incidence has more than doubled in one area in a three-year period. This root rot fungus is important also in coniferous plantations in Ontario. Studies are being made on the spread of the fungus and on control measures. An outbreak of sweetfern blister rust caused by *Cronartium comptoniae* was discovered in plantations of Monterey and Bishop pine in British Columbia in 1961. Most of the infections have developed in the stems so that heavy future mortality can be expected. Until adequate surveys and studies are completed, further plantations of these species have been suspended.



**FOREST PRODUCTS  
RESEARCH BRANCH**

*Stress Testing a Beam. — With increasing knowledge of the physical properties of wood, laboratory research aims at discovering new uses for wood in industry.*

# FOREST PRODUCTS RESEARCH BRANCH

## INTRODUCTION

Studies of the Forest Products Research Branch as in past years were directed toward the more efficient utilization of wood, and to aiding in the continued advancement of Canada's forest industries. A broad program of basic and applied research included the mechanical, physical, chemical and anatomical properties of Canadian woods, the development of new and better uses for wood products, and improved manufacturing techniques. The results of this research received wide dissemination and were made available through various media to the thousands of plants comprising the timber manufacturing and wood-using industries of Canada.

The establishment of the Branch, with Headquarters staff in Ottawa, comprises an Industrial Liaison Service, a Technical Information Service, and research Laboratories located in Ottawa and Vancouver. During 1962-63, the Branch employed 69 professional personnel, 54 technicians and tradesmen, and 24 clerical staff in continuing positions. An additional 30 research workers were hired on a seasonal basis.

The year under report has been one of considerable progress and development. Although staff reductions necessitated some changes in the program originally planned, an active program of research was nevertheless performed. In general, emphasis continued to be placed on areas of research — both basic and applied — which would contribute to the more efficient use of Canadian woods and thereby be of assistance to the forest products industries.

## SPECIAL RESEARCH

During the year the first program of extramural research was initiated, which involved four universities undertaking selected research problems of direct interest to the Branch. Work on the four projects is being undertaken by graduate students of the universities concerned, on a two-year basis. It is expected that this extramural research will increase the potential of the Branch.

Of special interest was the initiation of research concerned with the improvement of the fire-resistant properties of wood and wood products. The program included the installation of an 8-foot fire tunnel at the Ottawa Laboratory and the initiation of studies on the flame-spread resistance of various species of Canadian woods, both treated and untreated.

The Vancouver Laboratory, in co-operation with the western red cedar shingle industry, commenced a search for weather-resistant fire-retardant treatment

for cedar shingles and shakes. A large number of potentially useful chemicals were submitted to screening tests and a few of these have shown promise justifying further investigation.

Effective April 1962, the Housing Standards, Canada, made mandatory the grade marking of lumber so as to permit the effective use of span tables (prepared by the Forest Products Research Branch as Technical Note No. 30, and incorporated as an appendix to the Housing Standards). This development, and the administration of the grade marking of Canadian lumber for export to the U.S.A. to meet the requirements of the Federal Housing Administration, continued to involve the Branch in considerable work during the year as it provided the Chairman and the Secretary for the Canadian Lumber Standards Administrative Board. Information was also provided on technical details concerned with the grade marking and the strength properties of Canadian woods as requested by the Federal Housing Administration in Washington, and the Central Mortgage and Housing Corporation in Ottawa.

#### INDUSTRIAL LIAISON

The Industrial Liaison Service Officers, now active in all provinces, continued their role of disseminating information and research findings through visits to industrial plants, government and association officials; attending meetings and conferences; presenting lectures and talks, participating in the FPRB courses on the application of research findings; and dealing with technical enquiries. The Officers in the various regions participated actively on industrial committees and were frequently represented on technical panels and group discussions. They continued to bring effectively to the attention of FPRB research workers current industry problems and research needs.

During the year the Branch continued its program to assist industry and government by presenting a number of industrial courses on improved techniques in sawmilling, lumber seasoning, as well as demonstrations in the techniques of log quality evaluation. Some 160 key personnel from industry attended FPRB sawmilling courses conducted in Ontario, Manitoba, Alberta, and the Yukon. Some 80 representatives from industry and the Forest Service of the Province of Ontario attended three log-quality evaluation demonstrations conducted in eastern and southwestern Ontario. For the first time, the Branch presented a lumber-seasoning course entirely in French which was attended by some 20 industrial representatives from the Province of Quebec.

