DEPARTMENT OF THE INTERIOR, CANADA

HON. SIR JAMES LOUGHEED, Minister; W. W. CORY, Deputy Minister

R. H. CAMPBELL, Director of Forestry

REPORT

OF THE

DIRECTOR OF FORESTRY

FOR THE FISCAL YEAR ENDED MARCH 31

1920

OTTAWA
THOMAS MULVEY
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1921

15430—1

CONTENTS

APPENDICES

REPORT OF THE DIRECTOR OF FORESTRY

R. H. CAMPBELL

This report covers the work of the Forestry Branch for the fiscal year 1919-20, ended 31st March, 1920.

The past year was remarkable as including the most disastrous season for forest fires since the establishment of the Forestry Branch. All through the West there was very little snow in the winter, and when it disappeared the early spring brought an abnormal period of drought and continuous high winds. Later in the summer conditions improved in Manitoba and Saskatchewan, but in Alberta and British Columbia the weather continued very dry and the situation caused great anxiety all through the summer. Even the strenuous exertions of the field staff could not prevent fires getting away, and heavy damage to the forests resulted in some localities.

While the revenues received from the forests are yet small as compared with the amount required for their protection and management, still they are increasing steadily. The total revenue for the last fiscal year was $127,975, as compared with $23,445 in 1913-14. Between these years receipts from the different sources increased as follows: Timber from $18,867 to $70,229, grazing from $221 to $42,248, and hay from $773 to $9,592. With such a marked increase in revenue it would seem that we are justified in expecting that the forests will in time make financial returns commensurate with those secured in Europe. In France the expenditure on state forests is $3,000,000, or $1 per acre, and the revenue is $4,800,000, or $1.60 per acre. In Hesse there is a net revenue over expenses of $5.32 per acre, and in Saxony an expenditure of $3.33 per acre brings in receipts amounting to $6.35 per acre. In Switzerland the net annual returns range from $3 per acre in the forests where least is expended to $8 per acre where most is expended.

The British Government has continued its interest in the forests of the Empire and has arranged an Empire timber exhibit and an Empire forestry conference to be held in London, England, during July, 1920. The timber exhibit for Canada was collected and arranged by the staff of the Forest Products Laboratories of Canada, and one of the members of the staff will go to London to look after the exhibit. It is expected that the Dominion Government will be represented by an official of the Forestry Branch. Other Canadian foresters will also attend, representing the provincial governments and various organizations. It is hoped that the result of the conference will be, not only the establishment of a permanent imperial timber exhibit and of a system of collecting information in regard to the forests of the Empire, but also the organization of an imperial forest commission or committee which will keep up both of these and will assist the development of the forests and proper scientific forest management throughout the Empire.

At the request of the Forestry Commission for the British Isles the work of securing tree seed of Pacific Coast species was again undertaken. It was found impossible this year to obtain the seed of Douglas fir as the crop was a complete failure. The Sitka spruce, however, bore heavily, and 600 sacks of cones were collected along Masset inlet on the Queen Charlotte islands in what was the centre of the airplane spruce industry during the war. A temporary kiln and extracting plant were erected at Port Clements and a yield of about 1,000 pounds of seed was obtained. Seven hundred pounds of this seed were shipped to the Forestry Commission and the remainder sold to the Belgian Government.

15430—2

The forest ranger school for returned soldiers organized by the Department of Soldiers' Civil Re-establishment was continued at Vancouver, British Columbia, and the course considerably extended. Some of the teaching was given by foresters on the staff of this branch. Graduates of the school, who were employed as forest and fire rangers, gave satisfactory service on the whole.

The usual methods for interesting the public in the forests and their protection have been continued. These include illustrated lectures, talks to schools, and distribution of literature to school children and to homes near to or in the forest. By the co-operation of the Publicity Branch of the Department of Trade and Commerce moving pictures have been taken of fires and fire-fighting and also of tree-planting, so that hereafter Canadian moving picture theatres, lecturers, and educational institutions will not have to depend on pictures of such scenes from other countries. It is hoped that the showing of these films throughout Canada will give Canadians some idea of the fact that their own country is in the van of progress.

STAFF

The total permanent staff of the branch for the last year was as follows:—

Head office	40
District inspectors	5
Assistant district inspectors	4
Forest supervisors	17
Forest assistants	12
Forest rangers	99
Chief fire rangers	9
Inspectors of tree-planting	8
Forest Products Laboratories, technical staff	20
Outside clerical staff	40
	254

APPROPRIATION

The appropriation for the year was $850,000. The expenditure was divided as follows:—

Salaries at head office	20,510 62
Salaries of officials on military leave	1,520 09
Travelling expenses	3,034 19
Printing and stationery	6,240 56
Miscellaneous expenses	2,910 87
Fire-ranging	232,042 18
Forest reserves	458,878 79
Tree-planting	61,781 65
Forest Products Laboratories	61,055 29
War appropriation	1,505 59
Total	$849,479 83

NOTE.—The item of $1,505.59 shown under War appropriation was drawn from the Forestry appropriation and later refunded.

The field expenditure, exclusive of tree-planting on prairie farms, is divided as follows among the provinces:—

Manitoba	$ 96,443 52
Saskatchewan	185,524 34
Alberta	247,773 19
British Columbia (Railway Belt)	161,179 92
Total	$690,920 97

LIBRARY

During the year 306 books and pamphlets were added to the library and indexed in the card catalogue. The number of magazines regularly received in the library was 104. Of these 43 were subscribed for in the regular way, the remainder having come from different government agencies or from societies with which the branch maintains an exchange of publications.

The number of photographs received was much smaller than in previous years, chiefly owing to the fact that very little survey work was carried on during the year. The collection of lantern slides has received a large accession, the two most important additions being some eighty slides to illustrate French forestry methods, made from photographs sent in by an officer of the branch, and two hundred slides of individual trees illustrating the tree flora of southwestern Ontario, the chief hardwood region of Canada.

PUBLICATIONS

The intensive study of all printing, publishing, and publicity work of the Forestry Branch to get the best results with the lowest possible expenditure of money was continued during the year. In addition to the Annual Report only two bulletins were issued for circulation during the fiscal year, No. 66, "Utilization of Waste Sulphite Liquor," and No. 68, "Forest Fires in Canada, 1917," but the manuscripts for several important publications were in course of preparation. During the year the practice of making a charge for expensive and technical publications, which has long been followed in Great Britain and the United States, was inaugurated by the department at the suggestion of the Editorial Committee. The object of making a nominal charge for a bulletin is not to make money but to prevent waste through persons (particularly children) applying for documents in which they have no interest. The new plan has worked most successfully. The Forestry Branch has in daily use about three hundred different printed forms, and the work of standardizing these forms, and combining two forms where possible, has been continued, and has resulted in considerable saving in cost of printing. The experimental tests to produce the ideal forest fire poster are resulting in the establishment of certain principles, which will be a guide in future work. It is believed that the posters prepared for the season of 1920 are the best yet sent out, and that further improvements can be made in future years. The newspapers throughout Canada are now seized of the great importance of forest conservation and have given more attention to this subject than in any previous year.

STATISTICS

The Forestry Branch continued to co-operate with the Dominion Bureau of Statistics in the collection, compilation, and publication of forest products statistics. The forestry statistician of this branch revised the schedules received from manufacturers of lumber, lath, shingles, and pulpwood, and checked and edited the bulletins published by the Bureau of Statistics in connection with forest products. Articles were prepared for trade magazines on forest statistics and a detailed description of the methods used in Canada in collecting forest statistics was prepared for the International Institute of Agriculture, Rome, Italy.

The work of collecting and compiling information concerning Canada's forest resources and forestry development in Canada was undertaken with the object of putting this information into printed form for distribution at the Empire forestry conference in London.

TREE-PLANTING

The spring of 1919 in the Prairie Provinces was late and cool and therefore favourable for getting up and distributing nursery stock; but the cool weather continued well into the month of June, which delayed growth. As summer came on the weather became hot, dry and windy and the conditions for growth were generally poor. As a consequence, although the stock was shipped out in good condition, the growth of new plantations was far from satisfactory and even the old tree planta-

tions suffered considerably, particularly where cultivation of the ground was not well done. None of the older plantations were completely wiped out but the percentage of loss was much higher than usual.

The number of farmers to whom stock was shipped was 4,501, and the number of seedlings and cuttings distributed to them was 4,377,950, making an average of about 970 for each applicant. The stock available for distribution in the spring of 1920 is 3,266,850, and there are 1,801 new applications for trees. With weather and labour conditions so unsatisfactory this is a good showing. Coniferous trees to the number of 186,000 were distributed to farmers and there is a stock of 180,000 available for 1920.

The collection of tree seed for starting stock on the forest nursery is a matter which always requires great care and foresight. The dry weather of last year and other unfavourable conditions made the collection of a sufficient supply of good seed difficult, but sufficient was obtained to enable the nurseries to carry on at about the usual scale.

FIRES

In Manitoba the light snowfall of last winter (1918-19) was gone early in April, and was immediately followed by dry, windy weather. In addition, the water in lakes, streams, and muskegs was lower than ever known before. In early May bad fires broke out on the eastern boundary of the Porcupine forest reserve, apparently caused by settlers, trappers, and locomotives. These fires burned over a great deal of logged-over land and the "slash" had an important effect on the way the fires spread. On the other Manitoba reserves practically no serious fires occurred.

This dangerous fire condition extended westward into Saskatchewan and later into Alberta and British Columbia. During the latter part of May and the early part of June extensive fires raged throughout northern Saskatchewan and did great damage both within the forest reserves and outside of them. Eventually, these fires ran together and swept north through timbered country. Undoubtedly, the origin of these fires was due in large part to the unregulated use of fire by settlers in clearing their land. Although the province of Saskatchewan has excellent provisions in its Prairie and Forest Fires Act for the control of settlers' fires, our rangers have not yet been given sufficient authority under the Act to enable them to take full advantage of its provisions. The largest fire in Saskatchewan occurred in the Battleford fire-ranging district. It started on June 16, and was not extinguished until July 18, burning over an area of 2,740,000 acres.

In Alberta the early spring conditions were slightly better but by the end of May the fire situation throughout southern Alberta had become extremely serious, and early in June two serious fires occurred on the Crowsnest forest. The largest fires in Alberta, however, occurred a little later on the Bow River forest, both caused by camp-fires. Over $20,000 was expended in fighting these two fires which burned over 1,450,000 acres.

Conditions in the Railway Belt in British Columbia were very critical during July and August. About 90,000 acres were burned over, the most serious losses being in the Salmon Arm district, where a number of the largest fires were started by dry electrical storms.

It may be noted that in the states of Montana and Idaho the losses from forest fires in 1919 were among the most serious ever experienced in that region. The cost of fighting fires during June, July, and August in those states was over two and a half million dollars.

The total number of fires both inside and outside the forest reserves was 1313. The total area burned over was 5,491,215 acres, of which 1,556,462 acres carried merchantable timber, 1,429,005 acres bore young growth, and the remainder was grass land, brule not restocking, muskeg, and "slash." The causes of these fires are given

in the following table, together with a comparison of the percentage due to each cause in each of the last three years:—

Cause	Number of fires, 1919	Percentage— 1919	1918	1917
Unknown	341	26	27	32
Campers and travellers	152	11	14	18
Settlers	238	18	23	22
Railways	418	32	23	17
Lightning	57	4	5	4
Lumbering	27	2	2	3
Incendiary	22	2	2	2
Brush disposal (other than by settlers)	23	2	2	1
Other known causes	35	3	2	1
Total	1,313	100	100	100

FOREST RESERVES

The forest reserves comprise an area of approximately 27,500,000 acres, and consist of tracts of land unsuitable for agriculture which have been set apart permanently for forest production. At the request of the Soldier Settlement Board areas totalling about 480 000 acres were withdrawn from the reserves in order to be made available for soldier settlement. For the most part these areas consist of small tracts of a few hundred acres, withdrawn from a number of different reserves. Only in the cases of the Riding Mountain and Porcupine reserves were the areas larger, about 220,000 acres being withdrawn from the former and about 240,000 acres from the latter. The permanent staff employed on the reserves during the year was: District inspectors, 4; assistant inspectors, 4; forest supervisors, 17; forest assistants, 12; forest rangers, 99; a total of 136. The temporary staff of rangers on the reserves numbered 61.

