

DEPARTMENT OF THE INTERIOR, CANADA

Hon. ARTHUR MEIGHEN, Minister; W. W. CORY, Deputy Minister

R. H. CAMPBELL, Director of Forestry

REPORT

OF THE

DIRECTOR OF FORESTRY

FOR THE YEAR 1918

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OTTAWA

J. DE LABROQUERIE TACHÉ

PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1919

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REPORT OF THE DIRECTOR OF FORESTRY

R. H. CAMPBELL

This report covers the work of the Forestry Branch for the year 1917-18.

During the past year the controllable work of the branch has been kept within as small proportions as possible, consistent with reasonable protection for the forests under its charge. The season was a dangerous one in many parts, through part or the whole of the season, and taxed the vigilance of the staff. On the whole the results seem to show that where the staff is sufficiently organized and equipped the situation in regard to the control of fire has shown marked improvement.

That the expenditure on forestry work in Canada is being kept at a modest figure is shown by a comparison with other countries. The average expenditure on the forest reserves under Dominion jurisdiction in Canada is one and three-quarters cents per acre; while in the United States it is three cents; in India, nine cents; in Sweden, fourteen and a half cents; and in France, one dollar and four cents.

The authority for the control of fires has been very much improved by the amendments to the Forest Fire Acts of the provinces of Manitoba and Saskatchewan, passed last year, providing that during the danger season, from April 1 to November 15, no fires shall be set out for the clearing of lands without a permit from a fire ranger. A cordial co-operation between the Dominion and provincial authorities in a proper and wise enforcement of these acts should greatly decrease the fire losses. The benefit of the permit system has already been found and should increase as it becomes longer established and better known. It is understood that the province of Alberta is considering similar legislation at the present time, and if such legislation is adopted it will bring all the lands under federal administration under the same system in this respect, as the province of British Columbia has had this provision in its Fire Act for some years.

The situation in the British Isles created by the war has drawn special attention to the necessity for wood supplies both for the present war and to assure the position of the country in the future; whether in war or peace, and a sub-committee, on forestry of the Imperial Reconstruction Committee was appointed to consider and report upon the question. This sub-committee has recently presented its report and in it gives consideration to the sources of timber supply, particularly those within the Empire, and urges the imperial importance of the forests of Canada, as the main source of supply of coniferous timber within the Empire and the necessity for taking adequate steps for their protection and development. The findings of this report in its relation to Canada are of so much importance and come with such authority that it seems only right to call attention to them in this report in the exact words:—

“There remains a further question. The United Kingdom derives more than half its imported timber from virgin forests in foreign countries which are steadily being depleted. Canada contains the only large reserves within the Empire. Unless arrangements can be made with the Dominion Government for the effectual conservation of these reserves, it is inevitable that provision should be made within the British Isles on a far larger scale than is here proposed for purposes of defence. We consider that this question should be taken up at once with the Dominion Government.

"The United Kingdom is dependent for more than 60 per cent of its timber on the virgin forests of foreign countries, which are being steadily depleted. The proportion derived from sources within the Empire fell from 22 per cent in 1899 to 10 per cent in 1913. Every year we become more dependent on Russia, which, in 1913, supplied us with nearly half our total imports. We have no means of reckoning how long the virgin forests will last, but unless they are brought under systematic management their exhaustion can only be a question of time. The arguments advanced on this subject by competent students have been supported since 1895 by a steady rise in price. The only large reserves within the British Empire are those in Canada which are rapidly being depleted by fire. The Dominion Government has initiated measures for their protection, but the problem is both large and difficult. It is one in which the United Kingdom has a deep interest since the Canadian reserves are the only source on which the United Kingdom can fall back if supplies from Russia fail. The arrangement prevailing before the war under which the exports from the Canadian forests were absorbed by the United States, while the United Kingdom drew its supplies from Russia, no doubt found much justification in economy of transport, but, unless the Canadian forests can be adequately protected and made available in case of necessity for the United Kingdom, it is certain that the area of timber within the British Isles must be increased far beyond that recommended in the proposals made in the following pages. We commend this Imperial question to the attention of the conference meeting in London. It is urgent because preparations made now cannot mature for many years and unless provision is made now either in Canada, Russia, or the British Isles, it is practically certain that the United Kingdom will find timber difficult to procure in sufficient quantities before such preparations can mature."

In view of this report and recommendation it may be stated that as far as Canada is concerned, viewing the matter from the forest side first, what should be accomplished may be summarized under the headings:—

- (1) Protection, especially from fire;
- (2) Management on proper silvicultural principles;
- (3) Replanting;
- (4) Forest study and experiment.

Protection has been undertaken in some form by all responsible Government agencies in Canada. On none of the territories, however, federal or provincial, are the organization and equipment adequate and efficient for the extent of the work required, partly on account of lack of funds, partly on account of lack of interest resulting from an adequate understanding of the value of the forests and the danger of the present situation. Considerable has been accomplished but better organization and more adequate provision therefor are required.

The methods of timber operation followed in Canada result in a steady deterioration of the forest stand and condition instead of an improvement in condition and increase in quantity which would result from proper management. Little has been done to improve this condition. Probably more has been done by the federal forest service than by the provincial services, but only on a small proportion of the timber areas operated. Replanting of forest areas is being carried out on a small scale by the Dominion and also by the provinces of Quebec and Ontario, but not to such an extent as will have an appreciable effect on the timber supply.

Forest study and experiment have been only of a desultory character, and incidental to administrative work. At the forest nursery stations of the Federal Government and of the provinces of Quebec and Ontario experimental plantations are being studied. The Council for Scientific and Industrial Research of the Dominion Government is providing for the establishment of a forest experiment station in Ontario.

plans for which are now being made. An advisory committee has been organized by the federal forest service of foresters in the Government services, federal and provincial, in the forest schools, and in the employ of private firms, to consider and suggest



Photo. 12492

Studying our forest resources. Sample plot of second-growth white pine and red pine, trees marked and numbered to permit of future comparative measurements. Petawawa forest experiment station

plans for forest investigations in Canada, but effective action by this committee awaits the development of the necessary research staff in the federal forest service to give effect to the committee's recommendations.

Viewing the matter from the political side it should be kept clearly in mind that the jurisdiction over the forests of Canada is divided among the various provinces and the federal authorities, and by far the most valuable forests both in extent and quality and as a source of material for export are under the control of the provincial authorities. Concerted action should, however, be possible without interfering with the jurisdiction of the individual governing authorities, and it would be desirable to have formal action taken to bring this about. A formal recognition by the provincial authorities of the advisory committee organized in connection with the Forestry Branch of the Department of the Interior, and the further development of its functions as might be approved, might be a first constructive step in this direction. It might be possible and advisable for such a committee to co-operate or consult with the Imperial Forestry Committee if its functions are continued.

The Federal Government of the United States has developed two methods of co-operation with the state authorities by which the Federal Government assists the states, as follows:—

Under what is commonly known as the Weeks Law, passed in 1909, \$200,000 is appropriated from the National Treasury from which payment may be made to aid in forest protection on the watersheds of navigable streams in any state on lines satisfactory to the federal authorities.

The same Act provided for an appropriation of \$1,000,000, and for each fiscal year thereafter a sum not exceeding \$2,000,000, for use in the examination, survey, and acquirement of lands located on the headwaters of navigable streams. This was intended to apply to lands in states where the state was not financially able to undertake the work. With the consent of the states interested considerable areas on the Appalachian mountains have been acquired under this Act and it is frequently referred to as the Appalachian Law.

The necessity for research work in forestry is being felt more and more, both from the point of view of production and utilization. There is an intimate relation between the two as the possibility of profitable utilization of the products of the forest has a direct bearing on the methods it is possible to adopt to promote better production. Problems of utilization are being worked out by the Forest Products Laboratories, though much more extensive facilities than have yet been furnished for such inquiries are required. With the control of the fire danger becoming effective to a large degree on the more intensively administered forest reserves it is possible to make advances in forest development and management, and special investigations through a series of years are required to determine how far the theoretical principles worked out in other countries can be applied to Canadian conditions if we are to be certain that the plans that are followed are the proper ones and will bring the desired results.

The forest nursery station at Indian Head has been used as an experiment station in planting, various mixtures being used in the sample plantations. Careful measurements and records of the results have been kept and much valuable information has been gathered which will be of great value in developing the replanting work now being done on the forest reserves. In addition to experimentation with Canadian species a number of introduced species from temperate or northern climates have been used, such as Scotch pine (*Pinus silvestris*), cembra pine (*Pinus cembra*), larch (*Larix europea*), and spruce (*Picea excelsa*), from Europe, and Himalaya pine (*Pinus excelsa*), Japanese larch (*Larix leptolepis*), and spruce (*Picea ajanensis*) from Asia. Of these species Scotch pine has shown the greatest adaptability to Canadian conditions and has made satisfactory development in every respect.

The Honorary Council for Scientific and Industrial Research, in laying out the programme of research work that required development in Canada, included forest research as one demanding immediate attention and recommended an appropriation of \$6,000 for making a beginning in such work, and the amount necessary was provided. The council asked this branch to undertake the work that was to be done, and on consultation with the council it was decided that the establishment of a forest experiment station was advisable and that the tract in the vicinity of Petawawa, placed at the disposal of the Department of the Interior for the purpose by the Department of Militia and Defence should be devoted to this purpose, and that the forest survey to obtain the necessary information in regard to the nature and condition of the tract should be begun and the expenditure provided from the special appropriation. The location of this tract is in the pine district of Ontario and a large portion of the tract was at one time included in timber berths and cut over for pine, so that it gives a good location for the study of the development of this important Canadian species.

The planting of the forest lands has been continued this year on a small scale, plantations aggregating 102 acres having been made on the forest reserves in the prairie districts in Manitoba and Saskatchewan.

The placing of appointments in the outside service of the department under the Civil Service Commission has improved very much the possibility of obtaining properly qualified men for the positions required to be filled, and should in time improve materially the calibre of the force. There is, however, a lack of opportunity for men to obtain proper training for the work of forest ranger previous to appointment, as the forest schools so far established in Canada provide only for the higher technical training. As it is considered desirable that returned soldiers should be given the first

opportunity for obtaining employment in the forest service and gaining the necessary qualifications for appointment, arrangements have been made by the Military Hospitals Commission for a forest ranger course for returned soldiers to be given at Vancouver, in which co-operation is being given by the staff of this branch as well as the forest service of the province of British Columbia. The main divisions embraced in the course are (1) elementary surveying, (2) forest management, and (3) forest protection, and these will be covered by lectures and field demonstrations. The instruction will be given by foresters, including two of the inspectors of this branch.

The shortage of coal during the past winter called special attention to the necessity of utilizing as far as possible other sources of fuel supply, including wood. Large quantities of wood are used each year for fuel in Canada. The forest reserve regulations have provided for simple methods of obtaining fuel-wood from the forests, and large quantities have been taken out every year and the quantity markedly increased during the last winter. The regulations were framed, largely, keeping the requirements of the individual settler in view, but with the more active demand for fuel-wood coupled with the fact that there are on many of the forest reserves extensive burned areas which are not readily accessible, amendments have been made to the forest regulation that will facilitate the taking out of wood from such areas for use in the cities and towns. It was arranged also to co-operate with the provincial authorities in any organization they might form for assisting in the distribution of fuel throughout the western provinces.

In furtherance of the programme of forest development in the British Isles a request was made by the Home-grown Timber Committee for seed of a number of species of Canadian trees, mainly species native to the Pacific coast in the province of British Columbia, to be used for reforestation. Considerable time was given during last summer and fall to obtaining the seed required and seed of most of the species needed was secured. Unfortunately, owing to insects attacking the cones no supply of reliable seed of the two species specially desired, Douglas fir and Sitka spruce, could be obtained.

Another interesting request was received from the Government of New South Wales, which asked the Canadian Government to undertake an investigation of the suitability of certain woods from that state for the making of pulp and paper. This department expressed its willingness to undertake the carrying out of the necessary investigations at the Forest Products Laboratories of this branch, and the Government of New South Wales were advised of the quantity and type of material that would be required for the purpose.

THE WHITE PINE BLISTER RUST

A great deal of anxiety has been caused by the discovery of the white pine blister rust in Canada, a fungous disease which seriously threatened the growing of white pine in this country. The disease is of the same family as the rust on wheat, and similar in many respects, particularly in having two host plants. In this case currant bushes, particularly black currants, are the hosts in the first stage of the development of the fungus and the white pine in another stage. The effects of the disease are to destroy the young pine. The disease was first observed in Canada in the year 1914 and steps have since been taken to ascertain more in regard to its life history and its spread in Canada. As a result of these investigations undertaken by the Bureau of Pathology of the Department of Agriculture and also by the provinces of Ontario and Quebec, it was found that the disease was widely spread in southern Ontario and had appeared at some points in Quebec.