#### TECHNICAL ASSISTANCE

During the twelve-month period, 3,569 requests for technical information were answered, 2,562 by the Ottawa Laboratory and 1,007 by the Vancouver Laboratory. Distribution of Branch publications totalled 71,763 and 15,245 wood specimens were sold. Thirty-eight articles were published in various trade papers and technical journals, and 25 technical publications were edited and published by the Branch. Some 65 talks and lectures were delivered by the staff to industrial and public groups.

To maintain effective liaison with research and technical developments, officers of the Branch participated in a large number of conferences and meetings sponsored by associations, research societies and technical institutes. Dr. J. H. Jenkins, Branch Director, was a member of the Canadian delegation to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, held in Geneva, February 3-21, 1963. Dr. H. Schwartz, Superintendent, Ottawa Laboratory, actively participated in the Eighth Commonwealth Forestry Conference in East Africa in June and July, 1963. Mr. D. E. Kennedy, Head of the Ottawa Laboratory Timber Engineering Section, attended the Ad Hoc Meeting of Working Parties of the F.A.O. Conference on Wood Technology as well as the First General Meeting of the International Wood Research Society held in Rome, July 16-20, 1962.

The Forest Products Research Branch has continued to be actively represented on various national and international committees. In these important fields, personnel have contributed much technical and scientific data pertaining to Canadian woods. These representations include the Associate and Technical Committee of the National Building Code, and those specification committees of the Canadian Standards Association dealing with such items as engineered design in timber, laminated construction, plywood, shingles, millwork, poles and piling, preservative treatments, protective packaging and containers. Branch personnel serve on such international committees as those of the American Wood Preservers' Association, American Society for Testing Materials, International Union Forest Research Organizations, and the Food and Agriculture Organization of the United Nations. Staff members are also active on technical committees of various trade and research associations. Such participation ensures that technical advice and information resulting from forest products research is made available to specification-writing committees, and that important gaps in scientific knowledge are pointed out where urgent research is required.

The distribution of the English bi-monthly newsletter entitled "Research News" continued to increase during the year and reached a total of some 3,500 copies per issues. This publication, which has been given wide circulation in all segments of the wood-manufacturing and wood-using industries of Canada, contained brief reports and descriptions of current research work conducted at the Ottawa and Vancouver Laboratories and other items of interest to the industry.

A new series of French publications under the title "Recherches sur les produits de la forêt" were released periodically to provide additional information to industry in Eastern Canada. These publications contained selected items of interest to Quebec and the Atlantic Provinces where they received wide distribution through new French mailing lists which were also compiled during the year.

### RESEARCH PROGRAM

The research program for the year includes some 171 projects for the Ottawa Laboratory and 62 projects for the Vancouver Laboratory. Details of the various projects are described in the Annual Report, and Program of Work of the Forest Products Research Branch.

## ENGINEERED DESIGN

Evaluation of the physical and mechanical properties of building fibreboards for conformity with the requirements of the Canadian Government Specifications Board continued. Some 57 different qualities or thicknesses of particle board, insulating fibreboard, and hardpressed fibreboard were evaluated during the year. Results were used by Central Mortgage and Housing Corporation to determine acceptability of these materials for various end uses in house construction.

Calculations continued on the compilation of data for beams, posts and decking. The proposed tables were expanded to include six conditions of beam spacing for sawn beams. Data for small glulam beams and columns were added. Calculations are substantially completed; assembly and layout of the tables is progressing and should be completed in the coming year.

Investigations were conducted on end-joint spacing in laminated tension members, stress distribution, lateral instability, and sustained loading of laminated timbers. Research of this nature should lead to the development of better design methods and laminating techniques.

The Vancouver Laboratory has undertaken a co-operative project with the timber industry on mechanical grading methods. However, before machine methods may be used with confidence to assign working stresses to timber, it will be necessary to correlate their results with the results obtained by more conventional methods which have proven themselves over the years. With the lumber industry being wholly responsible for the development and construction of the machine, several thousand feet of stress-rated lumber will be checked for strength by laboratory test methods. All is now in readiness to initiate the testing program following final adjustments to the stress-rating machine.