Improvements.—Owing to the dangerous fire season and the necessity for careful watching for and fighting fire, neither men nor money could be spared for an extensive programme of improvements. The following improvements were, however, carried out:—

Class of Improvements—		Total cost.	Average cost.
Cabins	Number, 5	$ 2,472	$ 495
Houses	" 3	6,875	2,292
Stables	" 4	2,449	612
Other buildings	" 5	1,261	252
Lookout towers	" 1	250	250
Telephone lines	Miles, 44	5,054	115
Fireguards ploughed	" 27	217	8
" cleared	" 4	222	55
Roads	" 4	2,078	520
Trails	" 18	686	38
Miscellaneous projects, such as fences, etc		711	—
Total		$22,275	

Timber Operations.—Owing to the growing cost of fuel and increasing consumption of lumber the demands upon the forest reserves for fuel-wood and timber have also increased. Special efforts were made to dispose of fire-killed timber on those reserves on which areas have been swept by fire. The advantage of this policy is threefold; (1) it conserves the growing green timber for later use, (2) it removes a serious fire menace created by these areas of dry trees, and (3) it clears up the ground and permits natural restocking to begin at once. The matter of the disposal of débris is steadily becoming more satisfactory. The regulations require the burning of the brush under proper safeguards, while the timber cutting is proceeding, so that the fire danger from this most important source may be removed. In the beginning of this work, some years

ago, the settlers and other permittees showed decided reluctance to undertaking the extra labour thus required, but now that they are becoming seized of the necessity of this work to protect timber for themselves and other settlers they are showing increasing willingness to comply with the regulations. The total number of timber permits issued was 4,362, which is an increase over the preceding year which was one of the heaviest since the Forestry Branch was established. The quantity of saw-timber cut under these permits was over twelve million feet board measure, which was nearly double the cut of the preceding year. Increases were also recorded in the case of mine timber and fuel-wood.

Fires.—There were 220 fires on the forest reserves as compared with 116 in 1918. One hundred and fifty of these fires, 68 per cent, burned over more than ten acres each. The total area burned over was 1,600,916 acres, of which 418,641 acres were covered with merchantable timber, 499,161 acres with young growth, and the remainder was divided among grass land, old "burn" not restocking, "slash" and muskeg.

A statement of the number of fires on forest reserves in 1919 and their causes is given below with a comparison of the percentage due to each cause in each of the last three years:—

Cause	Number of fires, 1919	Percentage— 1919	1918	1917
Unknown	79	36	40	31
Campers and travellers	30	14	20	21
Settlers	26	12	13	18
Railways	46	21	11	14
Lightning	9	4	3	5
Lumbering	12	5	4	3
Incendiary	6	3	6	4
Brush disposal (other than by settlers)	5	2	3	1
Other known causes	7	3	—	3
	220	100	100	100

Planting on Forest Reserves.—As usual the greater proportion of the trees used for planting on the forest reserves was supplied from the forest nurseries at Indian Head, Sask. Forest nurseries are, however, gradually being established on the larger forest reserves where planting will be necessary. A total of about eighty-five thousand young trees was set out on six reserves. The reserves and the species planted thereon were as follows: Spruce Woods, jack pine; Dundurn, jack pine, Scotch pine, and spruce; Manito, spruce and jack pine; Elbow, jack pine and Scotch pine; Pasquia, spruce and Scotch pine; the Pines, spruce, jack pine, and Scotch pine. Generally speaking the young trees were got into the ground under satisfactory conditions. These are sample plots and, along with those previously set out, are being studied closely in order to determine the best methods for future planting.

GRAZING

The number of grazing permits issued during the year was 1,653 and the total number of stock grazed was 99,361. This represents an increase in the number of permits issued of 481, or 40 per cent over last year and 220 per cent over the previous year. The increase in the number of stock grazed was 12,756 head, or 15 per cent over last year and 256 per cent over the previous year. These figures do not take into consideration the cattle grazing on forest reserves in the Railway Belt, the grazing regulations not having been applied to British Columbia as yet.

The increase thus shown indicates that the grazing resources of the forest reserves are being appreciated by the settlers on adjoining lands, who, because of the forage thus made available are adding stock-raising to their other enterprises. A further evidence of the increasing appreciation of the reserves and the policy adopted in the administration of the grazing resources is the readiness of the settlers to group

themselves into grazing or stock associations in order to secure the benefits of co-operative management and the privilege of consulting with the forest officers relative to the administration of the range in which they are interested. There are now forty-three such associations which have received official recognition, many of them having been organized during the past two years. Five of these associations are in Manitoba, eleven in Alberta and twenty-seven in Saskatchewan.

The shortage of feed during the past two seasons in most sections of the West, and the consequent demand made upon the forage resources of forest reserves, have rendered it necessary to ascertain the maximum carrying capacity of the various grazing districts in the reserves, not only to the end that the greatest number of stock may be accommodated, but also in order that the reserves may not be over-grazed and the ranges injured in consequence. Expert reconnaissances have therefore been made on several of the reserves. Maps showing the location and density of the various forage types and detailed plans of management have been prepared in each case, and it has already been found possible as a result to accommodate considerably more stock than was feasible under the haphazard system of grazing management previously followed by the settlers and ranchers. It has been demonstrated that if the forest reserves are to meet the increasing demand being made upon them for grazing it can only be done by the adoption of a scientific system of range management based upon exact information as to the various types of forage existing on each range, and such other information as will assist in the proper handling of the stock. This is work requiring special training and experience, and can therefore be proceeded with only as such expert assistance is made available.

RECREATIONAL USES

Summer Resorts.—The forest reserves are steadily coming into more general use for recreative purposes. Each year shows an increase in the number of cottages erected at the various summer resorts. Camping and picnicking parties find healthful pleasure on the shores of the various lakes, and those resorts which are accessible by automobile are visited by considerable numbers each week-end and holiday during the season. There are many locations throughout the forest reserves which, while not sufficiently large to permit of establishing summer resorts, offer very desirable building sites for a limited number of cottages, with a measure of privacy not obtained in the larger summer resort areas. For this reason they are considered more desirable by many persons, and it has been decided to make such sites available under annual (renewable) permits by laying them out into building lots, from time to time, as the demand becomes apparent. In such cases the permittees are required to erect satisfactory buildings within a year, as is the case in the larger summer resorts

Fishing.—Angling is, of course, indulged in at most of the summer resorts and it is found that good fishing invariably increases the attraction of such places. Non-residents of the province are required to take out fishing permits at a special fee, and the sum thus realized helps to meet the cost of the protection and supervision of the fisheries. It is the policy of this branch to prevent netting in these lakes and streams and to permit fishing by angling only, and by this means, together with adequate supervision and occasional restocking where feasible, so to improve the fishing that non-resident visitors will be attracted, as undoubtedly the money spent by these visitors in the course of their outing amounts to considerable in the aggregate. By the co-operation of the Dominion fisheries authorities and the General Passenger Agent of the Canadian National Railways, a shipment of 250,000 pickerel fry was recently planted in lake Madge in the Duck Mountain forest reserve. These fry were brought from the Dominion hatchery at Gull Harbour via Selkirk and Winnipeg, a somewhat arduous undertaking. They were distributed in good condition, however, and the prospects for successful results are excellent.

Game.—The provincial authorities have always realized to a greater or less extent the value of the forest reserves as game sanctuaries. The natural conditions on the reserves favour the increase of game and fur-bearing animals when adequate protection is afforded, and the fact that the reserves are divided into districts, in charge of forest rangers who are interested in the protection of all the resources of the forests, has the tendency to reduce the activities of the poacher to a minimum. The forest officers, while not assuming primary responsibility for the protection of game, a matter which properly belongs to the province, co-operate fully with the provincial authorities and in some cases are constituted provincial game wardens in order that such co-operation may be more effectively carried out.

An important instance of the increasing appreciation on the part of the provincial authorities of the value of the forest reserves as game sanctuaries is found in recent amendments to the Alberta Game Act. By one of these amendments it has been made necessary to obtain a special permit before any fur-bearing animal may be trapped or otherwise taken on a forest reserve. By another amendment the Cooking Lake forest reserve and that part of the Cypress Hills forest reserve which is in Alberta have been declared game preserves, and it is further provided that any game preserve established by the Dominion Government shall be a game preserve within the meaning of the Alberta Game Act. This last provision is considered important as it provides a means whereby any portion of a forest reserve possessing the necessary features of a game refuge may be brought within the scope of the above Act, should it be so desired.

FIRE-RANGING OUTSIDE FOREST RESERVES

The dangerous fire season of 1919 strained to the utmost the energies of the fire-ranging staff in the districts outside forest reserves and made clear, what has been known all along to those in charge, that in a dangerous season the patrols of each fire ranger are too extensive for safety and that a much larger regular staff is urgently required. The number of chief fire rangers employed was 11; the number of fire rangers and assistants temporarily employed was 207. The number of fires which occurred was 1,093. The total area burned over was 3,890,299 acres, of which 1,137,821 acres carried merchantable timber, 929,844 acres bore young growth, and the remainder was grass land, old brule not restocking, muskeg, and "slash."

Hereunder is a statement of the number of fires outside the reserves in 1919 and their causes, together with a comparison of the percentage due to each cause in each of the last three years:—

Cause	Number of fires	Percentages 1919	1918	1917
Unknown	262	24	26	22
Campers and travellers	122	11	14	18
Settlers	212	20	24	23
Railways	372	34	25	17
Lightning	48	4	5	4
Lumbering	15	1	2	3
Incendiary	16	1	1	2
Brush disposal (other than by settlers	18	2	1	1
Other known causes	28	3	2	—
	1,093	100	100	100

PETAWAWA FOREST EXPERIMENTAL STATION

During the year the survey of this tract was completed and the data concerning the different sections were tabulated and maps drawn for information and guidance in future operations. The completion of the survey confirms the opinion early formed that this tract is in every way suitable for a forest experimental station wherein to study how reproduction of desirable species may best be promoted in a country that has been logged-over, and where the logging has frequently been followed by fire. The reserve is typical of the great extent of cut-over timber lands in Ontario

and Quebec. In the area sixteen sample plots of varying size have been surveyed and their borders marked. These include pure and mixed stands of white pine, red pine, jack pine, and different broad-leaved trees. Some plots have been thinned to determine the rate of reproduction under these conditions, while others have been cleared of débris and left unthinned to show the rate of reproduction under natural conditions. The trees in these plots have been numbered (the numbers being stencilled on the bark) and measured, and the records so tabulated that their rate of growth can be determined readily by measuring them again at regular periods. The work of measuring typical trees in order to secure data upon which to base growth tables and yield tables was also proceeded with during the year. It is interesting to note also that the series of form factors for trees worked out by Professor Tor Jonson, of Sweden, were found to be approximately correct for Canadian species, so far as measurements were carried out.

FOREST INVESTIGATIONS

While in all districts where there are technically trained foresters located there are observations being made and investigations of a more or less detailed character being carried on, the organized scientific work in these directions has been mainly centred at the forest experimental station at Petawawa, Ont., as outlined in the preceding paragraph, and at the forest nursery station at Indian Head, Sask. At Indian Head a large number of plantations of small area, in some cases of single species and in other cases of various mixtures, have been in existence for some years. Careful records have been kept from year to year of the growth and development of the trees and there is being steadily accumulated a store of information that will be of the greatest value in future planting work on farms or in the forests. The conifers, when once well established, show satisfactory results.

FOREST PRODUCTS LABORATORIES

While hampered by difficulties caused by post-war conditions referred to in last year's report, principally by the loss of officers who have gone to other organizations, every effort has been made to continue the work of the Forest Products Laboratories efficiently. The work of testing forest products for the purpose of aiding Canadian industry is varied, and reference is here made only to the more important lines of investigation. These during the fiscal year included studies of decay in pulpwood, deterioration of pulp, decay of timber in buildings, problems in manufacturing newsprint paper, Nova Scotia mine timbers, factors entering into the durability of railway ties, the use of Canadian red pine for paving blocks, and the utilization of overmature aspen. The laboratories are making studies of all Canadian commercial timbers, with the object of giving architects, engineers, and builders complete information as to their mechanical and physical properties. The timber already dealt with is Douglas fir and the timber under investigation during the year was Sitka spruce. This latter wood has come into great prominence in the last few years because of its use in airplane construction.