An international forest conference was called in Washington early in 1917 to consider particularly the danger to the white pine of the United States and Canada on account of the introduction of this rust, and at the close of that season another conference was held in Pittsburg. The conclusions at this conference were that the

disease had evidently been present in the United States for some years without having been noticed, that its spread was probably comparatively slow, and that it was found

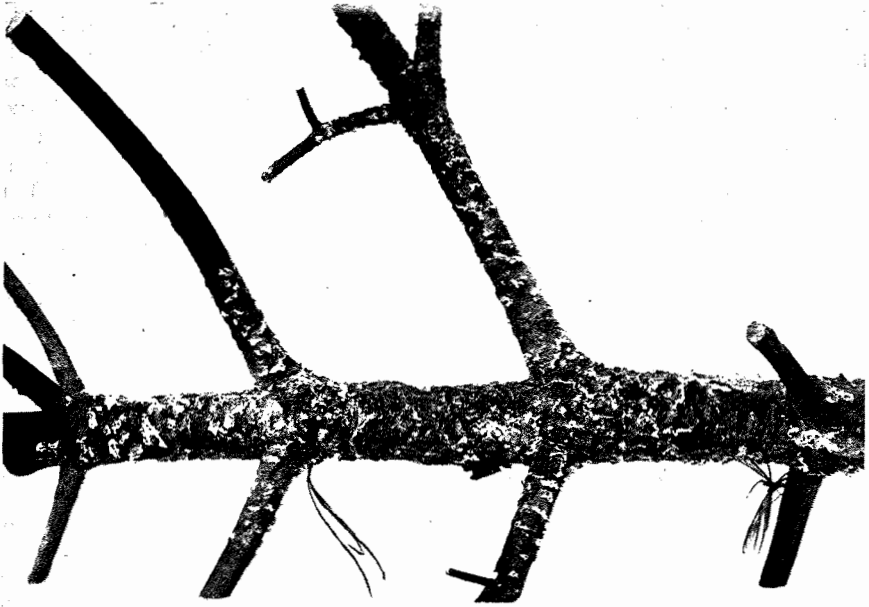


Photo. 12721
White pine blister rust. Bad infection on a young pine stem. Tree is practically dead. Photograph by courtesy of the Dept. of Agriculture

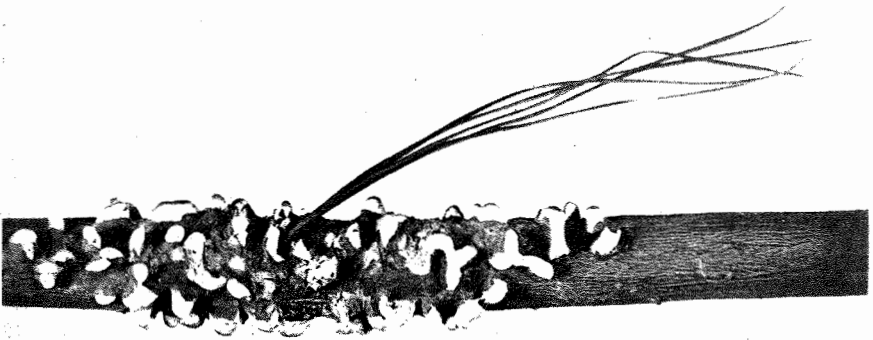


Photo. 12710
White pine blister rust. Blisters on a pine shoot. Twig is not yet dead. Photograph by courtesy of the Dept. of Agriculture

only in the eastern part of the United States and had not yet spread to any of the western white pines. Proposals were made to control the distribution of currant and

white pine stock so as to localize the disease, particularly to prevent the distribution of such nursery stock in the western part of the country, where the disease had not yet appeared; to continue the study of the disease; to undertake eradication work only in places where the infected tracts were isolated and there was prospect of reasonable success. It was felt that the complete eradication of the disease was now an impossibility.

In consequence of this situation the matter was considered by representatives of the Canadian Department of Agriculture and Department of the Interior, the Commission of Conservation, the Provincial Governments, and the Canadian Lumbermen's Association, and it was decided to recommend to the Dominion Government that a committee representing the various interests involved should be appointed to investigate the whole question and that a special appropriation of \$25,000 should be provided to deal with the matter. This committee representing the Dominion Government, the Provincial Governments interested, the Canadian Lumbermen's Association, and the Canadian Nurserymen's Association, met and considered the whole question and it was decided to make the following recommendations in regard to the action to be taken:—

British Columbia.—The shipping of white pine, currants, and gooseberries into this province to be prohibited.

Manitoba, Saskatchewan, and Alberta.—No prohibition at present but the matter to be reconsidered next fall.

Ontario.—Shipment of white pine and black currants to be prohibited north of the line of the Parry Sound branch of the Grand Trunk railway, formerly the Canada Atlantic railway.

Quebec.—The shipment of white pine and black currants to be prohibited north of the St. Lawrence river and west of Quebec City except on the island of Montreal.

New Brunswick and Nova Scotia.—No prohibition.

It was decided that the investigation of the history of the disease, which was carried on by the Bureau of Plant Pathology, should be continued, and that sample areas should be selected in the provinces of Ontario and Quebec, at several different places, so that the action of the disease could be further studied. Two plots were to be established in the western part of Ontario, two in the Ottawa valley, and two in the province of Quebec.

It was also decided that it would be desirable that inspection for the discovery of any cases of the disease should be begun in the provinces of British Columbia, Alberta, Saskatchewan and Manitoba, particularly at points where it was known that shipments of currants were sent out last year or the present year; that inspection should be carried on in the northern part of Ontario, in the part of Quebec north of the St. Lawrence and along the international boundary, and in the province of New Brunswick.

The work will be carried on under the direction of the Bureau of Plant Pathology of the Department of Agriculture under the general supervision of the committee.

STAFF

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

Head office.	36
District inspectors.	5
Assistant inspectors and forest supervisors	17
Forest assistants.	6
Forest rangers.	89
Chief fire rangers.	9
Inspectors of tree planting.	9
Forest Products Laboratories, technical.	15
Outside clerical staff.	34
On military leave.	43
Total.	263

The total number of men who have enlisted is 72.

Word has just been received that Lieut. D. A. MacDonald, of the Royal Flying Corps, who was for a time reported "missing," has been taken prisoner and is in Germany. Mr. MacDonald was forest assistant on the Bow River division of the Rocky Mountains forest reserve.

APPROPRIATION

The appropriation for the year was \$650,000. The expenditure was divided as follows:—

Salaries at head office.	\$ 12,671 01
Salaries of officials on military leave	15,835 44
Travelling expenses.	1,485 90
Printing and stationery.	11,268 08
Miscellaneous expenses, head office.	726 62
Statistics.	2,020 75
Fire-ranging.	190,469 15
Forest reserves.	304,168 55
Tree planting.	57,100 69
Forest Products, Laboratories.	56,548 21
War appropriation.	9,755 82
Total.	\$662,050 22

NOTE.—The item of \$9,755.82 shown under "War Appropriation," was drawn from the Forestry appropriation and later refunded, and the remainder of the over-expenditure was covered by refunds by holders of timber licenses of amounts expended on protection of their limits.

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

Manitoba.	\$ 85,445 93
Saskatchewan.	137,457 54
Alberta.	177,548 50
British Columbia (Railway Belt).	94,185 73
Total.	\$494,637 70

LIBRARY

The awakening recognition of the importance of research work in all lines of activity has given additional importance to the library of the branch. Room for research work in forestry is very large and the work of research naturally begins in the library by way of investigation of work already accomplished along the projected lines. Hence the necessity of having on hand the records of all work accomplished throughout the world up to the latest possible time.

During the year about four hundred books and pamphlets were added to the library and, as usual, were carefully indexed as were also the extracts from the technical publications received. The number of new photographs added to the collection of forestry pictures was considerably smaller than in past years, owing to the fact that forest survey work was so greatly reduced. Sets of lantern slides for the various district inspectors' offices were completed and a lecture was also prepared to accompany them. Each of the district offices now has a set of slides which it is hoped may be of considerable assistance in extending information on forestry and the aims and methods of forest administration.

PUBLICATIONS

The endeavour in preparing the publications of the branch has been to secure the greatest amount of efficient publicity at the lowest cost. To this end all publications are carefully edited to see that all material admitted is the most suitable for the purpose. The steady demand for these bulletins proves that Canadian producers, exporters, and transportation companies find them of value in their work. A good deal of attention

has been devoted to supplying information to Canadian newspapers, which are always alert in giving warning against forest fires and in assisting in the protection of the great natural resource represented by our forest. The experiments made in new forms of posters, warning all woodsmen against the careless use of fire, have resulted in bringing out some very effective posters which are weatherproof and portable. The search for the ideal poster is being continued. During the year the following publications in pamphlet form were issued:—

- Bulletin No. 58. Forest Products of Canada, 1915 (French edition).
 - " 60. Canadian Douglas Fir: Its Mechanical and Physical Properties.
 - " 61. Native Trees of Canada.
 - " 62a. Forest Products of Canada, 1916: Lumber, Lath and Shingles.
 - " 62b. Forest Products of Canada, 1916: Pulpwood.
 - " 62c. Forest Products of Canada, 1916: Poles and Cross-ties.
 - " 62d. Forest Products of Canada, 1916: Directory of Saw-mills
 - " 62. Forest Products of Canada, 1916: (Being a combination of Bulletins 62a, 62b, 62c and 62d.)
- Pamphlet, "Advice to Settlers Regarding Handling of Fire."

STATISTICS

As the Bureau of Statistics of the Department of Trade and Commerce is taking a census of industries for the year 1917, which will include the figures of production, this branch has not undertaken the usual collection of the statistics of forest products except as regards poles and cross-ties which it was thought we could better handle for the year. No statistics of production for 1917 will therefore be issued by this branch and for subsequent years the collection and publication of the figures will probably be made by the Bureau of Statistics. This branch will however co-operate in the preparation of the forms and reports and in any other way possible and will carry out any special statistical studies that may be found necessary.

TREE PLANTING

The planting of trees on the farms in the prairie districts has become so thoroughly established and the results are so generally successful that there is little that it is necessary to remark specially. There have been, since the inauguration of the tree distribution, 45,357,146 trees distributed for planting on the farms, but that there is still a great field of development to be covered is indicated by the recent criticism of an eastern journalist, travelling by rail through the western prairies, that he could not see much evidence of where these trees were planted. All of these trees were planted on farms and 85 per cent or more of them are growing successfully, but there is room and necessity for as large a distribution for many years yet.

The number of trees distributed to farmers in 1917 was 8,400,000, the largest in the history of this work, and these were distributed to 4,561 applicants. Owing to poor seed conditions in 1916 and an unfavourable year in 1917 the supply available for distribution in 1918 is considerably smaller. The number of coniferous trees sent to farmers in 1917 was 158,616. The dry season was not favourable to the evergreens and they suffered considerably.

A supply of coniferous trees for planting on the forest reserves was also grown at Indian Head and plantations were made on several small reserves in the prairie districts.

FIRES

The season of 1917 was very dry in the southern part of the Prairie Provinces, especially in the spring and early summer, but in the northern portion the conditions of moisture were generally better, though similar conditions to those in the south seemed to prevail westward. In the Rocky mountains the spring was wet but was followed by a dry and dangerous time in July. In British Columbia there was considerable variation in the spring, but the summer and fall were very dry and there were

many fires, especially in the southern part of the province. On the whole the season was one that required great alertness, and that the fires were generally so well held gives some confidence that the protective organization is becoming increasingly effective and may soon be in a position to deal efficiently with any situation that may arise.

There have been serious losses during the season, however, especially of young trees. In one case some 14,000 acres, with considerable young growth scattered over it, was burned, as a result, solely, of the incompetence of the forest ranger, whose services have fortunately since been dispensed with. This illustrates how easily the work of a good protective organization may be nullified by the unsuitability of one man. In every other district in the reserve referred to the fires were prevented from entering, or were extinguished immediately. In another case some 20 acres on a forest reserve were planted with young trees and 2,000 acres of young growth were burned over, making a net loss in the young stand, for the year, of 1,980 acres. These fires could not be attributed to lack of watchfulness on the part of the rangers, but are indicative of a lack of proper public opinion and care, for which to some extent the rangers must be held responsible although the process of education of the public is a slow and difficult one and the view that the only permanent wealth of the country is agricultural is hard to eradicate.

The total number of fires during the year was 1,085, as compared with 891 in 1916, and 1,706 in 1915. The number of these fires that burned over an area of ten acres or more, was 348, as compared with 146 in 1916, and 482 in 1915. The total area burned over was 616,682 acres, classified in part as 106,849 acres of merchantable timber, and 116,107 acres of young growth. The quantity burned was 34,373,000 feet board measure and 965,869 cords. The average area of the fires over ten acres was 1,770 acres.

The causes of fires are indicated in the table hereunder. The number of fires is shown for 1917 only, but the percentage due to each cause is shown for the last three years for the purpose of comparison.

	No. of Fires.	Percentages.		
		1917.	1916.	1915.
Unknown..	348	32	30	30
Campers and travellers..	199	18	20	33
Settlers..	242	22	18	15
Railways	183	17	20	13
Lightning..	40	4	7	4
Lumbering..	28	3	3	2
Incendiary	25	2	1	1
Brush disposal (other than by settlers)..	12	1
Other causes..	8	1	1	2
Total..	1,085	100	100	100

FIRES AND RAILWAYS

The inspection of the patrols along the lines of railway was carried out by one permanent inspector and eight temporary inspectors. The patrols on the railways under the jurisdiction of the Dominion Board of Railway Commissioners were furnished by the railway companies, but on the railways owned by the Dominion Government the patrol was provided by this branch, there being eight patrolmen employed. On the whole the companies looked well after the clearing of the right of way, especially in view of labour conditions, and the patrols were well maintained. Some defects in these respects were called to the attention of the companies. The locomotives were inspected regularly and were generally found in good condition. Out of 281 inspections 29 locomotives were found defective. The number of fires on Dominion lands, attributable to railways, was 183, or 17 per cent of the total number.

It would be of considerable advantage if the railways through Dominion lands, which are constructed under provincial charters, were brought under regulations similar to those established by the Dominion Board of Railway Commissioners.

FOREST RESERVES

The forest reserves include an area of 23,024,640 acres, and the permanent staff employed thereon is: District inspectors, 4; supervisors, 13; forest assistants, 5; forest rangers, 98; total, 120. The staff is smaller than is necessary for proper management but under present conditions any increase in numbers can hardly be made. In fact it has somewhat decreased owing to the withdrawal of men required for the army, and resignations resulting from the offer of more remunerative positions in provincial forest services. The temporary staff of rangers on the reserves numbered 67.