Work has been conducted by both laboratories on plywood. Data from both floor and roof studies on the performance of construction plywood have been used in drafting a performance specification as part of a new Canadian Standards Association specification. Several designs for splicing plywood panels were chosen for test and several hundred test specimens were fabricated. Testing of these joints is well advanced and results show that two or three designs appear to give good performance.

## NON-DESTRUCTIVE TESTING

The Ottawa Laboratory has continued its research program of vibration testing of commercial size timber. The vibrational properties of small clear specimens have been studied extensively and results have indicated that strength tests of such specimens could be based on correlations between strength and vibrational properties.

The Laboratory has now developed a powerful low frequency excitation technique employing pulses of compressed air which are directed at the centre of the member under test and impinge alternately on the top and bottom surfaces. By a precise control of the pulse repetition rate, large members can be vibrated in a manner suitable for studying their vibrational properties. The technique may have potential in providing a means for the selection of ten-foot crossarms of adequate strength.

#### PACKAGING

A new type of corrugated fibreboard container has been developed at the Ottawa Laboratory for the shipment of potatoes to northern regions. This box, which is octagonal in shape and can be made from one piece of fibreboard incorporates a number of desirable features; it permits free air circulation in the stacks, facilitates irradiation of the potatoes, and is easily handled by one man.

In developing more efficient packaging for northern shipments for the Department of Transport, the first project undertaken resulted in a saving of three dollars in an overpack formerly costing four dollars.

The Laboratory has continued to co-operate with the Canada Department of Agriculture in the development of various containers for butter, eviscerated and frozen poultry, and eggs.

Research was undertaken for the Department of National Defence on various military packaging and movement of supplies.

Investigations were conducted on improved nailing for wooden boxes incorporating a Canadian developed nail made from wire of square section which is twisted to produce a full spiral. Following a comprehensive program of testing, it was shown that the spiral nail produced a much more efficient box joint than does the conventional coated round wire box nail. These results may lead to a reappraisal of box nailing requirements.

#### PEELING OF DOUGLAS FIR

During the year, several man-months were devoted to acquainting industry with the information acquired from the study of Douglas fir which was described in the last Annual Report. The major contribution from the research was the development of methods for accurately measuring the "horizontal gap" and for estimating the amount of wear in the lathe so that corrections could be made. After some delay, special instruments were made available for accurately measuring the horizontal and vertical gaps. A comprehensive technical report on this study was published and distributed.

#### DURABILITY OF GLUE BONDS

Long-term exposure tests of glue bonds in plywood type construction were continued under both interior and exterior exposure conditions, and results are now available for periods extending up to eleven years. For joints stored under normal interior conditions, very little deterioration of bond quality has been detected with the possible exception of some of the urea formaldehyde resin adhesives. The only adhesives which have not shown deterioration to date as a result of exterior exposure, based on delamination, are the room-temperature-curing phenols. All other adhesives studied, including the melamines and melamine-ureas, delaminated under exterior exposure conditions in periods ranging from a few months to several years. For adhesives placed under study more recently, the strength of the bonds will be determined following various periods of exterior exposure, in addition to examining panels for visible delamination.



A technique, developed at the Ottawa Laboratory, for evaluation bond quality in exterior type poplar plywood was adopted by the Canadian Standards Association and incorporated in a recently published C.S.A. Specification for this material. A variety of special testing of commercial products was conducted for Central Mortgage and Housing Corporation.

#### EFFECT OF INTERMOLECULAR FORCES

Research in the field of solid state physics, which is being carried out to obtain information on the molecular structure of wood and the forces acting between molecules of wood and between wood molecules and those of other substances, was continued. Polarization measurements on oven-dry yellow birch at frequencies from 80 kc. to 25 mc. and at temperatures from 20° to 100°C were completed, and the information obtained has contributed to an understanding of the molecular interactions involved. Additional equipment was designed and assembled to make possible the conducting of nuclear magnetic resonance and electron paramagnetic resonance measurements on wood and associated substances. The overall objective of work in this field is to provide fundamental information which it is hoped will point the way to new approaches and new developments in fields such as adhesion, coatings, treatments, and wood stabilization.