The work in regard to railway ties covers the handling of the tie from the woods to the track, with the object of finding how best to increase its durability. This has involved a field survey of railway ties and the securing of the co-operation of railway officials. The investigation is already leading to important results.

The preparing of exhibits of wood products for use at exhibitions in Canada and abroad received considerable attention. There is a real demand for this work, which tends to extend the use of Canadian products both at home and overseas.

Proof of the value of the laboratories to the business and manufacturing interests of Canada is shown in the steadily increasing number of inquiries received relating to timber and forest products, and the problems of their manufacture. The number and character of these requests for accurate information is one of the many indications of the need of broadening the scope of the work of the laboratories.

TABLE 1—Statement of Revenue, Forestry Branch, Fiscal Year ended March 31, 1920

Reserve	Timber sales	Timber fees and dues	Timber seizures	Grazing permits and trespasses	Hay permits and seizures	Surface rentals	Special uses	Nursery stock	Unclassified	Total
	$ cts.	$ cts	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Turtle Mountain		227 70		2,415 30	497 50	35 00	32 00			3,207 50
Spruce Woods		12 75	16 76	991 65	155 50	50 00				1,226 66
Riding Mountain		16,672 67	791 40	2,058 61	1,381 95	510 60	353 25		682 30	22,450 78
Duck Mountain		5,742 41	194 20	679 07	531 00	210 02	131 00			7,487 70
Moose Mountain		566 05	20 50	1,025 25	1,470 85	95 00	0 75			3,178 40
Beaver Hills		78 75	14 00	392 70	957 00		4 50			1,446 95
Porcupine	1,100 1[illegible]	5,032 80	151 98	347 53	1,083 90		121 00			7,837 37
Pasquia	4,907 3[illegible]	4,697 56	462 80	30 15	182 50		25 75			10,306 08
Fort à la Corne	355 1[illegible]	834 95		91 20	58 75					1,340 09
Pines		1,156 22	12 00	428 05	72 70		9 25			1,678 22
Nisbet		1,391 35	1 00	44 05	182 25		13 50			1,632 15
Big River		444 95		189 05	598 25		14 00			1,246 25
Steep Creek		30 25		63 25						93 50
Sturgeon		19 22		100 50	61 75		10 61			192 08
Keppel		440 00		511 00	73 75		7 50			1,032 25
Manito		132 73		1,196 00	126 75		15 25			1,470 73
Dundurn		19 25		305 80	80 30		4 25			409 60
Seward				424 60	96 00		24 00			544 60
Elbow			15 00	605 20	85 75	118 50	17 75			842 20
Big Stick				5,614 05			35 00			5,649 05
Cypress Hills		913 76	32 15	6,231 93	91 25	35 00				7,304 09
Cooking Lake		19 35	54 00	781 60	398 05	49 25	0 25			1,302 50
Crowsnest	2,164 40	2,540 41	55 55	10,784 36	25 00		301 85		15 00	15,886 57
Bow River		748 84		6,653 31	81 25		336 55			7,819 95
Clearwater	4,162 70	917 06	221 62	105 75	93 25	257 54	140 85			5,898 77
Brazeau	2,802 08	1,182 53	76 80	41 80		569 56	130 00			4,802 77
Athabaska	3,168 01	0 50		117 0[illegible]	11 25		72 25		5 00	3,374 03
Lesser Slave	2,238 25	1 00	53 00	19 01	110 00		3 00			2,424 26
British Columbia Reserves	3,216 87	119 05			86 00	91 72	72 00			3,585 64
Indian Head Nursery								1,581 00	723 69	2,304 69
Total	24,114 98	43,942 11	2,172 76	42,247 79	8,592 0[illegible]	2,022 19	1,876 11	1,581 00	1,425 99	127,975 43

Table 2—Statement of Timber Permits Issued, Fiscal Year ended March 31, 1920

Reserve	No. of permits		Kinds and quantities of timber authorized to be cut								
	Free	Paid	Poles or rails	Fence-posts	Saw-timber	Railway cross-ties	Mine timber	Building logs	Fuel, green	Fuel dry	Dues and fees
			No.	No.	Ft. B.M.	No.	Lin. Ft.	Lin. Ft.	Cords.	Cords.	$ cts.
Turtle Mountain	41	40	.....	4,200	97,500	.....	.....	2,750	.....	1,320	227 70
Spruce Woods	29	1	.....	.....	.....	.....	.....	.....	.....	407	12 75
Riding Mountain	243	1,016	600	32,547	5,533,069	.....	.....	35,752	325	4,516	16,672 67
Duck Mountain	184	316	1,500	20,773	1,882,171	1,000	.....	16,888	.....	4,710	5,742 41
Moose Mountain	3	156	650	19,670	10,580	.....	.....	7,390	271	609	566 05
Beaver Hills	117	13	200	700	6,763	.....	.....	8,560	.....	1,587	78 75
Porcupine	81	73	8,200	9,232	2,772,989	.....	.....	24,494	.....	227	5,032 80
Pasquia	22	93	11,200	135,318	195,112	4,820	.....	24,09[illegible]	.....	7,930	4,697 56
Fort à la Corne	87	102	15,875	15,906	272,533	3,000	.....	59,086	10	1,633	834 95
Pines	43	133	5,435	12,420	1,820	.....	.....	33,129	25	3,394	1,156 22
Nisbet	153	150	31,000	18,325	4,480	.....	.....	234,748	.....	6,405	1,391 35
Big River	11	22	2,600	13,550	.....	.....	.....	12,926	.....	1,165	444 95
Steep Creek	11	7	200	1,300	3,000	.....	.....	500	.....	250	30 25
Sturgeon	5	4	3,000	1,000	.....	.....	.....	7,384	.....	25	19 22
Keppel	39	148	650	1,175	6,000	.....	.....	8,500	459	557	440 00
Manito	63	61	4,158	11,440	.....	.....	.....	3,000	187	984	132 73
Dundurn	2	9	.....	.....	.....	.....	.....	.....	46	45	19 25
Cypress Hills	172	296	76,853	52,570	7,970	.....	500	51,510	546	2,581	913 76
Cooking Lake	13	3	.....	500	.....	.....	.....	2,864	.....	335	19 35
Crowsnest	108	98	10,379	12,004	1,133,028	.....	204,612	159,829	19	1,745	2,540 41
Bow River	26	51	11,850	4,595	292,260	.....	.....	47,914	.....	600	748 84
Clearwater	57	14	4,800	1,000	2,000	.....	34,000	137,231	.....	1,417	917 06
Brazeau	3	14	.....	.....	.....	2,350	302,680	32,906	.....	75	1,182 53
Athabaska	2	.....	.....	.....	.....	.....	.....	.....	.....	50	0 50
Lesser Slave	4	.....	.....	.....	.....	.....	.....	3,000	.....	45	1 00
British Columbia Reserves	9	14	5,520	1,495	6,000	.....	.....	4,185	.....	260	119 05
Total	1,528	2,834	194,670	369,720	12,227,275	11,170	541,792	918,638	1,888	42,872	43,942 11

TABLE 3—Statement of Grazing Permits issued on Forest Reserves, Fiscal Year ended March 31, 1920

Reserve	No. of permits	Number of Stock				Dues and fees collected
		Cattle	Horses	Sheep	Total	
						$ cts
Turtle Mountain	138	2,277	389	.....	2,666	2,415 30
Spruce Woods	49	911	63	327	1,301	991 65
Riding Mountain	99	4,628	118	.....	4,746	1,993 11
Duck Mountain	39	1,414	47	.....	1,461	679 07
Moose Mountain	134	3,561	284	.....	3,845	1,025 25
Beaver Hills	38	1,294	75	.....	1,369	392 70
Porcupine	16	580	73	157	810	347 53
Pasquia	9	79	20	.....	99	30 15
Fort à la Corne	4	283	40	.....	323	91 20
Pines	28	1,326	97	.....	1,423	428 05
Nisbet	7	122	23	.....	145	44 05
Big River	14	1,094	4	25	1,123	189 05
Steep Creek	3	250	.....	.....	250	63 25
Sturgeon	3	382	3	.....	385	100 50
Keppel	44	1,646	287	.....	1,933	511 00
Manito	113	2,807	986	58	3,851	1,171 40
Dundurn	26	808	171	.....	979	305 80
Seward	29	409	360	.....	769	424 60
Elbow	66	1,700	463	520	2,683	605 20
Big Stick	153	7,406	2,520	5,700	15,626	5,360 70
Cypress Hills	172	5,823	4,403	.....	10,226	6,113 53
Cooking Lake	36	2,051	156	.....	2,207	692 60
Crowsnest	269	14,794	2,863	7,631	25,288	10,189 36
Bow River	121	11,039	3,204	1,200	15,443	6,653 31
Clearwater	21	65	105	.....	170	85 75
Brazeau	3	.....	69	.....	69	41 80
Athabaska	18	18	120	.....	138	117 02
Lesser Slave	1	31	2	.....	33	19 01
Total	1,653	66,798	16,945	15,618	99,361	41,081 94

TABLE 4—Statement of Timber Cut on Forest Reserves under Authority of Timber Sales, Fiscal Year ended March 31, 1920

Reserve	Previous sales still operating	Sales made current year	Saw-timber	Mine Timber			Railway Cross-ties	Telephone poles	Dues collected
				Props	Props	Lagging			
			Ft. B.M.	Ft. B.M.	Lin. Ft	Lin. Ft.	No.	Lin. Ft.	$ cts.
Big River	1	.....	.....	.....	.....	.....	.....	.....	.....
Fort à la Corne	1	2	334,825	.....	.....	.....	.....	.....	355 19
Porcupine	2	1	40,867	.....	.....	.....	.....	.....	2,054 05
Pasquia	5	2	939,622	.....	.....	.....	.....	.....	1,969 78
Brazeau	3	3	1,427,837	35,135	37,676	280,342 Cords.	.....	.....	4,547 12
Clearwater	1		147,545	1,713,415	.....	955	.....	.....	4,162 70
Crowsnest	5	1	421,670	346,326	.....	.....	.....	.....	1,721 65
Cypress Hills	1	.....	.....	.....	.....	.....	.....	.....	13 37
Lesser Slave	.....	2	1,658,601	.....	.....	.....	.....	.....	.....
British Columbia Reserves	1	1	3,430,901	.....	.....	.....	.....	36,905	677 08
Athabaska	.....	1	119,500	.....	100,636	.....	942,120	.....	4,090 54
Total	20	13	8,521,368	2,094,876	138,312	.....	942,120	36,905	19,591 48

TABLE 5—Statement showing the Quantity of Timber Sold and Revenue due, Fiscal Year ended March 31, 1920, on Licensed Timber Berths within Dominion Forest Reserves

MANITOBA

Reserve	Timber berths	Area in reserve	Quantity Sold			Revenue		
			Lumber	Lath	Other* products	Dues payable	Rent payable	Total payable
	No.	Sq. Mls.	Ft.B.M.	No.		$ cts.	$ cts.	$ cts.
Riding Mountain	4	42·43	.....	.....	600	.....	222 15	222 15
Duck Mountain	11	99·77	1,057,963	2,646,050	.....	5,578 04	499 90	6,077 94
Total	**15**	**142·20**	**1,057,963**	**2,646,050**	.....	**5,578 04**	**722 05**	**6,300 09**

SASKATCHEWAN

Porcupine	41	841·82	24,958,368	2,927,070	.....	14,342 68	2,515 70	16,858 38
Sturgeon	9	169·02	23,050,170	3,788,150	.....	15,555 17	847 53	16,402 70
Big River	3	260·77	90,010,372	4,329,650	.....	5,154 64	1,303 85	6,458 49
Nisbet and Pines	4	80·69	.....	.....	10,134	1,455 28	173 15	1,628 43
Total	**57**	**1,352·30**	**138,018,910**	**11,044,870**	.....	**36,507 77**	**4,840 23**	**41,348 00**

ALBERTA

Crowsnest	11	215·38	8,651,396	.....	2,126,549	.....	1,374 70	1,374 70
Bow River	14	327·90	4,392,185	.....	2,613	1,797 29	1,825 60	3,622 89
Clearwater	4	371·52	.....	.....	.....	.....	1,887 80	1,887 80
Brazeau	11	163·85	89,880	.....	82,261	2,560 54	1,131 30	3,691 84
Total	**40**	**1,078·65**	**13,133,461**	.....	.....	**4,357 83**	**6,219 40**	**10,577 23**

BRITISH COLUMBIA

Total	**11**	**133·57**	**3,567,063**	.....	**13,629**	**3,023 17**	**667 85**	**3,691 02**

GRAND TOTAL

Grand Total	**123**	**2,706·72**	**155,777,397**	**13,690,920**	.....	**49,466 81**	**12,449 53**	**61,916 34**

*The figures in this column indicate the number of units upon which the dues were calculated. They include 1,945 cords of wood, 82,861 railway cross-ties, 11,113 fence-posts, 2,126,238 lineal feet of mine-prop and 13,629 logs.