Improvements.—The improvement work on the forest reserves was kept down to as low a point as possible, consistent with the need for protection and the proper utilization of the services of the staff during the periods when active patrol and fire-fighting were not required. The system of improvements has been planned carefully so as to be economically constructed and permanent. There yet remains a very large programme of improvements to be carried out in order to give proper protection to the forests in the reserves. Following is a statement of the improvements completed during the year, with the total and average cost, including the cost of labour by forest rangers:—

Class of improvements—	Number.	Total.	Average.
Cabins	13	\$ 3,085	\$ 237
Houses	6	8,024	1,337
Stables	9	1,932	215
Lookout towers	3	455	152
Other buildings	20	4,339	217
Bridges	2	2,681	1,340
Telephone lines Miles.	248	28,393	114
Fireguards ploughed	104	766	7
" cleared	21	652	31
Roads	36	4,525	125
Trails	151	10,556	70
Miscellaneous projects, such as fences, etc.		3,809	
Total		\$ 69,217	

Timber Operations.—There has been a considerable increase in the timber operations on the forest reserves, partly due to the increased demand for lumber by the farmers and partly to the requirements for fuel which were not met by the coal supplies available. The regulations in regard to dead timber, of which unfortunately there are large areas on the reserves as a result of fires, were amended in view of these conditions so as to greatly facilitate the removal of such material. The number of permits issued was 3,613 and the quantity cut thereunder was 6,862,983 feet board measure, 38,669 cords, and 763,016 lineal feet. The number of free permits was 1,851. There were sixteen millsite locations for cutting under settlers' permits occupied on the reserves in the prairie districts. These have been a great convenience to the settlers, who could thus get their logs sawn conveniently in the forest and needed to haul out only the lumber. While the quantities cut under permit have largely increased the quantities reported under seizures are steadily decreasing, apparently indicating that the observance and enforcement of the regulations are steadily improving.

Operations were carried on during the past year on eighteen sales, four of which were made during the year. The cut of saw-timber on such sales was 4,149,125 feet board measure and that of mine props and lagging 1,720,107 lineal feet.

The operations are being conducted with much more care than in the past. The disposal of debris is more thorough and the protection of seed trees and young growth more carefully carried out. The prospects in this respect are very hopeful. Unfortunately, the good results obtained are nullified to a large extent by the slash left on neighbouring operations that are not properly supervised. This was specially demonstrated in the large fire that occurred in the Crownsnest valley.

Fires.—There were 159 fires on the forest reserves, as compared with 43 fires in 1916, and 205 fires in 1915. Eighty-three of these fires, 52 per cent, burned over more

than ten acres each. The total area burned was 196,519 acres, of which 23,043 acres were covered with merchantable timber and 44,139 acres with young growth.

A statement of the causes of fires on forest reserves in 1917 and a comparison by percentage with the three previous years is attached:—

Causes.	No. of Fires.	Percentage.		
		1917.	1916.	1915.
Unknown.....	50	31	35	34
Campers.....	33	21	17	22
Settlers.....	29	18	14	24
Railways.....	22	14	17	9
Lightning.....	8	5	4	2
Lumbering.....	5	3	9
Incendiary.....	6	4	2	6
Brush disposal (other than by settlers).....	1	1	2
Other causes.....	5	3	2	1
Total.....	159	100	100	100

Forest Nurseries.—Small nurseries for the supply of trees for reforestation have been started on several of the reserves in the prairie districts. These reserves are the Pines and Moose Mountain in Saskatchewan, the Spruce Woods in Manitoba, and the Cypress Hills in Alberta. These nurseries are not intended to supply more than the local necessities and at present consist of only a few beds of seedlings which can be looked after without a special organization for the purpose. A large part of the stock for replanting has been furnished from the forest nursery station at Indian Head. It will probably be necessary, as soon as it can be undertaken, to provide for an extension of the nurseries on the forest reserves, if the restocking of them is to be accomplished.

The plantations set out during the year aggregated about 100 acres, the trees being placed generally about four feet apart each way. The species used were spruce, jack pine, and Scotch pine. The season was dry and windy and therefore unfavourable to success, and there was a considerable loss of stock in the plantations. Arrangements have been made for stock to fill up the place where the seedling died.

Grazing.—The number of permits for grazing stock during the year was 516, and the total number of stock grazed was 27,891, of which 18,774 were cattle, 2,498 horses and 6,600 sheep. The number of stock grazing on the reserves is considerably larger than the figures show, as there are large numbers grazing on the forest reserves in British Columbia on which the grazing regulations are not put into force and in regard to the stock on which there is, therefore, no record. The number reported shows a considerable increase over the previous year.

The grazing on the small reserves scattered throughout the prairie country has been a great advantage to the farmers living in the vicinity and has assisted materially in the development of the stock industry in the districts in which they are located. Considerable further development may yet be made.

During the year 6,600 sheep were grazed on the forest reserves, mainly in the Livingstone valley in southern Alberta. The conditions for sheep grazing in this valley are very satisfactory and the stock were taken off the range in good condition. The chief difficulty in the development of sheep grazing is the lack of facilities for getting the sheep from the winter grazing grounds to the range in the mountains. Driving or rail haul for long distances is necessary and adds to the cost, while it may affect more or less the condition of the stock.

The extent to which the grazing on the reserves is being used and the increasing demands for it make necessary at the earliest possible time a careful study of the range



Photo. 12472

Grazing on forest reserves. Cattle grazing on the Riding Mountain forest reserve, Manitoba

and its possibilities of development, but that cannot be undertaken under present staff conditions.

Fish.—The fishing resources of the forest reserves are contained for the most part in relatively small bodies of water which will not admit of net fishing to any considerable extent. The exception to this is found in the northern reserves, some of which contain fairly large lakes, in which net fishing has been carried on for years past. Provision has been made for a continuance of net fishing in these more remote northern reserves, but it has been considered that in the small reserves lying closer to settlement a policy which provided for angling and trolling alone would be the only policy that would insure a continuous and increasing supply of good food and provide good recreation. During the year demands were made in some of the newspapers that netting be allowed in these small reserves so as to relieve the local food situation, and in one case a request was made that the fishing season be extended. Careful inquiry was made in these cases and it was found that in no instance could the demands be acceded to without impairing the future productivity of these waters. Further, it was found that in no case was the food situation so serious as to warrant the adoption of the rather drastic measures proposed.

The forest rangers have been active in their efforts to prevent illegal fishing, and all prohibited fishing appliances have been confiscated wherever discovered.

While fishing without a permit by resident British subjects is allowed in those waters which are not frequented by trout, grayling or Rocky Mountain whitefish, permits are required to fish in trout waters and a large number of such permits have been issued during the year.

The policy of regulated fishing is already having noticeable results in some of the forest reserves in the increasing number of fish taken, and it may reasonably be expected that a continuation of this policy will improve the fishing on all of the reserves.

Game.—Reference has been made in previous reports to the Stony Indians, a number of whom have located on the Kootenay plains on the North Saskatchewan river, in the Clearwater division of the Rocky Mountains forest reserve. The location is not suitable for agriculture and would not yield the Indians a living without recourse to hunting. As these Indians are persistent and skilful hunters their activities have resulted in a serious decrease in the game of that region, and complete extermination of the game is inevitable unless these Indians return to their reserve. It is satisfactory to note that at the last session of Parliament an appropriation was made to cover the cost of the removal of these Indians, and an effort will shortly be made by this department and the Department of Indian Affairs to have them transferred to the Stony Indian reserve.

The half-breeds at Grande Cache, in the Athabaska division of the Rocky Mountains forest reserve, have also proven themselves the most destructive enemies of the game in the country surrounding their location. The report of a party which recently travelled through this vicinity in the interests of the Smithsonian Institute, stated that one of the greatest curses of the north country game is the half-breeds who recognize no game laws and have practically exterminated big-horn sheep.

In addition to their destructive inroads on the game these half-breeds refuse to conform to the grazing regulations, and, as it is found impossible to compel the white people to recognize the regulations while the half-breeds are allowed to ignore them, the grazing regulations are practically suspended in so far as the Athabaska forest is concerned. It has long been recognized that the only effective remedy is the removal of the half-breeds to another location, but as this action was opposed by the provincial authorities, measures which had been adopted to secure their removal from the reserve were dropped. It is hoped, however, that as the situation develops some way will be found of dealing with the matter.

The forest rangers have continued to co-operate with the provincial authorities in the protection of game on the areas in forest reserves which have been proclaimed game preserves, and have assisted in seeing that the hunting laws were observed on the areas where hunting in season is permitted. A few prosecutions were made for illegal hunting.

The Alberta government proclaimed a close season from November 1, to December 31, 1917, on all game in that portion of the Cypress Hills forest reserve which lies in Alberta. This is the first instance where the Alberta government has passed prohibitory regulations in regard to game on forest reserves, but there is no reason why game preserves may not be proclaimed by the province in forest reserves where conditions make such action advisable. Previously, hunting has been prohibited by the province in Dominion parks only.

FIRE-RANGING OUTSIDE FOREST RESERVES

The forested areas, outside of the lands examined and included in forest reserves, are patrolled by temporary fire rangers under the supervision of chief fire rangers, who are generally permanent officers. The extent of territory to be covered, approximately 132,000,000 acres in the provinces of Manitoba, Saskatchewan, and Alberta, and 6,000,000 acres in British Columbia, makes it necessary to have large patrol districts, there being 126 in the former, averaging 1,047,000 acres, and 58 in the latter, averaging 107,000 acres. In the more northern districts, where patrol is made by canoes, the rangers generally have a canoe man to assist.

While there is not much money available for improvement in these districts, the rangers have done considerable in clearing trails and canoe routes, erecting cabins and lookout towers to facilitate the protection of their districts. The rangers are fighting against heavy odds but on the whole they have taken hold of the work actively and are securing some success and a measure of popular support. Some rangers, unfortunately,

were not well fitted for the work and have weakened the organization at important points.

The number of chief fire rangers employed was 11, and of fire rangers and assistant rangers 226. The number of fires was 926, as compared with 848 in 1916 and 1,501 in 1915. The total area burned over was 420,163 acres, of which 83,806 acres carried 25,619,000 feet board measure of timber and 849,771 cords of wood; and 71,968 acres were covered with young growth.

The causes of the fires outside the forest reserves were as follows:—

Causes.	No. of Fires.	Percentages.		
		1917.	1916.	1915.
Unknown	298	32	30	31
Campers	166	18	20	34
Settlers	213	23	19	13
Railways	161	17	20	14
Lightning	32	4	7	4
Lumbering	23	3	3	2
Incendiary	19	2	*	*
Brush disposal (other than by settlers)	11	1	*	*
Other causes	3	*	1	2
Total	926	100	100	100

* Less than one-half of 1 per cent.

FOREST SURVEYS

The only survey carried out during the year was that on the military reservation at Petawawa. Owing to the late date at which the appropriation for the survey became available, and to difficulties in getting a party organized, the survey did not begin until August 1. As a consequence the survey was completed on only about one-third of the tract but, with a full season's work during the coming year, it is hoped to have the whole area covered.

The soil over the portion examined is generally light, becoming pure sand in some locations, and in some parts there is a rocky subsoil. There are also considerable areas of muskeg. The types of forest cover vary considerably but a great part of the reserve is covered with an even-aged growth of from 40 to 60 years of age. This is not a virgin stand, being largely natural reproduction following extensive logging operations of 30 to 50 years ago. There is little mature timber and few pure stands and the reproduction has a rather large predominance of hardwood species. Ash, elm, oak, maple, birch, and other hardwoods occur, and white and red pine, jackpine, and spruce among the conifers. There are some pure stands of pine of the different species occurring over small areas. The forest cover as a whole is very typical of the vast areas of cut-over lands now existing in the provinces of Ontario and Quebec; hence the district presents an admirable area whereon experiments may be made and theories tested and worked out to conclusions which may solve the problem of the best methods of utilization of such lands which are now over large areas producing little or nothing of value.

FOREST PRODUCTS LABORATORIES

The Forest Products Laboratories have suffered severely by reduction of staff. A considerable number enlisted in the army early in the war, but latterly the demand for technical men has become so great that a large part of the remaining staff has been drawn into work for private firms in positions more remunerative than those offered

in the Government service. This situation raises a serious question as to the future status of the work of scientific research, so important for the development of the industries of the country and the proper utilization of its resources. The pulp and paper division being one of those that have suffered most severely on account of the loss of men, the advisory committee appointed by the technical section of the Canadian Pulp and Paper Association, realizing the seriousness of the situation, have taken up with the firms engaged in the industry a proposition for financial assistance to this division of the laboratories, at least for the war period, so that it can be properly manned and the work carried on efficiently. It is expected that such a formal proposition will shortly be made. This will involve a scheme of co-operation in the conduct of the laboratories on the lines which seem to be favoured by the Imperial Research Department and by the Canadian Honorary Council for Scientific and Industrial Research.

The main projects under way have been continued. The compilation of the literature from all languages on waste sulphite liquor has been completed and the material submitted for publication. This will be a very valuable reference work on the subject and may lead toward the utilization of material which not only is now waste but is actually injurious in streams into which it is turned. The manufacture of alcohol for war purposes from such waste liquor has been discussed with several pulp and paper firms and it is possible that arrangements may be made for starting such manufacture. The investigation of the chemistry of pulpwoods is proceeding and much valuable information has been obtained that will give direction for the best methods of chemical treatment of such woods. In wood preservation a simple and satisfactory method for the impregnation of hemlock and jack pine, woods not of long life and now used so largely for railway ties in Canada, has been worked out. Generally progress has been made and good work done so far as equipment in men and machinery will permit.

The completion of sets of specimens of Canadian woods made it possible to furnish such sets to a number of educational institutions, particularly technical schools.

A request was made by the Imperial Munitions Board for co-operation in the testing of timbers at Vancouver for aeroplane construction, and after discussion of the whole situation, and in view also of the possibility of the establishment of a permanent testing station and forest laboratory at Vancouver, an arrangement was reached and has been approved that a plan of co-operation for the testing work required should be carried out between the Imperial Munitions Board, the University of British Columbia, and the Department of the Interior. Under this arrangement the university will provide the necessary accommodation and the Imperial Munitions Board will furnish the necessary staff except the superintendent and this department will provide the superintendent and will also furnish the equipment.

STATEMENT of Revenue, Forestry Branch, Fiscal Year, 1917-18.