#### PARTICLE BOARD BINDERS

Appreciable savings in resins have been shown to be feasible by changing the distribution of binders throughout the cross-section of the boards. Properties such as internal bond strength, water resistance, and thickness swelling can be modified considerably by changing the ratio of resin in the core particles to that in the more heavily impregnated surface particles without altering the amounts of raw materials and the conditions of pressing. All experiments with particle boards were carried out with planer shavings — no engineered particles were used.

#### WESTERN RED CEDAR EXTRACTIVES

New knowledge of the cedar extractives gained through earlier research fully explains the stains developed by, and the corrosion of, various metals used as fastening for cedar. It has also been used to develop and accelerated test method for determining the usefulness of various coated nails for exterior fastening of cedar siding. The more resistant nails chosen by this method are now being tested under construction conditions.

#### FIRE-RETARDANT TREATMENTS

Work is being completed on the first phase of the extensive program dealing with the effect of three commercial fire-retardant treatments on the properties of wood. Research findings have been published under the following titles : "Strength Properties of Wood Treated with Fire Retardants", "Gluing Characteristics of Fire-Retardant Treated Wood", "The Effect of Relative Humidity on Fire-Retardant Coatings", "The Hygroscopicity of Wood Treated with Fire-Retardant Compounds", "The Gluability of Fire-Retardant Treated Birch Veneer", "Paint Holding

Qualities of Fire-Retardant Treated Wood", "Kiln Drying of Lumber Treated with Fire-Retardant Chemicals". Work is continuing on various aspects of fire-retardant treatments.

#### PAINTS AND COATINGS

The face checking of Douglas fir plywood was previously found to be inhibited by treatment with a polymerizable oil followed by baking. However, further work indicated that the oil-treated samples performed little better than control samples when both were protected with a good paint. Face checking is expected to be considerably reduced by the use of phenolic-impregnated paper overlays now available for Douglas fir plywood. Exposure panels of plywood with a medium density overlay have been prepared. It was noted that these panels required considerably less paint than the natural plywood surface. Panels coated with the following types of paints are being placed on exposure: acrylic, latex, polyvinyl acetate, linseed oil, and alkyd.

A number of film-forming clear finishes, including varnishes, one- and two-component polyurethanes, and other commercial products of unknown composition were exposed to a period of severe weathering and leaching in the weatherometer. No one class of product was found to be superior. The best varnish investigated compared favourably with the best two-component polyurethane.

#### DIFFUSION IMPREGNATION OF WESTERN HEMLOCK

It was shown that western hemlock, because of its high moisture content in the unseasoned condition, is a very suitable wood for impregnating with soluble boron compounds by the diffusion process. This is a preservative treatment against insect and fungal attack for use where treated material will not be exposed to leaching. A report describing the tests made and the results obtained was published.

#### PROTECTION AGAINST MARINE BORERS

Recently it was reported that *Limnoria tripunctata*, a marine wood borer with a reputation for attacking creosoted wood in tropical waters, had been discovered in the Strait of Georgia. Because it owns and operates hundreds of wharves and marine structures on Canada's west coast, the Department of Public Works instigated a co-operative project with the Forest Products Research Branch and the Pacific Biological Station of the Department of Fisheries to establish the range of distribution of the borer and to test the effectiveness of various preservatives against it. To this end, the F.P.R.B. constructed test racks and prepared test specimens treated with 17 proven or possible preservatives and advised on their installation. These racks have been inspected following six months exposure. The Pacific Biological Station inspected hundreds of specimens of wood attacked by *Limnoria*, and confirmed the presence of *L. tripunctata* in the Strait of Georgia. However, the only incidents of *Limnoria* attack of creosoted wood were found in wood containing extremely low retentions of creosote, and wood damaged by bolt-holes, pike-poles and abrasions, and these were attacked by the native *L. lignorum* as much as by *L. tripunctata*. In no case was properly treated wood attacked. It is therefore concluded that the presence of *L. tripunctata* in the Strait of Georgia does not create any new hazard.