APPENDIX No. 1

REPORT OF THE CHIEF OF THE TREE-PLANTING DIVISION

NORMAN M. ROSS

This report covers the fiscal year 1919-20, ended 31st March, 1920.

The season of 1919 on the average, covering the three Prairie Provinces, was the most disappointing from an agricultural and horticultural standpoint experienced since the inception of our work in 1901. Late summer frosts, extraordinary high winds, and drought combined, following two rather abnormal seasons, resulted in a condition which proved absolutely disastrous to all agricultural operations in many districts. Even in the most favoured sections, which were comparatively small and isolated, general growth conditions were only average; consequently the report of results both on our own nurseries and on the individual plantations throughout the West is the most unsatisfactory yet submitted.

In the older plantations many of the trees were unable to survive in districts where there had been three consecutive seasons of drought. This does not mean that the plantations were entirely killed out, but many individual trees succumbed. The damage was naturally most noticeable where the belts had not received the best of attention. Wherever good care and cultivation had been given and the trees kept free from grass, losses were very considerably less and in many instances only a lessened growth resulted.

In the newly set out plantations many were complete failures and could hardly have resulted otherwise under the conditions. In the districts worst affected no rain of any account fell till August. The greatest loss generally was in the cutting stock. Soil conditions owing to drought did not induce rooting and even where the cuttings did root well severe frost unusually late in the spring killed off a very large percentage.

In reference to nursery operations, the first part of the season was very favourable for shipping on account of the early opening of spring and rather cool weather holding back growth. For transplanting evergreen stock the earlier planted plots were quite successful as the plants seemed to get established before the hot, dry weather, but the last few days' plantings were almost a complete failure.

NURSERY WORK

The shipping of broad-leaved stock commenced April 22 and was completed May 7. Evergreens were shipped out May 13 and shipment completed May 19.

DISTRIBUTION OF BROAD-LEAVED STOCK IN 1919

Number of applicants receiving trees	4,501
Seedlings and cuttings distributed	4,377,950
Average number per applicant	970
Number of applicants on inspection list in 1919	8,221
Number of new applications received	1,801

The broad-leaved stock available for shipping this spring (1920) from the Indian Head and Sutherland Nurseries is as follows: Maple, 556,500; ash, 406,350; Russian poplar, 1,134,000; caragana, 395,000; willow, 775,000; total, 3,266,850.

Practically all seedling stock on the Saskatoon nursery at Sutherland, Saskatchewan, was a failure and the cutting stock made very short growth, the season being exceptionally dry and unfavourable in the Saskatoon area.

There will be in 1920 approximately 7,900 applicants on our inspection lists. This is about 300 less than in the preceding season, but following such a disastrous crop season a reduction was inevitable. New applications from April 1, 1919, to March 31,

1920, number 1,801. This shows an increase of 500 new applications as compared with those received in the previous year, clearly indicating that in spite of all drawbacks the settlers are more anxious than ever to plant out tree belts. It must be remembered that for three years the labour problem in Western Canada has been very serious, and this in itself has accounted very largely for a falling off in the number of farmers applying for trees. With a return of more normal seasons and the gradual readjustment of labour conditions, there will undoubtedly be an unprecedented demand for stock from the Dominion Forest Nurseries.

Conifers.—The following evergreens made up of transplants of the different species were shipped out at the nominal rates charged per 100: White spruce, 40,500; jack pine, 49,700; lodgepole pine, 2,900; Scotch pine, 3,900; a total of 97,000 distributed among 433 applicants. In addition 89,000 seedlings and transplants were sent to various reserves, bringing the total of conifers sent out up to 186,000. The evergreen stock for distribution in 1920 amounts to 180,000 spruce, jack pine, and Scotch pine.

Collection of Seed.—The prospects for a heavy seed crop in 1919 were very good; the trees blossomed and set seed freely, but the exceptionally hot, dry summer prevented the Manitoba maple seed from filling properly, and as a consequence the supply of this species was very scarce. We secured 7,270 pounds of maple seed, collected in the Carman and Portage la Prairie districts. The ash crop was better and 3,715 pounds of seed were collected in the Qu'Appelle valley just north of Indian Head. A total of 300 pounds of caragana seed was collected on the nursery. This was a good seed year for spruce, but it was difficult to secure labour for picking the cones. Altogether 270 bushels of cones were collected on the Spruce Woods reserve and the Cypress hills. The hot season, however, affected the filling of the seed, and as a consequence the yield of seed was not so great as in some seasons. Of spruce seed 290 pounds were extracted. Ten bushels of Scotch pine cones collected on the nursery yielded 4½ pounds of clean seed. It was a poor seed year for Scotch pine. Of jack pine cones 192 bushels were sent in from the Saskatchewan and Manitoba reserves, yielding some 90 pounds of clean seed.

Distribution of Seed.—As seed was not very plentiful, only small amounts were sent out early in 1920, as follows: maple, 31 pounds; ash, 8 pounds; and caragana, 64 pounds. This was sent to 101 different applicants.

Permanent Plantations.—Considering the weather conditions the growth in the permanent plantations was very fair. The conifers showed comparatively greater growth than the broad-leaved species, demonstrating their ability to thrive under more adverse conditions when once established. Measurements were made in all plantations as usual. No new plantations were set out, but a small experiment, one acre in area, in underplanting cottonwood with spruce resulted successfully for the first season, as practically all plants show a good green colour this spring (1920). About half an acre of a plot originally planted with Russian poplar and cut down about five years ago in order to experiment with sprout reproduction did not show a good reproduction to poplar, and in the meantime had become heavily sodded with western rye grass. Scotch pine transplants were set out in this area in the spring of 1919 and have done wonderfully well, not more than 4 per cent of the young trees having failed to root. It will be interesting to see how these young pines are able to compete with the rank growth of grass on comparatively rich soil.

PLANTING ON RESERVES

Spruce Woods Reserve.—Thirty thousand to forty thousand (30,000 to 40,000) jack pine seedlings three years old were shipped to this reserve on May 8 and used for filling "blanks" in the 1917 and 1918 plantings, which suffered badly from dry

seasons after planting. On the whole the plantations on this reserve are very promising. The jack pine trees in the more recent plantings are making a very much better growth than the spruce, while the original Scotch pine set out in 1905-6-7 looked very thrifty during the summer.

Broadcast Seeding.—Six pounds of Scotch pine, 30 pounds of jack pine, and 28 pounds of spruce seed was broadcasted on twenty acres prepared by burning off the grass and then disking the surface soil. The germination of pine was excellent and seedlings were found springing up thickly when examined in July. The spruce did not appear to germinate so freely, though as these seedlings are extremely small it is very difficult indeed to see them amongst the grass cover. The latter part of the season was excessively hot and dry and unfortunately a very great proportion of the seedlings were burned up by the heat before becoming thoroughly rooted. The ten acres sown in 1918, and which showed a very fair stand of plants that season and up to July, 1919, also suffered from the same cause.

Cooking Lake Reserve.—Twelve hundred (1,200) caragana seedlings were sent up for planting a shelter around a newly established nursery plot. A few pounds of seed of spruce and pine were also furnished and sown in prepared nursery beds.

Dundurn Reserve.—Two thousand (2,000) spruce seedlings, 2,000 Scotch pine seedlings, and 2,000 jack pine seedlings were shipped from Indian Head on May 10 and used for filling "blanks" in 1917 plantings. This district also suffered very severely from drought in 1917 and 1918.

Elbow Reserve.—Ten thousand (10,000) spruce, 10,000 Scotch pine, and 10,000 jack pine seedlings were shipped on May 9 and were planted in furrows spaced approximately 4 by 4 feet.

Manito Reserve.—Two hundred (200) spruce and 200 jack pine seedlings were used for filling in the "blanks" in older planting.

Pasquia Reserve.—Three hundred (300) spruce transplants and 200 Scotch pine transplants were shipped on May 10 and planted around the ranger station.

Pines Reserve.—Five thousand five hundred (5,500) spruce, 1,400 Scotch pine, 1,400 jack pine transplants, and the same numbers and varieties of seedlings were sent up for experimental planting on this reserve. Unfortunately, however, just as the planting was getting started very bad fires broke out on the reserve and all the men engaged in planting had to leave to fight fire; consequently most of this material was unplanted, as the fires were not got under control for many days.

VIDAL'S POINT

Thirty-four permits were issued in 1919 for camping on the Government property at Vidal's Point on the Qu'Appelle lakes, while increasing numbers made use of the portion of the property reserved for general picnics, bathing, etc.

APPENDIX No. 2

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR MANITOBA

F. K. HERCHMER

This report covers the fiscal year 1919-20 ended 31st March, 1920.

Continuing the economy practised during the war, only the most necessary work, and that entailing little expenditure, was carried out during the year. During the summer the general strike in Winnipeg, which affected communication over the whole province, seriously interfered with our work, particularly fire prevention.

The public is more and more extending its sympathy and assistance to us, and the high price of lumber during the year has convinced the settlers, who have been able to secure fuel and timber from the reserves, of the great value of forest reserves and timber protection.

BOUNDARIES

During the year about 340 square miles were withdrawn from the Riding Mountain reserve for soldier land settlement. This land has not yet been allotted. In addition to this large block from the Riding Mountain reserve, several quarter-sections were withdrawn from the Spruce Woods reserve for the same purpose.

IMPROVEMENTS

Wherever possible, we have endeavoured to use fireguards for roads, and to widen roads for fireguards. During the summer about 90 miles of fireguards were plowed or disked, and repairs and improvements made to about 100 miles of road. Fireguards were made only in open grass country.

Only one new building was erected, the east ranger cabin on Turtle Mountain reserve. Seven ranger stations were painted, while minor repairs were effected on nine other stations in the district. Repairs were made on 265 miles of telephone line.

SILVICULTURE

The demand for timber of all classes was very heavy during the winter. Nine saw-mills were operating on the reserves, in addition to many outside the boundaries.

Under the millsite regulations, settlers are able to secure permits and thus provide for their fuel and timber needs at a very considerable saving. Some difficulty was experienced in filling permits late in the winter owing to the great depth of snow. The disposal of brush and refuse from logging operations was in all cases good, and the forest was left in good condition for natural reproduction.

PLANTING

This work, which has been confined in this district practically to the Spruce Woods reserve, consisted of filling "blanks" in 1917 and 1918 plantings with jack pine seedlings, from the Indian Head Nursery, and spruce from the small nursery on this reserve. Twenty acres were sown broadcast, after burning and discing, ten acres to spruce and ten acres to jack pine. Other trees in the plantation show good growth, especially those four years old and older.

GRAZING

Grazing on reserves greatly increased during this year, and will continue to increase until capacity is reached. Stock associations were formed in many places, and the departmental methods and regulations gave entire satisfaction. The grazing of cattle tends to lessen the fire-hazard in the open and semi-open country. In all 9,230 cattle, 617 horses and 327 sheep were grazed on reserves in this district, and they left the pastures in good condition in the fall.

RECREATIONAL USES

Summer Resorts.—The summer resorts were used more extensively during this year than in the past, more especially at Madge lake in the Duck Mountain reserve, and Clear lake in the Riding Mountain reserve. The former now has between forty and fifty cottages. The people are very enthusiastic and support this use of the reserves.