Reserve.	Timber Sales.	Timber Permit Fees and Dues.	Timber Seizures.	Grazing Fees and Trespass Dues.	Hay Permit Fees and Seizures.	Surface Rental.	Special Uses.	Nursery Stock.	Unclassified.	Total.
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Turtle Mountain.....		69 45		1,254 25	139 95	85 00	0 25		76 00	1,624 90
Spruce Woods.....		25 50		441 75	61 85					529 10
Riding Mountain.....	278 25	10,764 67	707 37	319 25	506 60	11 60	605 75		5 00	13,198 49
Duck Mountain.....		3,266 70	275 36	117 50	195 20	135 00	3 50		0 25	3,993 51
Moose Mountain.....		344 50	69 70	155 75	300 55	65 00	1 50			937 00
Beaver Hills.....		243 90		110 85	195 30		3 00			553 05
Porcupine.....	509 24	897 53	59 20	51 50	178 00		79 50			1,774 97
Pasquia.....	1,976 98	2,239 02	124 10	8 30	16 40		3 25			4,368 05
Fort à la Corne.....	185 14	392 14	21 50				50 00			648 78
Pines.....		414 80		58 70	93 40		2 00			568 90
Nisbet.....		481 56	76 00	25 20	27 05		0 75			610 56
Big River.....	975 64	3 25	175 00	38 35	42 50		1 75			1,236 99
Steep Creek.....		35 55	18 00							53 55
Sturgeon.....		33 70			22 45		2 25			58 40
Keppel.....		189 45		214 70	30 95		3 00			435 10
Manito.....		79 00		656 50	54 95		7 75			798 20
Dundurn.....		1 50		152 15	3 75		2 50			159 90
Seward.....				221 25	37 75		3 00			262 00
Elbow.....		12 25	1 50	351 10	101 90		6 25			473 00
Cypress Hills.....	31 74	518 65	3 00		524 50	30 00				1,107 89
Cooking Lake.....		321 50	122 80	131 40	200 55					776 25
Crowsnest.....	4,820 87	614 79	91 70	2,780 26	50 50	53 55	24 75			8,436 42
Bow River.....		151 42	7 04	1,527 29	62 40	42 74	27 75			1,818 69
Clearwater.....	5,454 48	230 75		48 90	17 75	60 01	99 75		73 60	5,958 24
Brazeau.....	2,637 06	837 94	331 57		10 25	40 00	99 25			3,956 07
Athabaska.....				10 95	1 45					12 40
Lesser Slave.....	50 00	0 25			2 00				0 25	52 50
British Columbia Reserves.....	50 00	462 45	223 78	30 27	13 35	93 40	62 00			955 25
Indian Head.....								2,044 00	1,452 90	3,496 90
Total.....	16,969 40	22,632 22	2,307 62	8,706 67	2,891 30	616 25	1,089 50	2,044 00	1,608 00	58,865 06

REPORT OF DIRECTOR

STATEMENT of Timber Permits issued on Forest Reserves in the Fiscal Year, 1917-18.

Reserve.	No. of Permits.		Kinds and Quantities of Timber Authorized to be Cut.							Dues and Fees.	
	Free.	Paid.	Poles or Rails.	Fence Posts.	Saw Timber.	Mine Timber.	Building Logs.	Fuel Green.	Fuel Dry.		
					Ft. B.M.	Lin. Ft.	n. Ft.	Cords.	Cords.	\$	cts.
Turtle Mountain..	72	15		1,300	11,000		1,440		1,913	69	45
Spruce Woods..	47	4							769	25	50
Riding Mountain..	528	688	4,725	54,207	4,168,205		60,519	433	7,147	10,756	72
Duck Mountain..	238	207	4,800	16,975	1,342,298		24,867	5	3,372	3,266	45
Moose Mountain..	21	117	1,640	6,625	1,200		5,360	555	496	344	50
Beaver Hills..	78	2			21,768		2,200		805	31	00
Porcupine..	122	41	14,600	11,800	1,069,177		31,800		565	888	23
Pasquia..	11	55	4,800	19,785	27,250		3,000		5,622	2,226	80
Fort à la Corne..	95	65	27,274	9,955	152,139		41,443		1,206	392	14
Pines..	13	29	1,830	4,800	175		6,215	200	930	414	80
Nisbet..	59	41		2,911	45,571		3,000		1,955	343	81
Big River..	13		500	600					235	3	25
Steep Creek..	10	9		1,050	1,400		260		323	35	55
Keppel..	99	93	7,165	2,300	2,500		26,150	470	1,295	189	45
Sturgeon..	9	4	8,050	1,330			7,450		80	33	70
Elbow..	9								61	2	25
Manito..	25	30	4,900	1,225			2,000	153	436	79	00
Dundurn..	6								150	1	50
Cypress Hills..	175	175	78,962	30,410			50,100	239	2,399	518	65
Cooking Lake..	40	33	200	1,800	7,800	50,000	20,900		1,007	521	50
Crowsnest..	116	80	15,958	10,820	12,500	90,800	24,492	8	2,553	614	79
Bow River..	26	26	5,088	2,690			6,265		740	151	42
Clearwater..	22	12				23,000	800		713	230	75
Brazeau..	8	9	63			254,000	4,938		150	837	94
Athabaska..	1						100			0	25
British Columbia Reserves	8	27	200	250		1,092	20,795		1,714	462	45
Total..	1,851	1,762	170,755	186,947	6,862,983	418,892	344,124	2,063	36,636	22,241	85

STATEMENT of Grazing Permits issued in the Fiscal Year, 1917-18.

Reserve.	No. of Permits.	Number of Stock.				Dues and fees collected.
		Cattle.	Horses.	Sheep or Hogs.	Total.	
						\$ cts.
Turtle Mountain.....	87	1,221	125		1,346	1,254 25
Riding Mountain.....	14	705	23		728	261 50
Duck Mountain.....	7	542	2		544	117 50
Spruce Woods.....	26	367	38	553	958	441 75
Moose Mountain.....	21	560	30		590	150 75
Porcupine.....	8	235	18		253	51 50
Pasquia.....	2	26	15		41	8 30
Pines.....	5	221	14	35	270	58 70
Beaver Hills.....	12	357	10		367	110 85
Nisbet.....	6	72	8	7	87	25 20
Keppel.....	49	778	91		869	214 70
Big River.....	3	424	3		427	38 85
Manito.....	54	1,860	280	24	2,164	656 50
Elbow.....	52	1,170	135		1,305	351 10
Seward.....	18	320	131		451	221 25
Dundurn.....	8	455	83		538	152 15
Crowsnest.....	70	5,525	699	6,000	12,224	2,780 26
Bow River.....	53	3,420	668		4,088	1,527 29
Clearwater.....	5	79	64		143	48 90
Athabaska.....	3		34		34	10 95
Co king Lake.....	13	437	27		464	131 40
Total.....	516	18,774	2,498	6,619	27,891	8,613 65

TIMBER Cut on Forest Reserves under authority of Timber Sales in the Fiscal Year, 1917-18.

Reserve.	Previous Sales still operating.	Sales made Current Year.	Saw Timber.	Mine Timber.				Dues collected.			
				Props.	Props.	Lagging.	Lagging.				
						Ft. B. M.	Ft. B. M.	Lin. Ft.	Cords.		\$ cts.
Fort à la Corne.....	1		57,639								36 71
Pasquia.....	1	2	359,477								50 00
Porcupine.....	1	1	52,164								105 49
Big River.....	1		401,881								975 64
Cypress Hills.....	1		38,989								31 74
Crowsnest.....	6		333,718		529,189	2,245		Ft. B. M.		591,531	2,238 87
Clearwater.....	1		319,922	1,719,618			606				5,454 48
Brazeau.....	2	1		274,216	319,188	223		Lin. Ft.		871,730	1,457 74
Total.....	14	4	1,563,790	1,993,834	848,377	3,074					10,350 67

STATEMENT showing the quantity of Timber Sold and Revenue Due during Fiscal Year ending March 31, 1918 on License Timber Berths within Dominion Forest Reserves.

MANITOBA

Forest Reserve.	Timber Berths.	Area in Reserve.	Quantities Sold.			Revenue.		
			Lumber.	Lath.	Other* Products.	Dues Payable.	Rent Payable.	Total Payable.
			Ft. B.M.	No.		\$ cts.	\$ cts.	\$ cts.
Riding Mountain	4	4,443	325,000			85 00	222 15	307 15
Duck Mountain..	11	9,998	8,706,135	3,537,600	12,650	5,243 25	499 90	5,742 90
Total	15	14,441	9,031,135	3,537,600		5,328 25	722 05	6,050 05

SASKATCHEWAN

Porcupine and Pasquia	48	98,904	22,233,974	5,303,650	30,623	12,454 54	4,886 90	17,341 44
Sturgeon	12	17,778	49,066,934	12,290,900		28,847 78	891 33	29,739 11
Big River.. . . .	3	26,077	18,585,758	5,571,850		3,930 38	1,303 85	5,234 23
Nisbet and Pines.	5	11,680			12,319	793 12	173 15	966 27
Total	68	154,439	89,886,666	23,166,400		46,025 82	7,455 23	53,481 05

ALBERTA

Crowsnest	12	25,919	7,282,110		722,117	4,089 07	1,295 95	5,385 02
Bow River	16	37,444	3,867,319	949,850	149	1,887 43	1,860 95	3,748 38
Clearwater	4	37,756					1,887 80	1,887 80
Brazeau	12	22,626	929,323		10,000	553 71	1,131 30	1,685 01
Total	44	123,745	12,078,752	949,850		6,530 21	6,176 00	12,706 21

BRITISH COLUMBIA

British Columbia Reserves Total.	11	13,357					667 85	667 85
Grand Total	138	305,982	110,996,553	27,653,850		57,884 28	15,021 13	72,905 16

* The figures in this column indicate the number of units upon which the dues were collected. They include the following: 2,646 cords of wood, 10,875 fence-posts, 12,650 pieces of driftwood, 2,002 lineal feet of boom timber, 27,855 lineal feet of piling, 721,830 lineal feet of mine timber, and 10,000 railway cross-ties.

APPENDIX No. 1

REPORT OF THE CHIEF OF THE TREE-PLANTING DIVISION

NORMAN M. ROSS

The spring of 1917 opened up late and, as the previous fall had been very wet and as a considerable amount of snow fell during the winter, the wetness of the soil tended to increase the delay. The weather in the early part of the season throughout the planting months was very favourable, but in June and July many sections of the country suffered from extreme heat and drought, and actually the season's conditions as a whole were very unfavourable for any freshly-planted stock.

At Indian Head conditions were more normal than in other districts and the stock on the nursery made good growth and there was little loss. At Sutherland, however, the season was very hot and at times dry, and here the results of the nursery work were not up to the average, the stock for distribution being much smaller than we would like to see it.



Photo. 12744

Trees for prairie farms. Entrance drive on the farm of H. C. Weaver, Atlas, Saskatchewan. Trees planted in 1909 and 1910; photograph taken in September 1918. Planting material supplied by the Forest Nursery Station, Indian Head

In permanent plantations on the nursery no damage occurred from winter-killing, but late frosts in May and June defoliated the ash, retarding growth somewhat. Broad-leaved species made only small growth owing to lack of moisture, but the evergreens all made very good growth, clearly showing their advantage over the broad-leaved trees in a dry season.

There were no reports of serious damage from insects in any sections. In the districts where the poplar leaf-beetle had increased so much during the last two

seasons trouble was anticipated, but very few of these beetles were seen, which would indicate that their increase had been checked by natural causes. In Manitoba where the canker-worm has given much trouble in the last few years no reports of injury were received last summer.

The conditions affecting the farm labour situation are having a very noticeable effect on our distribution. During the summer many applicants who really desired to make a start in tree planting were unable to spare the time and labour necessary to properly prepare the soil, while at the present time an abnormally large number of letters are coming in cancelling orders which would otherwise be shipped out in a few weeks. In these cases, though all preparations had been made for planting, the farmers being unable to secure hired labour find it impossible to look after the planting and cultivation of the trees.

The number of rural schools in Saskatchewan to be furnished with trees this spring has increased considerably. Mention was made in my last report in regard to the arrangement arrived at with the Saskatchewan Department of Education in order to further encourage the planting of trees on the rural school grounds, and we may in the future expect greatly increased demands on our stock for school planting.

The inspectors' reports show that weather conditions were much the same in all districts; the early part of the season being favourable for planting, but being followed immediately by dry and very hot weather. The greatest loss appears to have been in the cutting stock. Most of the cuttings struck and made a good growth, but 40 to 50 per cent succumbed to the drought before they could become properly rooted. Ever-greens, too, suffered not only from dry weather but from late frosts occurring at the time of, or just after planting. In certain districts, especially southern Alberta, winter-killing was more noticeable than usual. This may be accounted for largely by the late growth induced by the heavy rains of August and September in the fall of 1916. At Lethbridge the rainfall for August, September and October was $9\frac{1}{2}$ inches, a most exceptional record. The records at Calgary show that from May to August, 1916, there were 13.20 inches of rain as compared with only 7.53 inches for the same period last summer.

Plantations of previous years which had become established made only small growth, but did not show any other bad effects from the dry season. The trees in these plantations were well ripened up before winter set in.

ANNUAL DISTRIBUTION OF DECIDUOUS STOCK

	1917.	1918.
Number of applicants receiving trees.....	4,761	4,388
Seedlings and cuttings distributed.....	8,400,000	4,449,150
Average number per applicant.....	1,841	1,015
Number of applicants in inspection list.....	9,289	8,990
Number of new applicants received.....	1,583	1,788

The figures for 1918 are not final as some cancellations and additions may still be made before the shipping season opens.

There is a great difference in the amount of stock sent out in 1917 and that booked for 1918. Our crop of seedlings and cuttings on both the Indian Head and Sutherland nurseries was much reduced owing to natural conditions, while the 1917 crop was rather above the average. The final figures for 1918 will be probably a little over 5,000,000, but, as previously stated, numerous requests are now being received either to cancel shipments entirely or to considerably reduce allotments owing to the shortage of labour on the farms.

NURSERY WORK

Shipping commenced at Indian Head April 30 and at the Sutherland nursery on May 2, very much later than usual. The packing work was very greatly handicapped owing to the extremely wet and muddy condition of the soil. At Sutherland shipping was finished May 18, and at Indian Head the distribution of broad-leaved stock was completed on May 9, and evergreen distribution on May 22.

A total of 5,768,300 seedlings and cuttings of broad-leaved trees was dug in the fall of 1917 and heeled in ready for distribution in the spring of 1918. These consisted of maple, ash, and caragana seedlings, and Russian poplar and willow cuttings.