## REFERENCE COLLECTIONS

Additions to the reference cultures of wood inhibiting fungi were made at both laboratories. These collections are used as an aid to the identification of isolates from wood products. The reference collections of small specimens of foreign woods, used for answering inquiries on imported woods, have also been augmented by the addition of some 50 species.

## LOGGING AND MILLING

Investigations into the factors affecting skidding in modern mechanized logging operations continued. In the past year, field studies were made on six additional company logging operations during the summer months, three of which were re-examined during the winter. Field work is now complete on this project, and although a great deal of compilation is still required on the data obtained, some preliminary results are available. The extent to which such factors as skidding distance, stand density, average size of tree, ground condition, incidence of brush, windfalls and extent of residual stand, affected productivity was studied.

A study of factors affecting product recovery is being conducted to establish a practical method of evaluating log and tree quality for the major species of the interior region of British Columbia, based on the external visible characteristics of logs and trees. The study, now in its second year, is being carried out with the full co-operation of the B.C. Forest Service, the industry associations, and the operators. Mill studies are also being run in connection with log quality studies.

Important information was given wide distribution on the evaluation of the quality of hardwood logs for factory lumber. Included were quantitative and qualitative factors used in segregating hardwood logs into distinct quality groups, information regarding the identification and evaluation of defects, and recommendations in regard to desired bucking practices.

Studies continued on the determination of methods of relating the measurable external characteristics of trees and logs to the yield of lumber and other wood products.

A logging study made in co-operation with the Alberta Forest Service was completed. The objective was to compare harvesting times for trees of varying diameter classes for the tree length logging method as used by the majority of the logging operators in the region. Analysis of the data is proceeding.

With the recent advent of new timber harvesting machines, incorporating shearing blades in place of chain saws for the felling and bucking operations, the Vancouver Laboratory began investigations into the shearing properties of wood. Knife blades, incorporating various designs, were built and testing is under way. Results of initial tests carried out on round spruce logs show the nature of the relationship between power requirements for shearing and knife design. Other species, as well as frozen and "unfrozen" wood, will come under study.

Laboratory studies to determine the effect of sweep, taper, and diameter on lumber recovery from spruce logs sawn with a circular saw have been completed. The data are currently being analysed. A parallel study will be conducted, using a bandsaw in place of the circular saw.

Studies were continued into the two main factors affecting the behaviour of circular saws, i.e. tooth cutting action and plate stability. The effect of lateral vibrations on the cutting of wood was studied with the single-tooth cutting apparatus and it was found that a substantial reduction of the parallel cutting force occurs under certain conditions. The cutting of frozen and "unfrozen" knots, and clear wood, is also being studied with this apparatus.

A special saw bench for measuring power requirements and investigating saw performance in the rip-sawing of dry lumber was completed and instrumented.

Studies on the machining properties of Canadian tree species were begun. Operations include: turning, mortising, boring, shaping and planing. Specimens for these tests have been prepared and conditioned to standard specifications.

Experimental apparatus to evaluate the surface quality of dressed lumber was designed and built. Irregularities occurring during the planing operation, such as knife marks, were identified on a recording oscillograph. These studies are continuing.

A survey of raw material used by furniture manufacturers in Eastern Canada was made with special reference to practices relating to the use of hardwood dimension stock. Findings of the survey were published. It was the general opinion of manufacturers that they would prefer to use dimension stock rather than lumber if regular supplies were available and could meet specifications. Studies are continuing.

# DEPARTMENT OF FORESTRY ESTABLISHMENT DIRECTORY

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Alberta .....	

# APPENDIX

**Table 1 — National Forest Inventory—1962**

Forest Areas (in thousands of acres)	
Softwoods.....	375,650
Mixedwoods.....	121,819
Hardwoods.....	59,380
Unclassified.....	59,040
Total Productive.....	615,889
Non-productive.....	480,914
Total Forested.....	1,096,803
Total Land Area of Canada.....	2,278,552
Volume of Merchantable Timber (in millions of cubic feet)	
Softwoods.....	592,832
Hardwoods.....	127,209
Total.....	720,041
Land Tenure of Productive Forested Land (net area in thousands of acres)	
Provincial Crown.....	503,647
Federal Crown.....	57,460
Privately Owned.....	54,782
Total Productive Forest.....	615,889