Fish.—No efforts have been made to restock any of the lakes on reserves, but, as little fishing is done, fish are rapidly increasing.

Game.—Big game animals, particularly the elk, are increasing. The Riding Mountain reserve contains what is believed to be the largest herd of elk in America, estimated at between three thousand and four thousand head. There are very few fur-bearing animals, with the exception of the beaver now in the reserve, all other species having been almost entirely trapped out. Prairie chickens which have gathered in the timbered reserves for the last few years are now moving out to the prairie. It seems that when the flocks become weak and exhausted they move to the timbered hills, where in a year or two they regain normal strength, and then go back again to the open prairie.

FIRES

The fire season during the summer of 1919, particularly during the early part of the year, was the worst experienced in Manitoba for many years. Lakes and rivers reached an extremely low level. The muskegs in particular dried out and were the seats of most of our large fires. These muskeg fires, while doing very little damage, were extremely difficult and expensive to fight. The general strike, which affected communication at the worst time of the fire season, made it difficult to get fires reported quickly, and allowed fires to reach large proportions before fire-fighting crews could reach them.

The appointing of Forestry Branch rangers to assist in enforcing that part of the Provincial Fire Act which refers to brush-burning was a great assistance and enabled us to control this danger.

In all, 95 large and small fires were reported by the rangers, only a small number of which did any damage to commercial timber or young growth, the larger number being grass or muskeg fires. On the whole this has been the worst fire year in my experience, and I consider our losses very small under the circumstances.

APPENDIX No. 3

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR SASKATCHEWAN

C. MacFayden

This report covers the fiscal year 1919-20, ended 31st March, 1920.

Saskatchewan is usually thought of as a purely agricultural province, but an examination of the land within her boundaries reveals the fact that of the area likely to become productive of agricultural, mineral, or forest wealth within the next generation, approximately one-third is forest land, or potential forest land. That portion of the province north of the Churchill river may, for the present, be disregarded, despite its latent mineral resources and the possibility that the Barren Lands caribou might be here propagated for domestic purposes. That part south of the Churchill is markedly divided into two sections, (1) a northern section, comprising lands carrying commercial timber and lands only sparsely wooded, and (2) a southern section, the Great Fertile Belt, practically devoid of trees, the dividing line being roughly the main line of the Canadian National Railway. The sparsely wooded part of the wooded section must ultimately be utilized for agriculture, but an area of approximately 22,750,000 acres, mostly in the northern part of the section, is absolute forest land, and should be maintained or put under forest cover. It is with this area that the Forestry Branch is most interested in this province. Of the fifteen forest reserves within the province, eight, including the larger ones, with a total area of 9,550 square miles, are within this ultimate timber-belt, and have within them the best standing timber of the province. The remaining reserves, seven in number, and all small, are scattered throughout the more strictly agricultural section of the province, and have in all 733 square miles within their boundaries. The latter figure will be increased by over 500 square miles upon the establishment of the proposed Big Stick forest reserve.

From the foregoing, it is seen that approximately one-ninth of the ultimate forest land of the province is now in forest reserves. The attention of the Forestry Branch is now specially directed to the latter, but a fire-protection force, as efficient and adequate as possible, is maintained on all lands believed likely to be kept ultimately under forest cover.

BOUNDARIES

During the year there were no additions made to the existing reserves, and no new reserves were created. The demand from returned soldiers for farm lands has necessitated the elimination of some lands from the reserves when they have upon examination been considered suitable for a permanent system of agriculture. With one exception, however, such eliminations have been confined to scattered and individual sections or quarter-sections originally included in the reserves so as not to break the regularity of the boundaries; this, at a time, however, when the demand for farm lands was considerably less acute. The exception was in the case of the Porcupine reserve, where about 8½ townships were withdrawn.

In addition to the lands actually eliminated from the reserves, a number of sections were examined, but the applications to have them withdrawn were not approved when these sections were found to be fit only for grazing lands,, and not for the continued growing of farm crops. The Forest Reserves Regulations provide for the fullest utilization of such lands, and it was deemed advisable to retain them in the reserves, where they would be a benefit to the neighbouring communities as a whole. Applications to have withdrawals made were seemingly on the increase at the end of the fiscal year, indicating a growing scarcity of accessible farm lands.

FIRE PROTECTION

The year under review is believed to be the most unfavourable, from the fire-protection standpoint, experienced since any thought was given to this matter.

Preceded by a very mild winter, with very little snowfall, and ushered in by an unusually early spring, the season started with the ground and cover in an extremely dry state. To add to an already hazardous condition, the months of April and May, and the first part of June, were marked by constant, high, and shifting winds, amounting at times in places almost to gales. These conditions appeared to the average homesteader ideal for land-clearing operations, with the result that hundreds of fires were set out for this purpose, and, fanned by the high winds, numbers of them became uncontrollable and swept over the country taking everything before them, though no labour or expense was spared in an endeavour to combat them. Of the 189 fires reported by the rangers, the great bulk could be directly, or indirectly, attributed to this cause. In all, a very large area was swept by fire, and the damage done was probably greater than in any previous year in the history of the Forestry Branch. The loss of a large area of promising young growth of pine on the Pines and Nisbet reserves is to be particularly regretted. In this connection it was interesting to note that where land had been logged under the Forest Reserves Regulations, the fires running over them were comparatively easy to handle, bringing out very forcibly the wisdom of the regulations requiring slash disposal in connection with all timber-permit and timber-sale operations. However, most of the reserves are now comparatively free of the areas of slashings which previously constituted a fire menace, and should be from now on correspondingly easy to protect from a repetition of this year's fires, providing that slashings are not again allowed to accumulate.

Light rains from the 8th to the 10th of June relieved the extremely dry conditions existing since early April, but it was not until the beginning of the third week of the month that sufficient rain fell to render any material aid in fire-fighting. From this date rains were frequent and few fires occurred, and winter setting in during the early part of October definitely ended the season.

IMPROVEMENTS

The programme of improvements for the year was materially curtailed, and the funds provided for them transferred to the fire-fighting accounts. This, coupled with the further facts that the staff's undivided attention was given to fires in the first part of the season, and that the latter part of the season was wet and followed by a very early winter, resulted in comparatively little improvement work being done. Especially was this so in the case of those improvements requiring an expenditure for labour outside of that of the regular staff, but the necessary maintenance work was carried out on all the reserves, and in the two fire-ranging districts outside of these.

Of the improvements undertaken most progress was made in the telephone systems on the Fort à la Corne and Nisbet reserves. On the former, the trunk line, previously constructed through the centre of the reserve from the west boundary to Poplar creek, was carried east to the River House ranger station, so that this line now traverses the whole length of the reserve, and with the line south to the Fort House district on the south side of the Saskatchewan, gives the ranger in charge direct communication with each of the ranger districts. To complete the primary system on this reserve a line to tap the Lars district is all that remains.

Owing to the number of rural and long-distance lines surrounding the Nisbet reserve, it has not been considered advisable to construct any expensive system of our own, it being possible to secure the required facilities by running short lines to connect with the rural and commercial lines outside. Previously, the headquarters of this reserve had long-distance and rural connection through the city of Prince Albert, and during the year the two ranger stations were given the same facilities, making it possible for the reserve headquarters or this office to get into touch with the two permanent rangers.

With the exception of the teamster's house, and the barn at Greenbush, the headquarters of the Pasquia reserve, two projects started during 1918-19, and finished during the year under review, no buildings of an expensive nature were constructed.

The headquarters buildings on the Fort à la Corne and Big River reserves were, unfortunately, lost in the forest fires, and necessitated the immediate erection of temporary quarters for the headquarters' staffs. These buildings for temporary quarters have been so designed, however, that without alteration, they will serve as warehouses or workshops when the permanent and standard quarters are completed. On the larger northern reserves and in the fire-ranging districts there were constructed a number of small patrol cabins at the more stategic points. These were designed as stopping-places for rangers on patrol, or, in some cases, as the headquarters of most of the temporary summer staff. The buildings have usually been built of logs. No outside labour was used in their construction, the work being all performed by the regular staff.

Two 80-ft. steel lookout towers were erected on the Pines and Pasquia reserves early in the year, and proved quite useful during the fire season a little later. In the fire-ranging districts, especially along the low-lying watercourses of the north, several new wooden towers were erected, and a number of the existing towers repaired. In the low-lying country drained by the Churchill river, such towers are the only means the rangers have of detecting fires at any distance; and it is planned to have enough of these in each ranger district to enable the ranger to reach a tower and take an observation therefrom at least twice each day in the course of his patrol.

During the year no work was done on new roads or trails. Existing roads, trails, and portages were, however, improved or maintained in a good state of repair by the rangers, during the periods of little fire-danger. The small reserves in the south, and the Pines and Nisbet in the north require little expenditure on this account, but the northern reserves, except for old logging roads, are lacking in this respect, and roads to make them accessible will, as time goes on, form a large part of our improvement programme.

GRAZING

The Forest Reserves Regulations provide for the fullest use of the grazing resources of the reserves, consistent with their proper management for continuity and equal division among those entitled to benefit by them. The regulations aim to encourage and aid the raising of livestock, especially in conjunction with forage crops on small farms in the neighbourhood of the reserves. That this aim is being met is evidenced in the yearly increase in the number of stock run on the various ranges covered by these regulations. During the year, grazing permits were issued to 580 permittees, aggregating 40,000 head of stock as against 27,600 last year, and 6,500 in each of the two preceding years. This marked increase is, in a large measure, due to a better understanding of the regulations, and a growing realization of the advantages offered by the reserves in this direction. A part of the increase, however, is due to closer supervision on the part of the administrative staff, crop failures, and the cry for increased beef production. The year has seen many of the problems presented in connection with grazing satisfactorily worked out. There exists a much clearer understanding of the regulations among all concerned, and they are being administered with growing regularity and uniformity. As predicted in former reports, grazing is being most satisfactorily handled when done on a co-operative basis, through small local stock associations, of which there are now twenty-four in the district, an increase of twelve over last year, and it is confidently expected that the same increase will be made this year.

The demand for range on the small reserves of the prairie is now equal to the capacity, and another year it will probably be necessary to eliminate as far as possible, all winter-grazing, and encourage the production of forage crops for winter-feeding on lands owned by the permittee. The crisis faced by the stockman last winter, forcibly illustrated the necessity of departing from the old hit-and-miss system of depending on the annual grass crops for winter-feeding, and there seems to be a growing opinion that recourse must be had to the growing of ensilage crops, if stock are to be every year carried through without undue losses.

SILVICULTURE

A growing scarcity, accompanied by a brisk demand, both domestic and foreign, with correspondingly high prices, brought all forest products into great demand, especially during the latter part of the year. This was particularly welcome in view of the fact that the fires of the early part of the year killed a very considerable quantity of merchantable timber, which the Branch was anxious to have utilized before it became worm-eaten and decayed. Our efforts in this direction were fairly successful, the larger areas being disposed of, and before another year the bulk of the fire-killed material should be salvaged. At the end of the year there were ten timber sales in good standing, four of which were new sales made this year, the others having been made a year or more ago. The ten sales involved a quantity slightly in excess of twelve million feet. There were cut from the timber sales during the year, approximately 3,500,000 feet board measure of saw-timber, and to this must be added slightly more than a like amount of the same class of material cut under permit.

In an attempt to salvage as much as possible of the fire-killed timber standing on the reserves, a special effort was made to increase the quantity of timber cut under permit. The number of permits issued during the year was approximately 1,500, an increase of 25 per cent over last year, and 50 per cent over the year previous. The great bulk of these permits called for the cutting of only fire-killed, or diseased timber, with the result that in the aggregate a large area bearing these classes of timber was cleaned up. In certain cases permits were issued at a reduced rate of dues, on the condition that the cutting areas be cleaned of all material, small and large, good and bad alike, and some really excellent results were obtained in this direction, leaving the areas free of all fire-hazard, and the ground in good shape to reseed naturally. The regulations requiring the disposal of all debris resulting from such cutting, were closely observed except in a very few cases, and in several of such cases the offenders were prosecuted and convicted for failure to comply with the rangers' instructions in this connection. While some, of course, continue to try to evade the slash-disposal regulations, most of the operators are now convinced of their proprietory and of the intention to enforce them, with the result that less trouble is being experienced in securing their fulfilment. The permit business is, as stated above, on the increase, but it is felt that this can yet be tremendously increased, to the mutual benefit of the settlers and the Forestry Branch, especially since these operations are limited largely to dead and down material. With the mounting price of coal, and the uncertainty of the supply each winter, it is felt that a campaign should be started another year to interest the prairie farmers especially in the co-operative cutting and shipping of fuel-wood. This could no doubt be extended to cover fence-posts, corral-rails, roof-poles, etc. The scheme is suggested by the fact that a number of farmers, working in the logging camps during the winter at the end of the season frequently take back with them a carload or two of these materials.