The evergreen stock available for distribution from Indian Head for the spring of 1918 amounted to 202,000 seedlings of Scotch pine, jack pine, lodgepole pine and white spruce.

Collection of Seed.—We are experiencing more and more difficulty in securing seed collections each season. Not only have the crops of the past three years been very light, but it is becoming a most difficult matter to secure labour for this class of work. The quantities and kinds of seed collected were as follows: Maple seed collected from various sources in Manitoba, 2,804 pounds; elm seed from Winnipeg, 50 pounds; ash seed, crop very poor, no collections; caragana seed collected on the nursery, 500 pounds; Scotch pine, cones picked on nursery at Indian Head, 19½ bushels of cones, 15 pounds of clean seed; jack pine, cones collected in Prince Albert district, 134 bushels of cones, 45 pounds of clean seed; white spruce, cones collected in the Prince Albert and Riding Mountain districts, 210 bushels of cones, 165 pounds of clean seed. No seed could be spared for distribution with the exception of caragana, of which 125 pounds were sent out in one-pound lots to various applicants for sowing in the spring of 1918.

Conifers.—The evergreens distributed in 1917 at the usual nominal charge of \$1 per 100 were as follows: White spruce, 86,910; jack pine, 31,000; lodgepole pine, 27,750; Scotch pine, 12,956; total, 158,616. Some evergreen stock was also shipped for planting on some of the forest reserves.

The reports on the evergreens sent out by farmers in 1917 are not nearly so favourable as in other seasons. Under the severe weather conditions noted above, however, nothing else could have been expected. Those evergreens, on the other hand, which were sent out in 1916 and previous to that time are giving excellent satisfaction, and the demand for this class of stock is increasing.

Seed-Beds.—There were prepared and sown on May 12, 5,440 square feet of new seed-beds, as follows: Scotch pine, 1,600 square feet; jack pine, 2,080 square feet; white spruce, 1,760 square feet. Both Scotch pine and white spruce seed were scarce; otherwise larger areas of these species would have been sown, as they seem to be the two kinds most popular among the farmers and are undoubtedly the best for general use.

PERMANENT PLANTATIONS

No new plantations were set out at Indian Head but about 2½ acres were added to the belts on the Sutherland station. The evergreens again showed their superiority over the broad-leaved species as to growth under unfavourable conditions. This is a feature which makes these hardy evergreens particularly adapted for use in the prairie shelter belts, where precipitation is often so very scanty. Once the evergreen becomes established it will grow and remain thrifty under conditions of drought and neglect which would often be fatal even to the hardiest of our broad-leaved species.

Measurements were, as usual, taken in these plantations, and the following table gives the average height of the different species at the end of each year up to the age

of 14 years, in the case of tamarack. All these plantations are spaced approximately four by four feet.

Species.	Age in years.								
	6	7	8	9	10	11	12	13	14
	Height in feet and inches.								
	' "	' "	' "	' "	' "	' "	' "	' "	' "
Tamarack	10 4	12 10	14 0	16 0	17 6	19 0	20 5	21 5	22 4
Scotch pine	5 5	8 0	9 6	11 0	12 1	15 2	16 9	18 8	
White spruce	3 0	5 6	7 2	8 10	10 0	12 0	13 7	14 4	
Maple	12 0	13 2	15 0	17 0	18 0	19 7	21 0		
White birch	12 4	14 0	15 6	17 0	18 2	20 1	21 0		
Russian poplar	18 5	21 1							

PLANTING ON RESERVES

Spruce Woods Reserve.—Experimental plantings were first commenced on this reserve in the spring of 1904, the species used being Scotch pine, one-year-old and two-year-old seedlings. Seed also was used. Planting was done in spots about four feet apart. These spots were prepared by removing a small square of sod with a spade and then setting the seedlings or sowing the seed in these depressions. The results were not favourable except where two-year-old seedlings were used. The seed germinated fairly well and might have come on all right, but unfortunately a fire ran over the plots in the second season destroying everything. In the following year about six acres were planted, using only Scotch pine two-year-old seedlings. These were set in plough furrows and this method was found most successful.

Further additions were made in 1906 and 1907, no change being made in method of planting. Altogether, approximately 21 acres were planted to Scotch pine in 1905 to 1907, all the seedlings having been shipped from the Indian Head Nursery. The plantations were successful right from the start, the growth in certain portions being exceptionally strong. Some measurements taken in 1915 show individual growths of 10 to 12 feet. The soil here is extremely light sandy loam and supports only a very thin growth of native grass.

No further plantings were set out on this reserve till 1916. In the meantime an attempt had been made to start a nursery on the reserve but this has not proved entirely satisfactory. However, a considerable number of plants were available and 28 acres, principally jack pine and white spruce, were planted. The planting was added to in 1917, approximately 37 acres being set out. These plantations are immediately adjoining, south and west of the ranger station; the stock used being: 95,200 white spruce seedlings, three years old; 1,500 jack pine seedlings, two years old; and 1,900 Norway spruce seedlings, three years old. The Norway spruce were set out simply because they were growing in the nursery, and it may be interesting to see how they will develop. This species is not sufficiently hardy to be used in any general planting. It is proposed to extend these plantations in the spring of 1918, and also to conduct some further experiments in broadcast seeding.

Beaver Hills Reserve.—Three thousand white spruce five-year transplants were set out as an experiment under aspen. The soil here is a rich clay loam. The plants were reported as being practically all alive in the fall of 1917.

Dundurn Reserve.—Sixteen thousand white spruce seedlings three years old, and 16,000 jack pine seedlings, two years old, were set out in plough furrows, covering 12½ acres. The season was most unfavourable in this district after planting and by autumn it was reported that nearly 50 per cent had died. Practically no rain fell

here all summer and the temperature at times was extremely high. As the soil is almost pure sand better results under these conditions could not have been expected.

Elbow Reserve.—Twenty-seven hundred seedlings of spruce, Scotch pine, and jack pine were planted in blank spaces in the 1916 plots. The failures were due largely to drifting sand and damage caused by moles.



Photo. 12488

Treeless or prairie farms. Scotch pine twelve years old, Indian Head, Saskatchewan

Manito Reserve.—Seedlings to the number of 375 were set out to fill blanks in 1916 plots. The reports on the planting here are very encouraging.

Moose Mountain Reserve.—One hundred white spruce, 100 Scotch pine, 300 jack pine, and 100 lodgepole pine transplants were set out in the neighbourhood of the ranger station, for experimental purposes. The soil and conditions here are very similar to those on the Beaver Hills reserve, a natural growth of aspen being fairly evenly distributed over the greater part of the reserve.

The Pines Reserve.—Under instructions from Ottawa I made a trip over this reserve, in company with the inspector of forest reserves, on August 16, 1917, in order to decide on some system of planting on the non-timbered area. The north half of the reserve is fairly well timbered with jack pine, the soil being light sandy loam, and such open spaces as occur appear to reproduce naturally to jack pine. The pine, however, is badly affected by "witch's broom" and it might be advisable to experiment with the introduction of some other species which would not be affected by this disease. Experiments with Scotch pine and white spruce will be arranged for as soon as possible in this portion of the reserve. The southern portion of the reserve is more open, the soil a good loam and bearing a heavy growth of grass. Where there is timber this is principally aspen and white spruce. An experimental planting of about 6 acres will be set out here this spring (1918) using white spruce, Scotch pine, and jack pine; both two-year-old seedlings and larger transplants will be used, as it is

thought that owing to the heavy growth of grass, etc., the seedlings may not be able to survive the competition.

VIDAL'S POINT

Thirty-eight permits were issued for camping lots on the Government property known as Vidal's Point on the Qu'Appelle lakes. No further improvements were made in connection with this property, but some arrangement should be made in the near future for a water supply.

APPENDIX No. 2

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR MANITOBA

F. K. HERCHMER

The following report concerns the work in the Manitoba inspection district during the fiscal year 1917-18. It covers the work done on the Riding Mountain, Duck Mountain, Turtle Mountain, and Spruce Woods forest reserves, and on the Manitoba South, Manitoba North, Pas, and Port Nelson fire-ranging districts.

IMPROVEMENTS

Riding Mountain Reserve.—Practically nothing new was attempted in the way of opening up new roads in this reserve, but the work was commenced from the north side on the Dauphin-Strathclair road. This consisted of widening and opening the old trail for 1½ miles, and during the winter a quantity of bridge material was taken out and distributed for use during the coming summer. The Provincial Government is co-operating with the Forestry Branch in making this road suitable for motor travel, and it is hoped considerable work can be done this season.

The road to Clark's beach on Clear lake was graded and put in condition for motor travel. This work was done by settlers who are interested in the summer resort with the assistance of the Forestry Branch. The remainder of the road work done consisted in maintenance, such as replacing bridges which had been washed out by spring floods and repairing corduroy over soft places.

Six miles of new fire-line were cut on the north boundary and made passable for travel, and several miles on the south and east lines were cleared of debris.

The only new building constructed was the Russell ranger station. This was erected under the supervision of the ranger, who, being a carpenter, saw that good work was done. The other buildings on the reserve are in good condition and required only general repairs, which were carried out by ranger labour.

Owing to the necessity for curtailing expenditure, nothing but maintenance was possible in connection with telephone work. The system worked very satisfactorily during all the season.

Duck Mountain Reserve.—All road-work on this reserve was confined to maintenance carried out by ranger service. Four and a half miles of the Alpine road were completed, and this road now provides a means of access to the lake for people from the north and also enables the ranger to reach the east side of his district. The Kamsack Station and Madge Lake roads required the greatest amount of repairs.

The only boundary cutting found possible was in the Pine River district, where six miles were cut under contract supervised by the rangers.

The new buildings on the reserve comprise a stable at Kamsack Station and a boat-house for departmental use, as well as a wharf and bathing-house for use of the summer campers at the lake.

A new telephone line was constructed for 3½ miles to connect the Kamsack ranger station and Madge Lake summer resort with the rural system. The line has proved most satisfactory. Poles were secured for repairing the west extension line, along the south boundary of the reserve, while the Provincial Government erected an independent wire on their poles for 7½ miles northward from Grand View to connect with the Forestry Branch line.

Spruce Woods Reserve.—No new road-work was undertaken on this reserve, as, owing to the open nature of the country and the fact that many old trails exist, it is possible to reach practically every part of the reserve fire-lines.

The new fire-line work consisted in ploughing $9\frac{1}{2}$ miles of a cross-guard in the Pleasant Point district, which guard forms a base for fire-fighters to work from in the event of fires entering the reserve. Some $107\frac{1}{2}$ miles of the old guards were also re-ploughed.

The telephone lines on this reserve were most satisfactory all season and the only work required was the replacing of some broken wires on the Douglas-Shilo line, which work was carried out by the ranger.

No new work in connection with buildings was undertaken, though necessary repairs were made at Shilo headquarters and at the Brandon Junction cabin and Pleasant Point cabin.

Some new material was required for repairing the main pasture fence, as well as for the watering-plant which has given great satisfaction. A new corral was constructed close to the Brandon Junction cabin for use in receiving and distributing stock and has proved of great assistance.

Turtle Mountain Reserve.—Maintenance work only was carried out in connection with roads on this reserve. The roads on this reserve are in good condition but require to be worked up frequently, as they are used as fire-breaks as well as roads.

The two existing telephone lines on this reserve were kept in repair by ranger labour and have been in good working order on each inspection.

A bunk-house has been erected near the headquarters for the use of rangers and employees on the reserve. The rough material for this building, as well as that for a proposed stable at West cabin, was secured from the reserve and sawn at a local mill. The remainder of the work in connection with buildings consisted in repairs to the headquarters house and to East cabin. A new steel lookout tower was secured to replace the one which was destroyed by a cyclone last season. A holding inclosure was found necessary for the west end of the pasture, in which stock could be held for a time in the autumn, when being distributed.

SILVICULTURE

Riding Mountain Forest Reserve.—The permit business was exceptionally heavy, 1,219 permits being issued covering over 3,000,000 feet board measure of spruce, with 7,667 cords of wood and other products which are covered by settlers' permits. The total revenue collected for permits exceeds \$10,000 which is a marked increase over former years. A number of people were interviewed in connection with having considerable quantities of fire-killed timber, which is suitable for fuel, taken out, but owing to the scarcity of labour and high price of supplies it was impossible to get any dealers to take the matter in hand.

Duck Mountain Reserve.—This reserve shows an increase in permits issued over last year, 440 having been issued covering over 1,125,000 feet board measure of spruce and other products. The revenue was \$3,165.

Turtle Mountain Reserve.—Twenty-eight permits were issued, principally for fuel, only 1,200 feet board measure being covered.

Spruce Woods Reserve.—Only fuel permits numbering 48 were issued. Brush disposal was taken care of with less difficulty than formerly, as the permittees and operators are realizing that the regulations respecting this are for their benefit.

PLANTING

Spruce Woods Reserve.—Further planting was undertaken on this reserve, approximately 37 acres being added to the plantations previously set out. Owing to the exceptionally dry and windy weather which prevailed immediately after these

transplants were set out, rather heavy losses were caused, though great care was exercised in planting. The plantations being close to headquarters and not far from a railway will, in a few years, be an object lesson to the public. The plantation of Scotch pine near Sewell shows remarkable growth and is well established.

Turtle Mountain Reserve.—The plantation north of headquarters showed more evidence of growth than in former years, and it is hoped that now being well rooted the trees will thrive.

GRAZING

Riding Mountain Forest Reserve.—No inclosed grazing permits were issued on this reserve though 900 head of stock were paid for on open grazing, double the number of last year. Several inquiries were made by persons who, it is hoped, will place stock this year in inclosures, which they will erect. Applications were also received for grazing on condition that the department would erect fences, but this was not deemed advisable on such a large scale and now that the public is becoming more conversant with the grazing policy of the Forestry Branch many are taking advantage of the large grazing areas which are available on this reserve.