**Table 2 — Annual Forest Depletion**

	Usable Wood Millions of Cu. Ft.		Percentage Utilization	
	1952-61	1962*	1952-61	1962
Products utilized:				
Logs and bolts.....	1,576	1,860	49.1	54.3
Pulpwood.....	1,284	1,275	40.0	37.2
Fuelwood.....	287	232	8.9	6.8
Other Products.....	63	57	2.0	1.7
Totals.....	3,210	3,424	100.0	100.0
Wastage:				
By forest fires.....	535	126		
Grand Totals**.....	3,745	3,550		

\* Preliminary estimates.

\*\* Does not include wastage caused by agencies other than fire, such as insects, diseases and natural mortality, for which no reliable estimates are available.



**Table 3 — Principal Statistics of the Forest Industries—1961**

Industry	Number of Employees	Salaries and Wages (\$1,000)	Net Value of Production* (\$1,000)	Gross Value of Production (\$1,000)
Logging.....	94,681 **	422,374	708,459	846,035
Pulp and paper mills.....	65,799	355,171	842,420	1,639,672
Sawmills.....	42,530	150,868	226,046	552,218
Wood-using industries.....	69,470	238,678	384,796	835,228
Paper-using industries.....	29,063	115,966	228,896	575,437
Totals.....	301,543	1,283,057	2,390,617	

\* Net value of production is gross or sale value, less cost of materials, fuel, purchased electricity, and process supplies consumed.

\*\* Man-year basis.

**Table 4 — Production and Trade of Major Forest Products — 1962**

Product	Production*	Exports	Imports
Roundwood (millions of cubic feet).....	3,424	130	59
Lumber (millions of board feet).....	8,800	5,460	232
Plywood (millions of square feet).....	2,052	308	112
Wood pulp (thousands of tons).....	11,855	3,044	63
Newsprint (thousands of tons).....	6,691	6,148	nil
Paperboard (thousands of tons).....	1,122	129	92
Wrapping paper (thousands of tons).....	326	36	2
Fine papers (thousands of tons).....	323	30	26

\* Preliminary estimates.

**Table 5 — Payments to Provinces for Forest Inventory, Reforestation and Forest Fire Protection**

Province	Forest Inventory		Reforestation		Forest Fire Protection	
	Fiscal Year 1962-63	Total to Date	Fiscal Year 1962-63	Total to Date	Fiscal Year 1962-63	Total to Date
Newfoundland.....	—	—	—	—	\$ 158,468	\$ 451,212
Prince Edward Island..	—	—	\$ 20,828	\$ 192,249	5,891	22,204
Nova Scotia.....	\$ 11,660	\$ 371,516	4,633	19,678	62,988	270,003
New Brunswick.....	35,745	242,607	—	—	69,062	350,786
Quebec.....	—	—	—	—	268,133	835,477
Ontario.....	201,492	2,708,246	502,085	1,796,428	290,018	1,577,070
Manitoba.....	18,484	427,707	31,322	123,462	141,025	480,432
Saskatchewan.....	64,987	454,164	5,885	48,002	123,634	516,872
Alberta.....	101,735	963,676	25,783	31,557	471,873	1,079,567
British Columbia.....	464,041	5,009,096	15,000	176,911	535,309	1,520,164
Totals.....	\$898,144	\$10,177,012	\$605,536	\$2,388,287	\$2,126,401	\$7,103,787

**Table 6 — Reforestation Under the Forestry Agreements**

Province	Number of Trees Planted		Area Planted (acres)		Area Seeded (acres)	
	Fiscal Year 1962-63	Total to Date	Fiscal Year 1962-63	Total to Date	Fiscal Year 1962-63	Total to Date
Prince Edward Island...	125,000	680,000	103	569	—	—
Nova Scotia.....	281,000	1,363,000	503	1,839	—	—
Ontario.....	32,720,000	147,708,000	49,695	164,683	2,713	8,713
Manitoba.....	2,008,000	9,862,000	2,970	10,376	300	1,651
Saskatchewan.....	170,000	2,564,000	170	2,231	310	2,187
Alberta.....	173,000	318,000	342	561	5,797	10,122
British Columbia.....	1,000,000	15,422,000	2,273	20,195	—	—
Totals.....	36,477,000	177,917,000	56,056	200,454	9,120	22,673