MISCELLANEOUS USES

Hay Cutting.—Owing to the extremely dry season and the shortage of hay and other forage crops, a most acute demand was felt for hay. This was much greater than could be met from the supply available on the reserves, but every assistance was given by the field staff in helping those looking for this commodity, to locate it on vacant lands outside. For the cutting of hay on the different reserves, there were issued 533 permits, aggregating slightly over twenty thousand tons.

Recreational Uses.—The year showed a growing tendency on the part of the public to use the reserves for camping and picnicking purposes. This was especially noticeable on the small prairie reserves, where their broken surface, covered with trees and frequently dotted with lakes, is restful to the eye of the prairie dweller. An opportunity is in this way offered to interest the public in the reserves and the work of the Forestry Branch, and it is proposed to encourage this use by subdividing further areas to lease for summer cottage purposes.

APPENDIX No. 4

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR ALBERTA

This report covers the fiscal year 1919-20, ended 31st March, 1920.

The duties of the Dominion Forestry Branch in the Alberta district cover the following fields: (1) the administration and protection of the Dominion forest reserves in the province of Alberta, (2) the protection of timber on Dominion lands not within forest reserves, and (3) the protection, in co-operation with the Board of Railway Commissioners for Canada, of timber along railway lines. The second of these fields is not restricted to the province of Alberta, but extends into the Mackenzie river region of the Northwest Territories.

Dominion forest reserves in Alberta cover an area of 19,532 square miles or 11,800,960 acres. Along with the area devoted to Dominion parks in the province about 10 per cent of Alberta is under forest reserve or park management. Surveys show that there are extensive areas in the northern parts of the province, which, while not suitable for agriculture, are capable of producing good timber. From the data so far gathered by surveys and investigations it is evident that not more than 65 per cent of the provincial area should be considered as agricultural, while the remainder, 35 per cent, being incapable of profitable agriculture, should be devoted to the production of timber. If even only 15 or 20 per cent of the provincial area were given over to forest production, and handled on a rational basis, the annual yield of timber, as a result of growth, would be sufficient to supply the needs of a population several times that of the present day. This, of course, refers to timber which is native to the province. Certain classes of timber not native would still have to be imported. Only a small part of the timber used in Alberta at the present time is produced in the province, for the reason that the more accessible supplies have been so thoroughly culled over, and so much destroyed by repeated fires, that it is difficult to enter into competition with outside sources.

Owing to the fact that the erroneous conception, that forest reserves are set apart to prevent the use of timber is still widespread, it may be stated that exactly the opposite is true. Areas not suitable for agriculture are set apart as forest reserves, and the timber therein protected, in order to maintain as full and as constant a supply as possible to meet the needs of the people in the surrounding districts. In disposing of such timber, however, it is the aim of the Forestry Branch to avoid the old haphazard and wasteful methods of merely exploiting the forest resources. It is required of operators that there should be reasonably complete utilization and that operations should be so conducted that there may be some opportunity for the forest cover to re-establish itself under conditions that will be favourable to proper development and fire protection.

FIRE PREVENTION AND SUPPRESSION

Fire-ranging within Forest Reserves.—The fire season of 1919-20 was the worst since forest reserves were established in Alberta. The winter of 1918-19 was very mild, with very light snowfall. The spring of 1919 opened early, with little precipitation and with unusually high, warm winds. The foliage and undergrowth remained dry until unusually late in the season. The fire-hazard was high in April, reached the peak in May, fell slightly in June and then rose in the latter part of that month and remained high till the end of July when there were copious rains. As there were very few fires after the first of August the season of high fire-hazard may be

said to have closed then. This high fire-hazard was not confined to western Canada but was common to the western part of the continent on both sides of the Canada-United States boundary. In the states of Montana and Idaho the losses from forest fires in 1919 were among the heaviest ever experienced.

The experiences of the year 1919 showed the great value of the telephone as a means of communication, and also emphasized that, if fires are to be reached in time to suppress them, roads and trails must be provided for speedy travel. Several of the fires that did the most damage occurred in remote districts not served, or only imperfectly served, by trails, and the time lost in reaching these fires allowed them to gain headway. The season was one of strikes and labour troubles. This made labour hard to secure to fight fires, and moreover the mining strikes affected the quality of coal used on the railways, with the result that the fire-hazard from this source was increased. Men not working spent considerable of their time in the bush, which added to the numbers of campers and caused an increase of fires from this source. While many hunters and campers were careful in the woods, many were very careless, with the result that during periods of extreme hazard those travellers not having business therein were excluded from the reserves most in danger. One of the most effective reforms in regard to forest fire prevention will be achieved when the public is seized of the great danger of the careless handling of fire in the woods, and of the great extent of the loss forest fires cause. Settlers clearing lands by fire were also a cause of fire. Many fires originated outside the reserves and gained such headway that efforts to keep them out of the reserves were unavailing. The total number of fires within forest reserves was 95. Of these 47 were large fires, that is fires burning over areas of more than ten acres, and 48 were small fires. This percentage of large fires is very high and is due to the long period of dry weather, accompanied by high winds, and to the fact that sometimes as many as eight fires broke out at one time at widely separated points, with the result that some of these fires could not be got under control by the crews which could be secured to fight them, until they had burned over a considerable area. All but six of the 95 fires occurred in the period from April to July, as follows: 17 in April, 43 in May, 10 in June, and 19 in July. The remainder were scattered through the other months. The chief known causes of fire were: railways, 43; camp-fires, 11; lightning, 7; hunters and travellers, 4; settlers and brush burning, 4; incendiary, 2. The fires of unknown origin numbered 19.

Over 200,000,000 feet board measure of saw-timber and about 800,000 cords of fuel-wood were destroyed. Eleven million feet board measure of saw-timber and 1,000,000 cords of fuel-wood were damaged but left in such shape that they can be salvaged. The remainder of the area burned over was covered with young growth, "slash," and old "burn."

In addition to the above fires within the reserves, the reserves staff for the protection of reserve timber fought fires which originated outside, and which they were able to keep from burning into the reserve. Of these fires there were twelve, which burned over 18,300 acres. The origin of 7 of these fires was unknown and one fire was attributed to each of the following causes: brush burning, lightning, hunters, railway, and steamboat.

Fire-ranging outside Forest Reserves.—For the purpose of administering the forest-protective work on Dominion lands outside of forest reserves in the Alberta district, the territory is divided into three immense districts, the Edmonton, McMurray-Slave, and Mackenzie. The Edmonton district covers an enormous area embracing all timber-land lying east of the Rocky Mountains forest reserve from the valley of the Saskatchewan river northward to and beyond the Peace River district. It also extends eastward over that part of the province lying north of the Saskatchewan valley, and northward to and including the Wabiskaw and Lac la Biche districts. The McMurray-Slave district extends north and east of the Edmonton

district, along the great waterways of the Athabaska and its tributaries to Fort Smith on the northern border of the province of Alberta. The Mackenzie district lies wholly in the Northwest Territories and extends along the Mackenzie valley as far north as Fort Simpson.

In the two northernmost districts the season was wet and fires were few. In the Mackenzie district only one fire was reported. This was early in June and the rains put it out before any damage was done. In the McMurray-Slave district, while the early part of May looked serious, on account of the late spring and the prevalence of fires to the southward, rains soon came and removed the fire-hazard for the remainder of the season. There was a total of seven fires, none of which did any serious damage. The patrols were on the alert in suppressing fires and also in warning travellers of the danger of camp-fires. There was a large movement of freight into the north, including considerable quantities of gasolene and gunpowder, and the rangers took care that, at the most important points of transfer from land to water carriage, these commodities were piled by themselves and protected.

The Edmonton district, which is the most southerly and westerly of the three, and, therefore, the nearest to the forest reserves, experienced a bad fire season like the reserves. In addition to having a dry, hot season, with continual high winds, this district also suffered more than the others, because settlers were pouring into it all through the summer, which meant a great deal of travel by rail and trail, and much use of fire to clear land; all of which added to the fire-hazard. The officers in the district had a total of 235 fires to combat. Of these 141 occurred in May, 45 in June, 18 in July, and 13 in August. In such a vast territory, while every effort is made to discover the cause of fires, it is impossible to learn the source of many of them. Of the 235 fires, the causes of 100 were unknown. 72 were caused by settlers, 28 by railways, 27 by campers, 7 by brush disposal other than by settlers, and 1 was incendiary. A total of 121,000 acres was burned over of which 13,000 acres bore young growth, 2,300 acres, "slash," 11,000 acres, old "burn," and 41,000 acres were grass land. The merchantable timber destroyed was estimated at about 45,000,000 feet board measure.

Railway Fire-ranging.—Fire prevention and suppression along the railway lines is carried on by officers of the Forestry Branch working in co-operation with the Board of Railway Commissioners for Canada. The same difficulties as to weather conditions, which faced the reserve organizations, also confronted the organization for the detection and suppression of fires along railways. The climatic conditions were as serious as could well be imagined, the season opening with a long dry period, marked by high temperatures and high winds. The labour situation reduced the average efficiency of workers and led to poor reporting of fires. Strikes at some of the more important coal mines necessitated the use of inferior coals, which set fires, particularly on steep grades, in spite of the use of spark-arresting apparatus on the locomotives. Generally speaking, the larger railways looked well to the clearing of debris from the right of way while some of the smaller and more poorly organized lines fell behind in this respect. This was particularly the case on some branch lines, where, to add to the danger the worst coals were used. On all the railway lines in Alberta there was a total of 45 fires, which burned over 18,475 acres and destroyed or damaged 18,000,000 feet board measure of saw-timber and 9,000 cords of fuel-wood. Approximately 11,000 acres of young growth were burned.

IMPROVEMENTS

The most important work of a forest administrative system is fire prevention and fire suppression, and in order to do this efficiently and economically the various forest units must be provided with means for quick communication, and for rapid travel of fighters to fires. There must also be a very considerable plant in the form of houses, cabins, and stables to permit forest officers to live at strategic points on the

reserves, often far away from centres of population or lines of ordinary travel. On each of the reserves there is a programme of improvements which is carried out from year to year as time and money permit. Between periods of danger the rangers are transferred from their beats to work on the opening of trails, building of bridges, telephone lines, cabins, etc. If the season is a wet one with few fires a great deal of work can be done in this way, but if the fire-hazard is continuous the rangers must be kept at their posts detecting and suppressing fires, and but little improvement work can be accomplished. The fire season of 1919 in the Alberta inspectorate was one of the most unfavourable for improvement work in the history of the inspectorate, owing to the almost continuous high fire-hazard. Besides this a heavy storm in early spring blew down trees across many of the trails and telephone lines and this necessitated that a large amount of the labour, which could be spared from fire-fighting be devoted to repair and maintenance work. Another cause of delay in the progress of improvements was the lack of suitable labour. In spite of this the work was steadily pressed forward whenever opportunity permitted. Thirty miles of standard roads were constructed and about double that length of new trails. A total of over sixty miles of old Indian trail was improved and made passable for pack-trains. The Lesser Slave reserve, the least accessible of all the reserves in this district suffered from a heavy storm of wind and sleet in early spring, which filled the trails with windthrown trees. That settlement is rapidly pressing this far north was shown by the fact that some of the smaller bridges and the corduroy on trails on this reserve were broken through by automobile trucks used by persons moving into the country.

Among the road improvements on all the reserves were about 20 small bridges and approximately 3,500 feet of corduroy. The buildings erected included four ranger station houses, three cabins for rangers to use on patrols, one storehouse and one stable. All the older buildings were maintained in a good state of repair.