Duck Mountain.—Owing to the fact that there is so much pasturage in the vicinity of this reserve, the settlers do not find it necessary to avail themselves of our areas, and only 175 head were placed on the reserve last year. Several inquiries, however, have been made from outsiders with a view to erecting their own fences and placing large numbers of stock in the reserve, and it is thought the grazing possibilities of this reserve will receive considerable attention in the future.

Spruce Wood Reserve.—The grazing inclosure of this reserve carried 373 head, which was in excess of the previous year but did not come up to expectations.

Turtle Mountain Reserve.—Permits covering 1,341 head of stock were issued for the inclosed grazing area on this reserve, which is becoming very popular. This is certainly an ideal grazing proposition, and the stock were delivered to the owners at the end of the season in first-class condition.

The grazing area is of great value in dealing with the fire situation, as the stock wear out well-defined paths from which fires can be fought to advantage. It is also noticed that, being attracted by the young grass found on the ploughed fireguards, these are kept eaten down, and the menace of dry grass and weeds in the fall is considerably reduced.

USES

Fish and Game.—The fishing in lake Max in the Turtle Mountain reserve has been practically a failure since the winter of 1916, when, for some unknown reason, a great many fish died. The lake, however, appears to be restocking itself and a few fish were secured last season.

The fishing at lake Madge in the Duck Mountain reserve furnished good sport and many fine fish were taken, among them being several pickerel which were, without doubt, the result of the introduction of these fish some years ago. Great interest was taken in this restocking, and I am advised in the event of a pickerel being caught it is immediately returned to the water.

The big game hunting was not as good in any of the reserves as in former years, and, though numerous parties were in the woods, many hunters failed to secure bags. This, however, was not surprising as a close season has been placed on elk, which were rapidly being exterminated, and the areas on which hunting is permitted have been considerably reduced during the last few years.

Hay Permits.—Three hundred and twenty-three hay permits were issued in the reserves, covering 6,157 tons, which is almost double the amount applied for last

season. These permits were distributed as follows: Riding Mountain reserve, 189 permits for 3,204 tons; Duck Mountain reserve, 44 permits for 1,414 tons; Turtle Mountain reserve, 70 permits for 1,188 tons; Spruce Woods reserve, 20 permits for 351 tons.

Summer Resorts.—War conditions affected the several summer resorts. Several neat and attractive cottages were erected at Clark's beach, on Clear lake, in the Riding Mountain reserve. The attendance at lake Madge in the Duck Mountain reserve kept up well. The cottages were all occupied. The patrons derived great benefit from the telephone line, which was established early in the season, connecting the lake with Kamsack, thus enabling business men to prolong their visits. On the Turtle Mountain reserve the regular patrons were in residence in their cottages, though the transient visitors were not as much in evidence as formerly; poor fishing and low state of water in the lake being partly the cause.

SURVEYS

No attempt was made to carry out further survey work, shortage of forestry students and necessity for economy preventing such work.

FIRE RANGING ● OUTSIDE FOREST RESERVES

The fire ranging work, outside of forest reserves, was divided into three districts, namely, Manitoba South, Manitoba North and Pas.



Photo. 12742

Forest utilization by modern methods. Traction engine hauling train of loaded log-sleighs over snow-roads. Duck Mountain forest reserve, Manitoba

Manitoba South District.—This district was divided into thirteen patrols, there being thirteen rangers and four assistants; the staff on the whole showing an improvement on previous years. The patrols were made by canoe and on foot, the lake Winnipeg and lake Winnipegosis patrols being made by canoe and sail boat. A small skiff with a detachable gasoline engine was also used on lake Winnipeg and proved very

advantageous to the service. At the commencement of the fire season the country was very dry, due to the light snowfall of the previous winter and lack of rain in the early spring, a condition most unfavourable to our work.

The total number of fires reported for the season was 44. Of these 20 were classed as large fires and burned over an area of 53,852 acres, incurring an expenditure of \$492.40 exclusive of the ranger service. The area burned over consisted of the following classes: 9,850 acres merchantable spruce and pine; 31,662 acres of young growth, spruce, pine and poplar; 13,240 acres old "burn," grass land, and slash. The 24 small fires reported as burning over less than 10 acres each, were put out by the rangers. These caused no expense, nor did they do any damage. On the whole the fire situation in this district could be termed as fair, taking all things into consideration.

Manitoba North District.—The Manitoba North fire district under Mr. Blackford, was enlarged to take in the northern portion of the east shores of lake Winnipeg. The management was all that could be desired; the fire rangers as usual, were all local Indians, who showed great interest in the work and had hopes of getting through the season without any fires, in fact had made this their slogan for 1917. The plan of granting small increases of wages in the cases of men who had worked satisfactorily for one or two years, proved successful, and formed an incentive to faithful service.

A number of our rangers have enlisted and are doing active service in France, several having been wounded. They write asking that their old positions may be again given to them on their return.

The successful prosecution of a white man who defied two of our Indians (who owing to circumstances could not follow the matter at once, having to return to their chief ranger, during which time the party got out of their district) had good results, as it showed the rangers as well as other inhabitants that the department is prepared to back its officers up when carrying out their duties.

Accompanied by the chief ranger I made a trip of some 800 miles by canoe through practically new country east and north of Norway House, taking in Island, Gods, and Oxford lakes. I found that the routes covered by our rangers were thoroughly posted with fire notices, put up carefully in conspicuous places, and that there were few evidences of recent fires along any such routes. The men of two Indian bands, Island and Gods lakes bands, were met while gathered for treaty and spoken to at length, a distribution being made of whetstones and rulers with which they were much pleased, and in both instances promises were made that all would take care of their campfires and notify the local ranger in case of meeting with fires which they could not themselves suppress. An excellent feeling was found to exist between our officers and all parties met with.

In all, 17 fires were handled, covering some 25,000 acres. But little damage was done to timber, and practically all of these fires were found to have been started by lightning, as the actual trees struck were located in many instances. In general the fire-ranging staff worked well and no cases of negligence were reported.

Pas District.—A change was made in the personnel of this district, Mr. H. Frank Stanley taking over the duties of chief fire ranger and taking active charge of the district for the summer months. No change was made in the patrols. Very good results were obtained in this district, there being 25 fires reported. Of these only two large ones occurred that had to be fought and caused additional expense. Very little damage was done to standing timber. The area burned over is reported as 1,920 acres, which is indeed very satisfactory. The staff in this district gave very good service.

FIRES IN FOREST RESERVES

In all, 30 fires were reported in reserves, and while a large area was covered, but little damage was done to commercially valuable timber, though it is to be regretted that young growth suffered materially. Spring opened with most unfavourable

weather and at one time it was feared great damage might be caused. High winds prevailed and as seeding was under way on the farms and men scarce it was difficult to procure help. Special precautions were taken and temporary rangers employed at the most dangerous points, while all officers were very energetic, constant patrols being maintained.

Four convictions were secured against settlers who had either let fires run or deliberately set fires. These convictions were well advertised in papers circulating near reserves, and had a good effect. The amendments to the Provincial Fire Act creating wooded areas in vicinity of the reserves in which settlers must secure slash-burning permits before setting out fires on their lands, will be of great assistance, as this practice has been the cause of a great deal of trouble.

PUBLICITY

Little could be done along publicity lines, the staff being fully occupied in work directly connected with the reserves, though some rulers and whetstones were distributed. Where this was done at schools, talks were given to the children, who seemed to appreciate them.

The business of the department was carried out very satisfactorily. Relations between our officers and the public were most agreeable, and but few breaches of the regulations were met with, as the people are realizing that the reserves are protected in their own interests. The marked increase in revenue is most gratifying, one reserve having considerably more revenue than its charges on account of salaries.

APPENDIX NO. 3

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR SASKATCHEWAN

G. A. GUTCHES

The area under the supervision of the Forestry Branch in the province of Saskatchewan for the year 1917-18 was practically the same as that covered in the year 1916-17, as there was no increase in the areas of the forest reserves and no increase in the areas of the railway and fire-ranging districts.

FOREST FIRES

During the year there were 114 large fires and 78 small fires, which burned over 300,000 acres and cost \$10,000 in labour to extinguish. These fires destroyed \$2,000,000 worth of merchantable timber, and at least an equal area of valuable young growth was burned up for which no estimate of damage could be secured. The majority of these fires were started by settlers burning off their land without due care as to fireguards and as to holding their fires on their own quarter-sections. Fires were occasionally started through carelessness by the railways and by crews of lumber companies, but fires started by these causes were few and were well looked after as soon they started; consequently, last season we had only one fire which did any considerable amount of damage outside of those started by homesteaders in burning off their land.

After a fire is once started in a settled district or large cut-over area it is almost impossible to stop it on account of the refuse and slash lying on the ground. The homesteaders usually cut cordwood and leave the slash on the ground, and, as well, cut down all young growth, leaving it lying on the ground, and then start a fire on this land without any protection whatever to keep it from spreading over large areas. The cordwood operators and lumbermen operating on timber-berths not under the jurisdiction of this branch leave the slash on the ground. If it were not for this slash and refuse most of the fires could be extinguished without any serious loss, but when a fire is fed by the enormous quantity of dry fuel left after cordwood and logging operations it cannot be stopped until it has spread over large areas and caused immense loss to merchantable timber, one of the most valuable natural resources of the country.

The Provincial Government has passed a fire law which we have not been able to enforce to any great extent up to the present time, as the Dominion fire rangers have not been made fire guardians under the Act. Until this is done, and till all provincial police and similar officers take an interest in the protection of the timber resources of the province, we must expect serious losses each year. Many of the justices of the peace also appear reluctant to enforce the provisions of the Act, even though the evidence is very strong. We cannot expect to secure the best results until the time arrives when all public officials are interested in the protection of timber, and enforce the laws for its protection impartially. I feel, however, that there is an improvement each year in the interest taken in forest protection by the public at large.

PUBLICITY AND EDUCATION

At the Prince Albert fair, held in August, a rather elaborate exhibit was arranged by this office. A miniature normal forest, having six age-classes and covering approximately 5,000 square feet was arranged; the species used being white spruce, black spruce and jack pine. The oldest age-class comprised trees from 25 to 30 feet

in height. Two adjacent areas, one showing poor utilization and brush disposal and the other showing proper methods, afforded a practical educative contrast. Another small area of nursery stock and yet another, showing the effect of a forest fire, were also arranged. In the forest a miniature model ranger house was shown, and the different Forestry Branch notices and placards were posted in conspicuous places. A ranger's camp with canoe and complete fire-fighting outfit was arranged and proper methods of locating and extinguishing camp-fires were demonstrated.

In a building close by, with a path leading up to it from the forest, was a further exhibit. This comprised mounted heads of elk, deer, moose and other game, and stuffed birds and fish. On the walls were maps and typical photographs, together with decorations of flags and bunting. Complete outfits of equipment used by forest rangers and fire rangers were shown. In connection with railway fire protection, a complete set of patrol equipment with gasoline car and hand-cars used by railway fire patrolmen was arranged, together with photographs representative of this branch of the work. Literature, blotters, rulers, and other publicity material were on tables for free distribution.

The fair was well patronized by settlers of the vicinity and our exhibit was the subject of much favourable comment on the part of the press and the public. By means of such an exhibit, many people become acquainted directly, and in an interesting way, with the activities, the aims and meaning of the work of the Forestry Branch, and I consider it an excellent and comparatively inexpensive method of advertisement.

During the past season, each forest ranger and fire ranger in the inspectorate was required to secure a list of the names of persons, together with their nationality and other information, in his district and vicinity. A circular letter appealing for carefulness in the use of fire and setting forth some of the resources, especially that of grazing on forest reserves, together with pertinent literature, is to be mailed to each person before the coming fire season. This work serves the double purpose of causing the ranger and the settler to become better acquainted with each other and also of providing a comprehensive and available record for this office and for the ranger himself.

IMPROVEMENTS

The improvements carried on during the present season were not very extensive on account of the lack of funds, but the fire rangers and forest rangers did a considerable amount of improvement work in opening up trails, cleaning out portages, constructing lookout towers, putting in corduroys, bridges, etc.

Material was purchased for the headquarters buildings of the Pasquia forest reserve and delivered on the ground, and all the houses and other buildings within the inspectorate were maintained in a satisfactory manner.

Sixty-five miles of telephone line were constructed between Hudson Bay Junction, Mistatim and Connel cabin on the Pasquia forest reserve. This telephone is of great assistance in carrying on the administration work of the reserve, in fire protection, and in railway work. The headquarters of the Elbow forest reserve were connected with the adjoining rural line. This makes seven reserves which have more or less complete telephone connections.

EQUIPMENT

An excellent supply of fire-fighting tools and other equipment was purchased for all the reserves this season, and as far as this part of the work is concerned all the reserves are in good shape. Two gasoline pumps with 1,500 feet of hose were ordered and will be placed in operation on the railway between Peesane and Swan River. The gasoline pump is an experiment in this district, but it will be thoroughly tested during the coming season.

The supplies of provisions placed in the remote districts for the use of men engaged in fire-fighting gave good results last season and fresh supplies were shipped out this spring.