**Table 7 — Payments to Provinces for Forest Access Projects and Stand Improvements**

Province	Forest Access		Stand Improvements
	Fiscal Year 1962-63	Total to Date	Fiscal Year 1962-63 Initial Year
Newfoundland.....	—	\$ 67,010	—
Prince Edward Island.....	\$ 978	978	\$ 12,303
Nova Scotia.....	61,356	262,716	7,507
New Brunswick.....	106,335	322,383	10,290
Quebec.....	1,076,026	2,353,259	223,546
Ontario.....	620,884	2,625,337	—
Manitoba.....	304,551	1,089,115	1,159
Saskatchewan.....	172,896	872,698	—
Alberta.....	409,664	1,318,693	202
British Columbia.....	790,111	3,454,292	—
Totals.....	\$3,542,801	\$12,366,481	\$255,007

**Table 8 — Aerial Spraying—New Brunswick and British Columbia**

Province	Gross Area Sprayed (acres)		Federal Payments	
	Fiscal Year 1962-63	Total to Date	Fiscal Year 1962-63	Total to Date
New Brunswick.....	1,782,600	21,437,550	\$190,399	\$4,914,135
British Columbia.....	—	156,000	—	83,927
Totals.....	1,782,600	21,593,550	\$190,399	\$4,998,062

**Table 9 — Annual Timber Production by Federal Agency**

Year	Yukon and Northwest Territories	National Parks	Department of National Defence	Forest Experiment Stations	Indian Reserves	All Species (in cunits)
						Total
1960-61.....	23,824	46,659	7,294	7,544	268,849	354,170
1961-62.....	18,144	45,482	13,536	2,366	214,460	293,988

**Table 10 — Annual Timber Production by Product**

Year	Logs	Pulpwood	Fuelwood	Poles, Piling	Mining Timber	Bolts	Other Roundwood	All Species Total Cunits
1960-61....	137,307	84,330	103,227	12,066	5,310	742	11,188	354,170
1961-62....	128,707	55,759	88,756	3,817	567	1,135	15,247	293,988

**Table 11 — Publications Produced, 1962-63**

Types of Publications	Forest Economics Division	Administration Branch	Forest Research Branch	Forest Entomology and Pathology Branch	Forest Products Research Branch	Total
<b>Bulletins</b>						
English.....	—	—	1	2	1	4
<b>Technical Notes</b>						
English.....	—	3	23	3	4	33
French.....	—	1	1	—	2	4
<b>Articles and Papers in Scientific Journals, Proceedings, etc.</b>						
English.....	—	—	18	114	25	157
French.....	—	—	1	2	13†	16
<b>Chapters in Scientific Books and Monographs</b>						
English.....	—	—	—	5	—	5
<b>Issues of Periodicals</b>						
English.....	1	—	4	6*	11**	22
French.....	1	—	2	6*	—	9
<b>Mimeos and Branch Reports</b>						
English.....	—	—	6	1	10	17
French.....	—	1	4	—	3	8
Bilingual.....	—	1	—	—	—	1
<b>Other Classifications</b>						
English.....	—	1	1	—	5	7
French.....	—	—	—	—	3	3

\* 48 articles in six issues during the years.

\*\* 6 issues of Research News includes 66 short articles.

† Includes 10 monthly contributions to Forest Conservation.