The difficulties above mentioned kept down telephone construction. Sixty-eight miles of new line were completed on all the reserves, the most important projects being on the Athabaska and Bow River forests. In addition a large amount of repair work was done on existing lines, and poles and other material were prepared and placed in position for construction next year. Smaller improvements, such as fences, pastures, corrals, wells, etc., were constructed on a number of reserves.

GRAZING

In spite of difficulties due to a most abnormal season grazing business in this district shows an increase over the preceding season. The same causes which made the summer of 1919 a dangerous fire season made it also a poor grazing year. The winter of 1918-19 was very mild, with little precipitation, and, as explained in the section of this report devoted to fire protection, rains were not general until late in the summer, when the season was too far advanced for any great improvement in the grass. The only falling off in numbers of stock grazed was in the case of sheep, the figures being approximately 21,000 in the season of 1918 and 8,800 in 1919. This decrease was due to several causes, chiefly to the moving of large herds of sheep from the districts in the southern part of the province to the more open spaces of the northern part of Alberta. The increasing density of settlement in the south is reducing the areas open to sheep, and the extremely dry weather of the season in this part accelerated the movement. In spite of this the total number of stock grazed on forest reserves in the district increased from 52,053 for the season of 1918 to 53,574 for the grazing season of 1919. The number of permits issued increased from 480 to 641, cattle pastured from 24,057 to 33,821, and horses from 6,991 to 10,922. The co-operation in handling the stock by the local stock associations continued satisfactory, and the number of associations is steadily increasing. Trespass cases were not numerous and several decisions handed down by the courts during the year will

assist in controlling this in the future. The general condition of the ranges so far as vegetation was concerned was much better at the close of the season than a year before, and the outlook for the next year, therefore, brighter.

SILVICULTURE

The aim in handling timber on Dominion forest reserves is to protect mature timber and accelerate the rate of growth of growing timber, in order to have as large a supply as possible, both present and future, to meet the requirements of the surrounding settlements. Thus after a bad fire season the endeavour is to dispose of all the fire-killed timber as quickly as possible, in order to prevent its deterioration, and also to clear the ground for the new growth that is to take its place. How far this can be carried out depends upon the state of the markets, the roads, and the industries. The bad fires of the summer of 1919, which left much timber killed but not destroyed, were a factor making for the disposal of increased quantities of all kinds of timber, while, on the other hand, the strikes of 1919-20 in the coal-mining industry affected adversely the disposal of mining timber. Thus the sales of mine props and lagging declined considerably, while on the other hand the heavy demand for building material was one chief reason for the greatly increased output of saw-timber, both under permit to individual settlers and by sale to operators. The cut of saw-timber on the reserves in Alberta was over three times as great in 1919-20 as in 1918-19, the production in 1919-20 being over five million feet board measure. The number of poles, fence-posts, and round building logs taken out was about the same in each year, and there was a slight falling off in fuel-wood. This latter was in part due to the deep snow of the winter of 1919-20, which prevented farmers drawing out fuel, who otherwise would have done so. This bad season for hauling of settlers' supplies was also partly the reason for the decline in the number of permits from 925 in 1918-19 to 861 this year. On the other hand, the demand of some of the prairie railway lines increased the output of railway cross-ties from less than 1,200 to more than 940,000. In a general view of the situation it is seen that as the objects and possibilities of forest reserve management on silvicultural lines become better understood the work becomes easier and the results more satisfactory both to the administrative officers and to the public.

APPENDIX No. 5

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR BRITISH COLUMBIA

D. Roy Cameron

This report covers the fiscal year 1919-20, ended 31st March, 1920.

The British Columbia inspection district embraces the Dominion forest reserves in British Columbia and the Coast, Salmon Arm, and Revelstoke fire-ranging districts, all situated within the Railway Belt of British Columbia.

The basic importance of adequate fire protection as a fundamental to the inauguration of a forest administration comprising even the most preliminary phases of technical development was strongly emphasized during the summer season of 1919. It would appear from the experience of the Forestry Branch which is confirmed by the disasters encountered even in the comparatively highly organized areas in the national forests of the United States, that the complete solution of our fire-hazard problems is still in the future and that the attainment of that goal is a task arduous enough to occupy the attention of the present generation of foresters almost exclusively. The possibility of making and carrying out plans for forest conservation and reproduction depends absolutely on establishing a protection system capable of standing the strain not only of normal seasons, but also of the extra hazards, which the experience already gained proves may be expected once in every four or five years. Consequently, the answer to criticisms of delay in connection with the undertaking of technical studies and artificial reforestation projects lies in the fact that it would be poor business foresight to spend any great amount of time and money in such ways, desirable though they may be, until our present great resources in standing timber are protected from the ravages of the fire fiend.

Criticism has been made that the more intensive organization effected in recent years has not decreased the number of fires reported, but rather otherwise. To this a twofold answer can be made: first that the efficiency in organization has increased barely sufficiently to cope with the greater increase in fire-hazard arising from the spread of settlement and the constant reaching farther afield of the logging industry, resulting in ever-growing acreage of logging debris; and second, that the expenditure of money is justified by the constantly decreasing percentage of fires running at large in green timber. In the old days it was considered sufficient to fight fires threatening settlements and private property, and to engage in only faint-hearted, if any, attempts to combat fires in the forest proper. It is useless to expect decreased fire-fighting expenditure for many years but more intensive organization guarantees greater value received for money paid out and an undoubted decrease in the value of forest resources destroyed.

The above remarks should not be construed to mean that any and all attempts to apply forestry methods are decried, but rather a warning lest enthusiam for progression along these lines should blind our eyes to the big problem. Given control of the fire situation all other things can be added; lacking this, other accomplishments must be heavily discounted as liable to extinction at any time.

The fire season of 1919 surpassed in hazard, intensity, damage, and expenditure any previously recorded in the history of forest administration in the Railway Belt. This, despite the fact that during the earlier months conditions were fairly favourable, with cool weather and normal precipitation. During the latter part of June, however, the country suffered from drying winds, rising temperatures, and lack of rainfall. These conditions continued with increasing intensity and a daily accumulating fire-hazard, reaching a peak between July 14 and 17, at which time the

temperature rose to 102 degrees, accompanied by hot, southerly winds of high velocity. During this time an epidemic of fires occurred, many of which escaped control and gave rise to a very serious situation. With few exceptions the fires were surrounded within a short time, but the continuance of dry, hot weather, with winds at night and consequent lack of normal increased humidity, necessitated active fire-fighting on the lines of all these fires for periods varying from two to six weeks, or until August 31, when the prolonged drought was broken by heavy precipitation.

During the latter part of September another emergency period ensued culminating in the Coast district with a veritable hurricane from the east on September 27, on which date fires ran broadcast, with considerable damage to property and logging equipment as well as to standing timber.

The total number of fires reported from all sources as occurring in the Railway Belt was 408, an increase of over 40 per cent over 1918, which was in many respects a normal year.

The proportion of large fires (i.e. fires burning over ten acres) increased from the normal figure of 17·5 per cent to 52·9 per cent, indicating the emergency existing during 1919. On the other hand the efficiency of the control organization is seen in the further decrease in the proportion of fires of unknown origin which dropped from 24·5 per cent in 1918 to 19·6 per cent in 1919. Fires of unknown origin were still the largest single item on the list. Railway fires jumped to second place with a percentage of 19·4. This was to be expected, inasmuch as the highest temperatures and greatest hazards occur in the valley bottoms where the railway lines are located. The occurrence of railway fires is a fair indication of the seriousness of the situation. Notwithstanding the high percentage of fires along railways only six fires reached large proportions. The intensive patrols established under the orders of the Board of Railway Commissioners demonstrated their value in their record. Fires caused by campers remained practically stationary at 15·6 per cent of the total. Of the other causes, "settlers burning brush" increased in proportion from 11·2 to 13·5. This record is considered fairly satisfactory in view of the increased clearing going on and the high risk attending burning operations during the season. Thirty-eight fires were started by lightning as against thirty-nine in 1918, but the percentage dropped from 13·8 to 9·3 because of the greater total of fires from all causes last year. Some of the most disastrous fires fought in 1919 were caused by lightning in the region of the Shuswap lakes.

The 408 fires noted above burned over 86,688 acres, destroyed or damaged 39,000,000 feet board measure of timber and over 24,000 acres of young growth. These figures show that although the whole season was infinitely worse than 1918 the damage to timber was reduced by nearly 30 per cent.

RESERVATIONS

No action was taken in establishing additional areas in forest reserves, but in view of the probability of further legislation in the near future a special reconnaissance was made of an area of approximately half a million acres lying south of the Canadian Pacific railway between Revelstoke and Sicamous, for the purpose of developing a complete improvement plan based on the requirements of the whole area. With this available, a start can be made in organization along lines which will not have to be altered as work develops. As a result of the survey, information is on file with respect to the proper location of headquarters, necessary trails, telephone lines, lookout stations, etc., correlated to the timber resources and the fire-risk.

SEED COLLECTION

Collection of seed of Sitka spruce was undertaken on an extensive scale for the Forestry Commissioners for Great Britain to be used in reforestation in the British Isles. This work was handled as a special project under this office under the immediate

supervision of a forester detailed from head office. A total of about one thousand pounds of seed was collected. When it is considered that there are approximately 100,000 seeds to a pound, it will be seen that the amount collected is sufficient to plant a large acreage even allowing for considerable loss in germination, seed-bed, and transplant stock. The collection was made entirely on the Queen Charlotte islands. Instructions were also given to collect seed of Douglas fir, but unfortunately the crop was a total failure in 1919.

FIRE PROTECTION WITHIN FOREST RESERVES

Forty fires were reported on forest reserves during 1919. Fires of unknown origin dropped to third place with 15 per cent, a clear index of more intensive organization and control. Carelessness of campers was responsible for the largest percentage, 32·5; and hunters came next with 27·5 per cent, showing the continued need for further propaganda work. A discouraging feature was the high percentage of incendiary fires equalling 10 per cent of the total. "Burning off" range to improve the pasturage is probably the underlying motive of these fires and not pure malice.

The lookout stations functioned throughout the entire season despite the smoke pall. Experience has shown that early morning observations will give good results, even during the peak of the fire-hazard. The reason for this lies in the fact that the greater atmospheric humidity during the hours of darkness condenses the smoke to a solid fog lying in the valley bottoms. Before this expands with the sun's heat, smoke from fires burning can be seen emerging as pillars above the general smoke cloud, forced through by the draft caused by the heat of the fire itself.

The average time between check reports from two different lookouts on the same fire was under one-half hour. Over 75 per cent of all fires occurring within the range of visibility of lookout stations were first reported by them, one station having a clear record of 100 per cent.

The lookout system on the forest reserves in the British Columbia inspectorate is not yet complete, but plans have been made for the establishment of further stations as rapidly as funds will permit. In the meantime experiments are contemplated in the occupation by lookout men of points now unreached by telephone, and to use heliographs to transmit messages to and from lookout stations now established, where the information can be relayed by telephone to the proper offices.

Scarcity and inefficiency of casual labour again threw the responsibility of controlling fires on the reserves largely on the unaided efforts of the forest officers.

IMPROVEMENTS

The bad fire season and large expenditure in connection therewith forced practical abandonment of the improvement programme. Some maintenance and completion work was put through on existing buildings, and locations made for trails and telephone lines. Lookout stations were equipped with improved facilities for observations. Considerable maintenance work was accomplished on trails during the early part of the season, principally by means of ranger and guard labour. Pastures were fenced at several cabins, and considerable clearing done at Mount Ida cabin and at the Highland Valley ranger station. A well constructed bridge was finished during the winter to replace the old one at the narrows of Trout lake in the Long lake reserve. In the spring Meadow creek, the outlet of Trout lake, was cleared of beaver dams to permit the rainbow trout to reach their spawning grounds.

SURVEYS

A start was made in the traversing of all unsurveyed trails on the reserves, including establishment of mileage notices, but the exigencies of the fire situation forced an abandonment of this project after the Niskonlith trail had been defined.

Other miscellaneous surveys in connection with administrative sites, project meadows, etc., were handled by the regular staff. A winter reconnaissance survey party was placed in the field in January and completed an extensive reconnaissance of the Monte Hills forest reserve. Reserve personnel was employed on the work. Valuable results were secured.