SILVICULTURE

Six timber sales were in operation during the year and the timber cut on these approximated 1,500,000 feet board measure. Of the six, one terminated during the year, three were sales which had been running previously, and one was a sale which was awarded late in December. Special attention may be called to the last which was for 1,000,000 feet, over 95 per cent of which is poplar. In addition to the usual clauses in regard to utilization and brush disposal, a special one was inserted, providing that the operator must cut in the sale area all poplar 6 inches and over in diameter

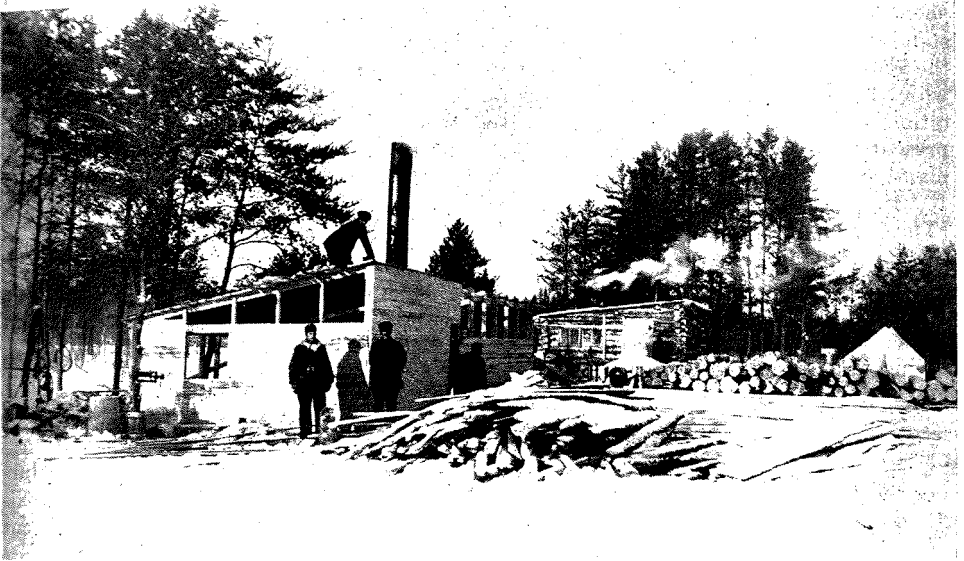


Photo. 11954

Making timber available for settlers. Saw-mill, Fort à la Corne forest reserve, Saskatchewan

at breast-height and that trees and portions of trees not suitable for sawing must be utilized as cordwood. In addition to those mills running in connection with timber sales there were nine mills cutting settlers' permits, located on the forest reserves. The brush disposal on timber-sale operations has been uniformly satisfactory, and little friction has been encountered in having the requirements complied with.

The demand for cordwood has been good and prices high. This has resulted in an increased demand for cordwood permits, especially on the Pasquia reserve where there are large quantities of fire-killed timber close to the railway.

On all classes of timber permits issued, the operators have been required to take the dead, down, and diseased material on the specified areas and to pile and burn all brush; thus the fire hazard has been decreased. When practicable, rangers have been cleaning up areas on the reserves and the fuel wood thus obtained has been sold at cost to the consumer. On the Nisbet reserve, especially, considerable of this work was accomplished, the material being marketed in Prince Albert. The object, of course, is to decrease the danger of fire.

The work on the cordwood operations and timber sales shows a great improvement over last year along the line of brush disposal, and on all the areas which I inspected the results were good. There could be quite an improvement, however, in the utilization of dead and injured trees and of inferior species such as white poplar and black poplar.

The operators also have a tendency to take out only the best portion of an area, but the men in charge have been advised to see in future that the operators take all trees that are marked and use all dead and injured material which is merchantable. I expect to see an improvement along these lines next season. The results are excellent when it is considered that the men in charge of these operations are usually inexperienced in this class of work.

One volume table from measurements of 113 trees on the Sturgeon reserve and one from 233 trees on the Big River reserve have been prepared. They are both for white spruce and, of course, are local, but should serve as a working basis for estimating white spruce in the province, which was the object in their preparation.

PLANTATION AND NURSERY

The experimental areas which were planted in 1916-17 are coming along well and show that on the sand areas of the prairie reserves there is a possibility that a good stand of jack pine, Scotch pine, and spruce may be maintained. On the Pines reserve the Forestry Branch has a nursery which is cared for by the ranger, and all the stock which has been used on the reserve was raised in this nursery. The stock for the plantations on the other reserves was received from Indian Head. The planting at the present time has been entirely for experimental purposes in order to secure data for planting on a large scale in future.

Planting was done on the Dundurn, Elbow, Beaver Hills, and Pines reserves. [The details of this planting and the results so far noted will be found in the report of the Chief of the Tree-Planting Division herewith.]

Arrangements have been made to start nurseries on the Dundurn, Elbow, Manito, Moose Mountain, and Beaver Hills reserves. One pound of white spruce seed has been shipped to each of these reserves and this will be planted in beds early this coming spring, thus forming the nuclei for extension of this work from year to year.

GRAZING

The utilization of the grazing resources on forest reserves in Saskatchewan during the past season showed a substantial increase; 236 permits for a total of approximately 8,000 head of stock were issued. This is an increase of about 25 per cent over the number grazed in 1916.

The prairie reserves are being used to a very appreciable extent of their capacity. A pleasing feature of the situation on these reserves is that a large majority of the permittees are adjacent farmers and homesteaders who take advantage of the fencing provisions of the regulations, either individually or as members of local stock associations. On these reserves, where the ground cover is largely grass, one of the best fire preventives is grazing, inasmuch as there is little possibility of fires being able to run on a well-grazed area. Hence, this utilization is not only a producer of revenue but is also a specific benefit as regards protection.

On the northern wooded reserves 25 permits for about 1,200 head of stock were issued; this being an increase of approximately 140 per cent over the previous summer. While the high percentage figure is encouraging, at the same time not 2 per cent of the available range on these reserves was utilized. It has been the policy of this office to do all possible propaganda work in acquainting the public with the grazing resources of these reserves, and the provisions under which they are administered. All available information and, when feasible, active help have been given to inquirers and prospective permittees in helping them to find suitable locations. This has had a direct result, as is evidenced by the fact that several persons have made application for grazing permits for the 1918 season on these reserves or have expressed their intention of doing so.

There is summer range in the northern forest reserves for over 60,000 head of cattle, and thousands of tons of hay are going to waste which could be used for winter

feed for a portion of this stock. Only about 1,200 head were grazed on the northern reserves this season, which shows that there are immense quantities of forage going to waste each year. In my opinion, this is the best summer range in the province, as we have excellent grass, pea-vine, etc., for feed, excellent water, and all kinds of range conditions, from open hills and valleys to heavy timber.

The grazing areas in the southern part of the province are becoming fully stocked, in fact, in many localities it is necessary for the farmers to sell their stock on account of lack of range. A large part of this southern country could be used for winter range, especially if it were not grazed down too closely in the summer. The summer range in the northern part of the province is going to waste, and if the cattle could be transported from the southern portion to the northern portion for the six summer months, the fat stock sold in the fall, and the remainder returned to the winter range in the south, I believe that the number of cattle which could be maintained in the province of Saskatchewan could be almost doubled. The only drawback in this method of using the range is the transportation, but I believe that the railways could haul these cattle at such a price that the stockmen could afford to send them to the northern reserves during the summer. I would beg to suggest that this matter be taken up by the Department of Agriculture with the railways and stockmen to see if some arrangement cannot be made whereby these cattle could be moved to the north during the summer season. The small farmers could form associations and send their stock to the northern reserves as well as the large owners. There is sufficient area for them all, with the cost of grazing at only five cents per head per month. As settlers are paying in the southern part of the province as high as one dollar a month for grazing stock, I believe that the small farmer could save money by sending his stock to the northern reserves, as the grazing would cost only thirty cents per head, and this would leave \$5.70 per head for transportation back and forth for a six-months' grazing season.

SPECIAL USES

Approximately 300 permits for 9,500 tons of hay were issued on the various reserves; this being an increase of 20 per cent over the preceding year. Much of the available hay on the prairie reserves is being used, but there is no doubt that there are many undiscovered meadows on the large northern wooded reserves and that the present known meadows can, by improvement, be made to yield much more than they are doing now. Utilization of range is to a large extent dependent upon hay available for winter feeding; hence as the demand for grazing on the northern reserves increases, development of hay land should automatically follow.

Permits for fences for grazing purposes to the number of 125 were issued and about 220 miles of fence have been erected under the authority thereof. Most of these fencing permits are for the prairie reserves.

The summer resort on the Moose Mountain reserve is becoming increasingly popular and its advantages are being generally recognized. Fish lake does not belie its name, and its clear water, sandy beaches, and surrounding forest make it a most attractive place for recreation and camping purposes.

TRAINING OF RETURNED SOLDIERS FOR FORESTRY WORK

A large number of returned soldiers are being used by the Forestry Branch, and their usefulness could be greatly improved by a short course in elementary forestry. Before entering on a course of this kind or beginning any work for the branch, their physical condition for this class of work should be thoroughly considered by a competent physician, as several of the returned men have failed, due to the fact that the work has not agreed with them, mentally or physically. The following outline would cover a general course for men physically fit for the work:—

Period of study for course.—The length of the period of study varies in different ranger schools from a few weeks to two years, but I would advise for this work a period of about ten months, divided into two terms, as follows:—February 1 to June 30; July 15 to December 15. This would give a fifteen-day vacation in the summer and one and one-half months in the winter to prepare for the new class.

Requirements for entrance.—The educational requirements should not be strict, but a man should have at least an ordinary common school education in order to understand the work to the best advantage.

The physical requirements should be of rather high grade, *i.e.*, a man should be in such physical condition that he could stand the work and take care of himself in the woods. Many of the positions could be filled by men who have one good arm, one eye, or who are poor of hearing, but otherwise they should be in good physical condition and not over thirty-five years of age.

Course of Study

The course of study that could be given in ten months with the best results should consist, in a general way, of the following courses:—

1 *Woodcraft.*—The work in this course would cover map reading; ordinary camp cooking; management of camps; canoeing; packing, both horse and man; first aid; and other practical work which would enable a man to locate and care for himself in the woods.

2 *Elementary Surveying.*—This would include a thorough course in the use of the ordinary surveyor's compass, elementary course in use of surveyor's transit and level. It would also include the making of ordinary maps, contour maps, and plans used in ordinary forestry work, which rangers are required to make.

3 *Silviculture.*—This is a study of the raising of and caring for a forest and this course would include a study of general forest conditions, nursery work, and general forest botany. Particular stress should be placed on the method of cutting, so as to secure reforestation of cut-over areas and the restocking of waste lands. In fact, it would be a general study of all Canadian tree species of commercial value from the time of seeding to the day of cutting and placing on the market.

4 *Mensuration.*—This is a study of the methods used in estimating the quantity, growth, and value of a forest and its products. It would include a course of study in the use and construction of board and log rules; value and growth tables; timber estimating; and a general outline of forest valuation and management. Sufficient mathematics should be given under this heading to allow the student to fully understand the course.

5 *Forest Protection.*—This would include a course in the protection of the forest from fire and insects; construction of roads, trails, bridges, fireguards, buildings, etc. Some of these headings do not naturally come under protection but in a course of this kind could best be taken here.

6 *Utilization.*—Under this heading should be taken up the study of logging and milling operations, market conditions, and a study of the methods best adapted for the complete utilization of all forest products.

The above six subjects will give practically all the information needed to cover the work of a forest ranger. Three subjects should be given each term, and about one-half of the time should be devoted to lectures and class-room work and the remainder entirely to field work, for the most important part (the practical work) can best be given by actual field demonstration.

Location of School.—A school of this nature should be located within a permanent forest area, where the students could get practical experience in the actual forest work and have free access to all woods operations.

APPENDIX No. 4

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR ALBERTA

E. H. FINLAYSON

The work of the Dominion Forestry Branch in this district consists in the administration and protection of the Dominion forest reserves in the province of Alberta—the *Forest Reserves Administration*; secondly, in the protection from fire of timber occupying public lands not included within the forest reserves—the *Fire-Ranging Administration*. The latter branch of the work extends northward as far as the Mackenzie River region of the Northwest Territories. Finally, a special organization is provided, in co-operation with the Dominion Board of Railway Commissioners, for fire protection along railway lines.

The Dominion forest reserves within the province of Alberta cover an area of approximately 19,278 square miles, or, in round figures, 12,380,000 acres. Dominion park reservations within the same province contain approximately 4,635,000 acres. The total area of the forest reserves and parks is, therefore, in the neighbourhood of 10 per cent of the entire provincial area. As a result of surveys in the northern parts of the province it has been determined that there are very extensive areas which are not at all suitable for agriculture, but which are nevertheless quite capable of producing tree growth. Taking the province as a whole, a rough classification of land would indicate that approximately 35 per cent of the area may be considered as absolutely agricultural land and should certainly be devoted to that purpose. From the present forest reserves areas, and from what is known of the other parts of the province, it may be said that at least 20 per cent of the provincial area is absolutely non-agricultural. As for the remaining 45 per cent, probably not more than two-thirds are suited for profitable agriculture. Therefore 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, excepts special classes of timber not native to the province which must be brought in from outside. At the present time only a small part of the timber used here is produced within the province, for the reason that the more accessible supplies have been so thoroughly culled over, and so much of the timber has been destroyed by repeated fires, that it is difficult to enter into competition with the province of British Columbia. Any steps which are calculated to have a remedial effect on this state of affairs have a most important bearing on the economic life of the province. Furthermore, the presence of a reasonable proportion of forest land exercises a very decided and beneficial influence on the general living conditions of a district. In Alberta the protection of forests is of the most urgent necessity, owing to the beneficial effect which they have on stream flow, as certain parts of the province, at least, are almost entirely dependent for water supply on the rivers and streams which rise in the hills and mountains. Finally, in the development of other natural resources, coal in particular, a supply of timber is most essential. Briefly then, it is in recognition of principles such as these that the forest reserves have been established. Contrary to an erroneous but somewhat general conception, the forest reserves do not exist for the purpose of preventing the use of timber. Exactly the opposite is true, and from time to time considerable quantities of timber are disposed of by this branch. In disposing of such timber, however, it is the aim of the organization to avoid the old hap-

hazard 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. There are four forest reserves in Alberta—the Rocky Mountains, the Lesser Slave, the Cypress Hills, and the Cooking Lake. The Rocky Mountains forest reserve, however, is divided into five distinct units designated “forests”: Athabasca, Brazeau, Clearwater, Bow River, and Crowsnest, each separately administered by a supervisor and staff of rangers. These five forests and the Lesser Slave reserve comprise the great bulk of the forest reserve area, the Cypress Hills and Cooking Lake reserves each covering only a few townships.