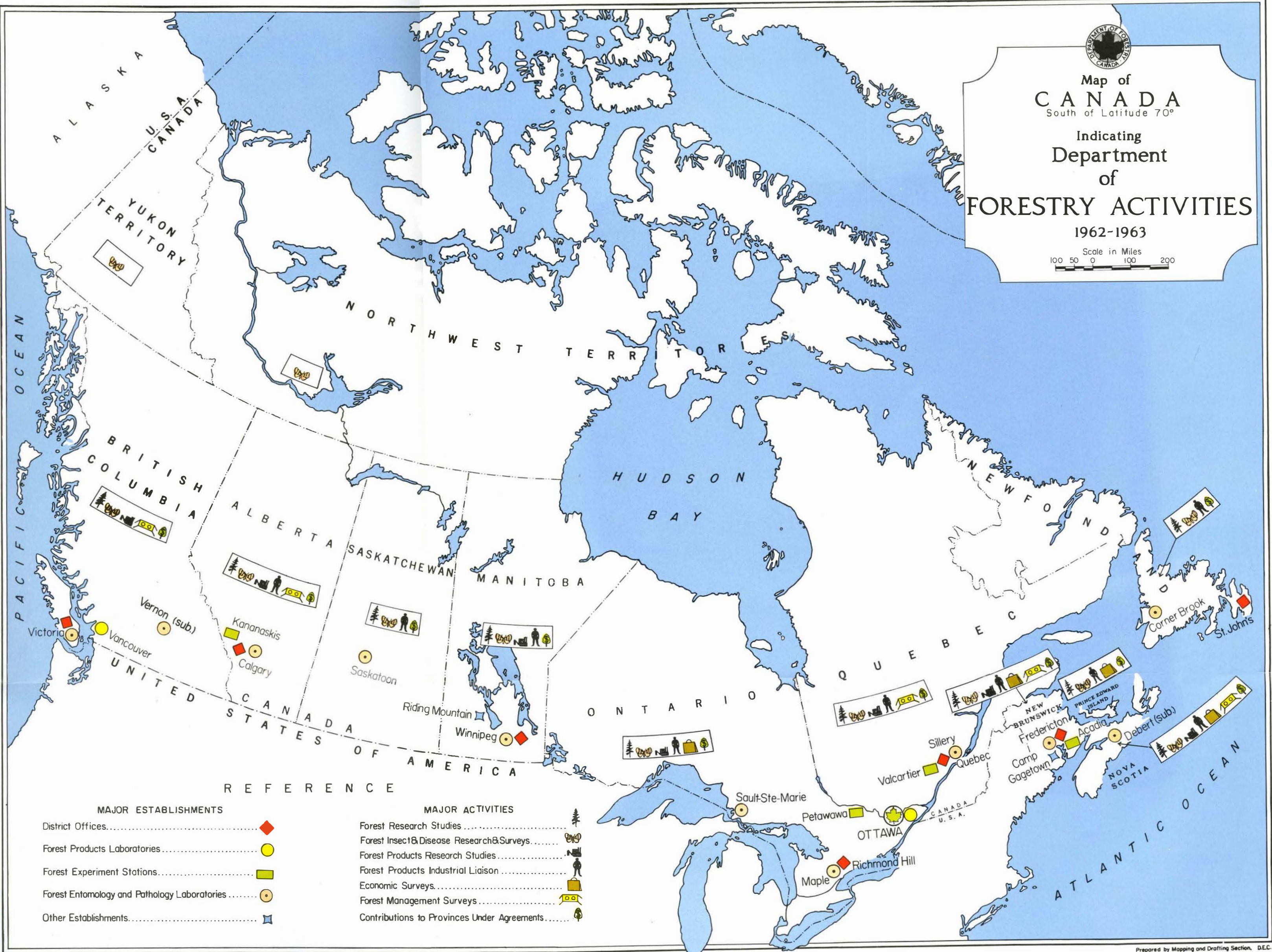
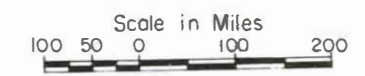




Map of  
**CANADA**  
South of Latitude 70°

Indicating  
Department  
of  
**FORESTRY ACTIVITIES**

1962-1963



REFERENCE

- MAJOR ESTABLISHMENTS**
- District Offices..... ◆
  - Forest Products Laboratories..... ●
  - Forest Experiment Stations..... ▭
  - Forest Entomology and Pathology Laboratories..... ○
  - Other Establishments..... ◐

- MAJOR ACTIVITIES**
- Forest Research Studies..... 🌲
  - Forest Insect & Disease Research & Surveys..... 🐛
  - Forest Products Research Studies..... 🏭
  - Forest Products Industrial Liaison..... 🤝
  - Economic Surveys..... 📊
  - Forest Management Surveys..... 📏
  - Contributions to Provinces Under Agreements..... 📄