SILVICULTURE

A small sale was awarded in the Salmon River valley on the Fly hills for operation in yellow pine and Douglas fir, and is being handled satisfactorily. The volume of timber permits remains small and may be expected not to increase for some time, inasmuch as most homesteaders have still considerable unused timber on their holdings.

SUMMER RESORTS

Both Trout lake and Paul lake were patronized more extensively than ever before. Unfortunately fishing fell off very greatly during the season. The water at Trout lake remained so low during the spring, owing to the light snowfall of the previous winter, that the flow of Meadow creek was seriously impaired, and a great percentage of the fry perished on the spawning grounds. Despite the co-operative activities of the forest officer on the ground and the fisheries overseer, Indian depredations continued on trout spawning in Paul creek.

EQUIPMENT

Additional equipment purchased was limited to replacements of worn-out material. The portable gasolene fire-pump saved the day many times in fire-fighting use, especially in the Coast district where ample water supply was available.

PUBLICITY

During the spring a concentrated effort was made to arouse the interest of the school children in the rural districts in the question of forest protection. Talks were given and matter distributed in forty-five schools. The children were asked to volunteer their services in protecting the forests and all gladly did so.

The forest officer in charge of this work reports very encouraging results. He was warmly welcomed by both pupils and teachers and in many cases regret was expressed that he could not make his talk longer. A number of the teachers asked whether there was a possibility of having the pupils go out for an afternoon in the woods under some person who could give them a lesson on the trees and their uses. The officer believes this form of publicity will produce lasting results and suggests that it would be a good thing if each school could be visited twice a year, and the lecturer be supplied with pictures, magic lantern, etc., and also with small badges which could be given to children who volunteer to help protect the forest.

FIRE-RANGING OUTSIDE FOREST RESERVES

The hazardous character of the season is shown both in the number and size of the fires fought. The total number of fires in the Railway Belt outside of reserves was 368 in 1919 as against 266 in the season of 1918, an increase of 102. The proportion of these which attained large dimensions was 21 per cent greater than in 1918. The total area burned over was 68,624 acres of which 27,351 acres carried mature timber; 19,114 acres bore young growth and the remainder was grass land, old "burn" and "slash." The heaviest loss in timber damaged and young growth destroyed was in the Salmon Arm district where the conditions were extremely adverse and where 24,493 acres of mature timber was damaged and 17,822 acres of young growth burned.

RAILWAY FIRE-RANGING

As pointed out above the railways emerged from the danger period with excellent records. Of the 89 fires reported as occurring along railways only six attained any size, the rest being extinguished while still in incipient stages by the railway fire-patrol organization, established under the orders of the Dominion Railway Commission and supervised from this office. General right-of-way conditions were much improved during the season. The main lines of both the Canadian Pacific and Canadian National railways were, except in isolated instances, in fair shape by the close of the season.

Contractors burning right of way along the Kamloops-Vernon branch of the Canadian National railways, under construction, were responsible for many fires, some of which did great damage. Of the fires occurring along railways (under operation) over half were caused by sparks from coal-burning locomotives. Frequent inspection of appliances failed to show glaring defects of equipment and the large number of fires must be attributed to the extremely combustible nature of the vegetation and litter along the rights of way, and in part to defective coal.

APPENDIX No. 6

REPORT OF THE ACTING SUPERINTENDENT OF THE FOREST PRODUCTS LABORATORIES OF CANADA

W. KYNOCH

This report covers the fiscal year 1919-20 ended 31st March, 1920.

As compared with last year the staff has been further reduced in number by the resignation of five technically trained men. Under these circumstances the work of the institution during the past year has necessarily been seriously hampered, although every effort has been made by the remaining staff to continue it efficiently. A brief review of the activities of the various departments is given below.

LIBRARY

Nearly three hundred books were added during the year and the reference files were considerably enlarged. The leading trade and technical periodicals covering the field of timber and forest products, have been regularly received and indexed.

EXHIBITS

The permanent exhibit installed at the laboratories has been greatly improved during the year. Numerous additions have been made, a new system of labelling devised, and the whole practically completely rearranged so as to be more instructive and valuable.

Several displays were prepared for exhibitions in Canada and abroad, including the Canadian National Exhibition, Toronto, and the Canadian Industries Exhibition in London. The laboratories also co-operated, by request, with the Canadian Pacific Railway, the Canadian National Railways, and the Canadian Forestry Association in exhibit work relating to forest products. A good deal of time has been devoted to the preparation of the Canadian contribution to the British Empire Timber Exhibition, to be held in London in July next. The compilation of a catalogue giving information on the timbers to be represented has been an important part of this work.

Sets of authentic hand specimens of Canadian woods prepared at the laboratories, were distributed to various institutions and officials in Canada and abroad.

DIVISION OF TIMBER PHYSICS

Fairly extensive miscellaneous work was carried out by this division during the year. It included microscopic and microchemical determinations, such as specific identification of samples of wood and analysis of pulp and paper, and also co-operation with other divisions and with the branch laboratory in Vancouver in connection with projects, and minor investigations. Progress in projects is reported below under "Wood Sections" "Decay in Pulpwood and Deterioration of Pulp" and "Decay of Timber in Buildings."

DIVISION OF TIMBER TESTS

Progress on projects is reported below under "Testing Clear Specimens" and "Efficiency of Newsprint Splices." Miscellaneous work included tests of Douglas fir in structural sizes, made for the Department of Lands, British Columbia, and tests of the same species, both in structural sizes and in the form of standard, small clear specimens, undertaken to secure information as to relative strength of rapid and slow-growth timber.

DIVISION OF PULP AND PAPER

Progress on projects is reported below under "Chemistry of Wood" and "Efficiency of Newsprint Splices." Miscellaneous work included compilation of information in answer to technical inquiries and co-operation with other divisions in one project and in minor investigations. On account of the conditions some work quite outside the scope of the division was dealt with, namely, tests of charcoal made in experimental burning on the Riding Mountain forest reserve, Manitoba.

DIVISION OF WOOD PRESERVATION

The most important work carried out by this division was that on three projects discussed below under "Railway Ties," "Red Pine Paving Blocks" and "Field Survey of Railway Ties." Miscellaneous work was done on the analysis of wood preservatives and on minor tests and investigations.

INFORMATION FURNISHED

The furnishing of technical information in response to inquiries relating to timber and forest products is an important function of the various divisions of the laboratories. This work usually involves a careful study of the available data on the subject in question and in some cases minor tests or investigations, the final step being the compilation of a report, a copy of which is forwarded to the inquirer. Two hundred and fifty-four inquiries of this kind were answered during the year as compared with two hundred and twenty-five last year.

From the character of the inquiries constantly being received it is evident that study and research along lines not yet undertaken in a systematic way are necessary in order to cover adequately the whole field of forest products. Divisions to deal with problems in wood conditioning, wood distillation, and derived products would be desirable. The pressing need of a general division of lumber has been referred to in previous reports.

PROJECTS

Investigations of major importance are rated as projects. Progress reports are drawn up periodically and on the completion of the work, or a certain section of it, the results are prepared for publication.

1 *Testing Clear Specimens.*—The purpose of this investigation is to provide authoritative and complete data regarding the mechanical and physical properties of all Canadian woods of present and possible commercial importance. Since this work was begun tests of six species have been completed. During the year tests of "green" material of four more species were concluded.

2 *Nova Scotia Mine Timbers.*—The object of the investigation is the determination of the relative strengths of the several species now used or of possible use, in the coal mines of the province for props and booms. The actual tests were finished before the beginning of the year and some work on the preparation of the results for publication had also been done.

3 *Railway Ties.*—The object of this investigation is to work out the most suitable methods of dealing with ties at every stage from the forest to the track, the final aim being to lengthen the service life of ties in the track as much as possible. Proper seasoning and efficient preservative treatment are of primary importance in this connection.

A seasoning study of jack pine and eastern hemlock begun in the autumn of 1918 was completed. The ties were then conveyed to the laboratories and there treated with creosote oil according to methods previously worked out and described in Forestry Branch Bulletin No. 67 "Creosote Treatment of Jack Pine and Eastern Hemlock for Cross-ties." Information obtained as a result of this work will be

prepared for publication. Arrangements are being made to place a number of these ties in the track for service tests. Very valuable information should thus be secured in the course of a few years.

4 *Chemistry of Wood.*—The object of the investigation is to establish standard methods for the chemical analysis of pulpwood and pulp and to carry out a complete study of the chemical character of Canadian pulpwoods. Cellulose, lignin, and resin determinations on five species of wood were continued for part of the year as were also pentosan and furfural determinations.

5 *Red Pine Paving Blocks.*—The object of the investigation is to work out a satisfactory method of creosoting this wood for paving blocks. The work was begun last year. Three different standard creosote oils were used, and blocks, manufactured at the laboratories, were treated both in the green and air-dry condition. Observation of test areas of pavement (laid in the yard) for bleeding and swelling was continued, as also were laboratory tests to supplement the outdoor work. A large number of measurements and determinations were made. It will be necessary to continue these for several months longer before reliable conclusions can be drawn.

6 *Wood Sections.*—This project provides for the preparation of a complete reference collection of microscopic slides of Canadian timbers and of important foreign commercial timbers. Photomicrographs will also later be made from these slides. The collection is urgently needed and will be invaluable as a check in wood identification and for research into this subject and into many of the properties of woods. Material of some seventy species was completely conditioned for sectioning during the year. Standard methods of staining were worked out. A special photomicrographic apparatus was designed and partly constructed.

7 *Efficiency of Newsprint Splices.*—The object of this investigation, undertaken at the request of commercial concerns, was the determination of the relative strength of different types of splice in newsprint as made commercially. Special testing equipment was designed and constructed at the laboratories and several hundred tests were made. Results were compiled and published.

8 *Field Survey of Railway Ties.*—This work, supplementary to Project 7 "Railway Ties," was undertaken for the purpose of obtaining first-hand information on track conditions and present tie practice on the various Canadian railways and of establishing closer relations with railway officials with a view to enlisting more active co-operation in these tie investigations.

A considerable number of prominent railway officials in Eastern Canada were personally interviewed by a representative of the laboratories, many expressing a desire to co-operate in line with our suggestions. Valuable information was also secured. Standard tie record forms were prepared and submitted to the railways and useful data thus obtained. Arrangements for inspection of track were concluded with several of the companies.

9 *Decay in Pulpwood and Deterioration of Pulp.*—This investigation was undertaken at the request of various commercial concerns with the object of working out methods of storing pulpwood and pulp which should eliminate or minimize the decay and deterioration which at present involve considerable monetary loss. Preliminary field studies of storage conditions of wood and pulp were made at several mills. Tests and determinations in connection were carried out at the laboratories. The investigation was then outlined and discussed with a number of commercial concerns and plans made for continuing the work on a larger scale next year.

10 *Utilization of Decayed Aspen.*—The object of this investigation is to devise some profitable method of utilizing this waste material of which immense quantities

exist in various parts of Canada. The development of such a method would also make it possible to remove the aspen, an inferior wood, from certain areas and to provide for the establishment thereon of more valuable species.

11 *Decay of Timber in Buildings.*—The object of the investigation is to secure exact and detailed information as to the conditions which facilitate the action of various wood-destroying fungi on woods used for interior construction in mills and factories, and to work out procedure and methods by which the decay can be prevented. Detailed studies of decay in a large number of mill and factory buildings in Canada and the United States supplemented by laboratory determinations, were made and a great deal of valuable information was secured much of which has been published.

ARTICLES AND ADDRESSES

A number of technical articles were prepared during the year by members of the staff and published in Canadian and foreign periodicals. Addresses were also delivered before scientific and technical societies.

GENERAL

Some three hundred and fifty visitors called at the laboratories during the year to secure specific or general information or to inspect the equipment. This number considerably exceeds the figure for last year, when less than three hundred visitors were received. As stated earlier in this report the number of technical inquiries dealt with was also appreciably greater than in the previous year. These figures indicate a growing demand on the part of the public for technical service in connection with forest products. Further, research in this field, as has been conclusively proved in other countries, greatly increases the value of timber as a national resource. The Forest Products Laboratories have already done valuable work and, more completely staffed and equipped, can unquestionably produce results of marked economic value to this country.