IMPROVEMENTS

The work of *fire protection* is the most important problem which confronts us, but the construction of systems of communication is basic to the development of a fire-protection system. Of the forest reserve areas, when originally established nearly 99 per cent, by reason of its rugged topography had been but little developed. Obviously then, the most pressing problem was to provide for communication within the forest reserves. The tote roads found to exist had generally been constructed up the valleys of some of the larger streams but had been designed for the purpose of rendering accessible for commercial purposes some definite resource such as timber or coal. The existing Indian trails, on the other hand, had been hacked out merely for the purpose of providing the pioneers with some method of getting through the country. It will be perceived that in neither case were such facilities provided with the object of forest administration in view, and though these preliminary tote roads and Indian trails have been and still are of considerable importance in our plan of administration it was necessary to do a very great amount of work along definitely planned lines. This development work was definitely started in 1912, and in the six years since that time over 2,000 miles of roads and trails have been constructed and approximately 350 miles of forest telephone lines. The necessary buildings for the establishment of some twenty ranger district headquarters have been provided, each usually including a house, barn, storehouse, fences, and other miscellaneous improvements. In addition to these headquarters buildings over fifty smaller cabins have been constructed at strategic points throughout the reserves to provide accommodation for forest officers on patrol and also for the storage of fire-fighting tools and equipment. While the foregoing figures indicate a very considerable amount of work as having been performed, there still remains a very great deal to be done, and probably some of our most expensive works will now become necessary.

Although climatic conditions which prevailed during construction season of 1917 were almost ideal for improvement work, other factors which entered into the situation seriously reduced the amount of work which could be completed.

Experience has shown that for fire-protective purposes, as well as for administrative reasons, it is necessary to provide for the quickest possible communication between the headquarters of the district rangers and settlements, towns, or cities where a supply of labour may be obtained on short notice and quickly transported to the point required. During the period in which special attention has been given to the development of the interior system of pack-trails we have to a considerable extent depended for communication from outside on old roads of a very inferior standard. In the past year more attention has been given to the heavy road-work which is necessary. On the Crowsnest forest a limited amount of such work was undertaken at the Livingstone Gap; further work being required there, however. On the Bow River forest very considerable road-work was carried on, particularly in the valleys of the South Sheep, Elbow, and Red Deer rivers. On the Clearwater forest

survey work was undertaken for the location of a good road to render the upper Saskatchewan valley quickly accessible from the town of Nordegg; construction work



Photo. 12732
Some of northern Canada's forest resources. White spruce at Sipiwesk lake, northern Manitoba



Photo. 12599
Protecting the people's forests. A cutting for a road through forest reserve showing brush piled ready for burning. Clearwater forest, Alberta

was started but comparatively little could be completed before the end of the season. On the Athabaska forest a beginning was made in road-work to open up the northern

districts which hitherto have only been accessible by pack-trail. Maintenance work was conducted by the regular staff on the various roads in all the reserves of the district.

With regard to the interior system of pack-trails, it was found that very considerable maintenance work and repair work had become necessary owing to the damage done as a result of high water and floods which occurred in 1915 and 1916. It was necessary to carry out new trail work on the Clearwater and Brazeau forests and Lesser Slave reserve. Approximately 80 miles of new trail were constructed on these three forests for the purpose of rendering accessible the more remote parts of the reserves.

A total of 105 miles of forest telephone lines was constructed during 1917. Notwithstanding the increased cost of the work, it is of the utmost necessity to continue the construction of telephone lines in the forest reserves. As a general rule the distances are so great, and travel is so slow, that it is of primary importance that these disadvantages should be overcome, so far as possible, by the provision of the necessary equipment to convey messages from one point to another quickly. By the completion of the Porcupine Hills branch in the Crownsnest forest that forest is now fairly well served with telephone communication, each ranger headquarters being connected with the forest headquarters. The extension of our administration to include part of the Waterton Lakes park, however, will necessitate the construction of about 8 miles of new line during the coming season. On the Bow River forest the construction of 24 miles of line from Morley to the Elbow river linked up two additional ranger stations. Four of the six ranger headquarters on this forest, therefore, are now on the telephone line. On the Brazeau forest two short stretches of line were built for the purpose of providing through connections and to serve lookout points. A very good beginning was made on the Athabaska forest where a little over 19 miles were constructed to connect the reserve headquarters at Entrance with the first district to the north. On the Lesser Slave reserve, also, a splendid beginning was made by the construction of some 35 miles of telephone line westward from the headquarters at Sawridge to the ranger station on the Swan river. At the present time the Clearwater forest and the Cooking Lake reserves are the only units of the district which are not provided with telephone communication of any kind.

With the exception of the Lesser Slave, Athabaska, and Cypress Hills reserves, where altogether four outlying cabins were built, the building operations were confined to the improvement and maintenance of existing buildings. At Sawridge, the headquarters of the Lesser Slave reserve, a good house and other small buildings were acquired by purchase.

FIRES

The fire season of 1917 was the most serious which has been experienced since 1914. On one or two reserves of the district the actual fire danger was perhaps even greater than was the case in 1914, although, fortunately, the number of fires which occurred and the extent of the damage done were not so great as in 1914. The fire season had three pronounced peaks. The first of these occurred during the month of May but was seriously felt only on the Lesser Slave and Cooking Lake reserves. On the other reserves of the district the spring rains started before any actual fire emergency arose. The second peak of fire danger was reached about the third week in July and was seriously felt on the Athabaska, Brazeau, Crownsnest, and Cypress Hills reserves. Between this time and the first few days of August somewhat serious fires occurred on all of these reserves. The fire danger was also great on the Bow River and Clearwater reserves at this time, but fortunately no serious fires occurred. Shortly after the beginning of August temporary relief in the form of rain was experienced, and this together with intermittent subsequent rainfall was sufficient, on most of the reserves, to keep things comparatively safe for the remainder of the

season. On the Crowsnest and Bow River forests, particularly the former, the break in the season was not so pronounced and the fire danger was considerable throughout the rest of the season, though no serious fires occurred. Final relief on these two reserves came only with the late fall rain and snow. On the Lesser Slave reserve, also, there was a dangerous period in September and October during which a number of fires occurred.

Sixty-six fires were handled by the forest reserves organization during the fire season of 1917; of these 31 occurred on areas adjacent to, though not included within, the forest reserves and consequently had a direct bearing on the fire protection within the reserves. Of these 66 fires 10 occurred during the month of May, 2 in June, 40 in July, 7 in August, 4 in September, 2 in October, and 1 in November. These figures illustrate fairly well the remarks made with regard to the periods of special danger referred to in the previous paragraph. The total area covered by these 66 fires was approximately 43,550 acres, 19,250 acres of which comprised the area burned over inside the forest reserves—approximately four twenty-fifths of 1 per cent of the entire forest reserve area of Alberta. On the reserves the area of merchantable timber damaged was 960 acres, young growth 9,110 acres, the remainder consisting of slash, old "burn" and grass lands. The total estimated damage resulting therefrom was \$23,300. On areas immediately adjacent to the reserve 750 acres of merchantable timber were burned over and approximately 10,000 acres of young growth, the remainder being areas more or less devoid of tree growth. The damage from fires adjacent to forest reserves is estimated to be in the neighbourhood of \$5,000 after making allowance for that portion of the timber burned which is still merchantable. The total expenditure incurred in the fighting of all these fires was \$7,250, this amount including the time spent on the fires by regular officers of the forest reserves staff. In connection with these 66 fires it was impossible to determine the exact causes of 11. Of the 55 fires, the causes for which were ascertained, railways were responsible for 27; for the remainder, campers and hunters, settlers, and logging operators were numerically responsible in the order named. That the railways were responsible for such a large proportion was undoubtedly due to the fact that the coal supplied to them during the season of 1917 was at times of rather an inferior quality; also, there is more or less continuous fire hazard along railway lines. As a general rule, however, the majority of railway fires are discovered and extinguished in the incipient stage by the special fire-patrol organization which is provided for that purpose.

From every standpoint the most serious fire of the season was that which occurred on the McLaren timber limits in the Crowsnest pass. This fire, which killed over seven million feet of merchantable timber and cost considerably over \$4,000 to extinguish, was the direct result of careless lumbering operations. Not only did all the evidence indicate that the fire actually started from a small mill operated by the company, but the conditions which permitted it to spread so rapidly and made it so difficult to control were exactly those which for years past this branch has been endeavouring to demonstrate to the department as being inimical to forest protection and conservation. Although the Forestry Branch is responsible for fire protection on such areas, it has as yet no control whatever over the operations on licensed timber-berths and cannot even require the operators to take reasonable steps toward protection from fire. Over a year previous to the occurrence of this fire it had been noted by officers of this branch that a serious fire menace was developing as a result of the lumbering slash being left on areas under operation by this company. A report was submitted, depicting conditions as clearly as possible, with the hope that some action might be taken to forestall so far as possible a situation such as arose last summer. Nothing was done, however, and, as a result of operating a small mill without reasonable precautions having been taken to protect the surrounding area, fire broke out in the very dense logging slash which practically surrounded the mill. Although there were two or three men within a very short distance of the point where the fire started, it

got such a serious hold in the very dry slash that it was beyond their power to control it. Within a very short time the fire had spread over a very considerable area. It should surely be realized, particularly at a time like the present when the financial and productive resources of the country are being strained to the limit, that fires which result from careless utilization of natural resources and which cause serious damage to the forest are a direct menace to the welfare of the state.

TIMBER SALES AND SILVICULTURE

With the exception of one new sale involving the disposal of approximately one and a half million lineal feet of timber to the Mountain Park Coal Company, on the Brazeau forest, the timber-sale work of the year was almost entirely confined to operations under previously existing sales. As was the case in the previous year, the greater part of the timber disposed of was for mining purposes and a very considerable proportion of it was fire-killed timber. Owing to the reduction in technical staff of the district it is becoming more difficult to give as much special study to timber-sale work as is really desirable. Timber-sale work is still confined to the Cypress Hills, Crowsnest, Clearwater, and Brazeau forests, although application was made during the year for a sale on the Lesser Slave reserve and there is considerable possibility that it may develop during the coming season. The timber-permit work also proceeded along essentially the same lines as in previous years with a little more attention being given on some of the reserves to the allocation of special cutting areas. The greater part of the timber-permit administration of the district takes place on the Cypress Hills, Crowsnest, and Bow River forests. On the remainder of the reserves of the district the timber permits issued are comparatively few in number. It is hoped, however, that the new regulations which were proposed by this district will result in a considerably increased timber business and that the sale of dead timber particularly will receive a decided impetus.

During the past year no work was undertaken in connection with the re-establishment of forest cover by planting or seeding. Work of this character, however, is of immense importance on the Cypress Hills reserve, for the district is one in which there is very serious shortage of timber to supply local demand. Moreover, it is of great importance that steps should be taken as rapidly as possible to re-establish the forest cover in the Cypress hills, owing to the important effect which it has on the water supply of the district and consequently on the irrigation systems which are being developed. On the Cooking Lake reserve, also, work of this character is necessary. As for the Rocky Mountains and Lesser Slave reserves, it will be necessary for many years to come, if not for all time, to depend largely on natural regeneration of the forests.

With regard to the timber resources of the province of Alberta, there is a very general misconception in the public mind as to the amount of timber which exists. It seems to be very satisfying to a great many people to delude themselves into a very comfortable feeling that the northern parts of this province contain almost boundless supplies of timber. From time to time one hears and reads of men, even of men in rather prominent positions, referring in glowing terms to the forest resources of the Great Northland. (Such was also the experience of the older provinces, even those containing more and better timber than Alberta. Within recent years, however, as a result of examinations in those provinces, some people have been brought to a realization that these "inexhaustible resources" are purely mythical and that the timber situation is one which requires very serious consideration and the application of the principles of conservation. The same is just as true in the province of Alberta. It is not possible to give general or accurate figures for the entire province, but as a result of extensive reconnaissance work which has been carried out, it is possible to give some rough figures for the largest forest reserve area in the province, namely, the Rocky Mountains. These examinations indicate that not

more than 15 per cent of the entire area of this reserve is covered with merchantable timber, that is, timber fit for commercial use and existing in blocks of sufficient size for logging, but regardless of its accessibility at the present time; that 32 per cent of the area consists of rather open woodland, the timber on which is of practically no commercial value at the present time; that 20 per cent of the area is covered with a growth of comparatively young timber which if properly protected and developed will become merchantable in the future; that the remaining 33 per cent consists of meadows, brush lands, and barren lands above timberline. On the 15 per cent covered with merchantable timber it is estimated that there is about seven billion feet (7,000,000,000 feet) of timber, and that approximately one-quarter of this amount comprises the really accessible, merchantable, and commercially valuable timber, the bulk of which is alienated in the form of timber berths. The examination also shows that at least one-fifth of the entire area, and probably considerably more, has been swept by fire within the last twenty-five or thirty years; that within the past fifty to seventy-five years from two-thirds to three-quarters of the entire area has been burned over; finally, that with the exception of a few isolated blocks or "islands" of timber the entire reserve has, at one time or another, been swept by fire. In addition to the Rocky Mountains reserve very extensive areas have been examined, and the results have not been more satisfactory; indeed in some cases they are decidedly less satisfactory. It would be inclining altogether too much to the side of optimism to expect that further investigations on areas which have not as yet been examined will prove the forest conditions to be any better. It is to be hoped that these figures illustrate, at least in a small way, that there is a great and pressing need for the people of this province to come to a realization of the actual conditions.

GRAZING

In the last annual report it was indicated that there would probably be an increase in the number of stock grazing on forest reserves during the season of 1917. This prediction was fulfilled, the increase, exclusive of sheep, being approximately 25 per cent. A total of about 9,600 head of horses and cattle grazed on all the forest reserves of the district, slightly over 80 per cent of this number being cattle. With the exception of a few small bands, the greater part of the grazing was confined to the Crowsnest, Bow River and Cooking Lake forests. The grazing areas of the other forests of the district are less accessible and consequently there has been comparatively little utilization of the grazing resources to be found within them. That even these three reserves are not yet fully utilized is indicated by the fact that on the Crowsnest forest alone summer range can be provided for approximately 10,000 head of horses and cattle. Taking the area within the Crowsnest forest as a whole it would be quite possible to provide for even a greater number, but there are certain areas within the bounds of the forest which are included within timber-berths, and over these berths this branch has not complete control of the grazing privileges except in cases where the licensees have agreed to its conducting a grazing administration. Permission of this kind has been secured from the Canadian Pacific railway for the areas comprised in timber-berths held by them, although there are other licensees that control timber-berths, contained within which there are extensive grazing areas, who have not exhibited the same spirit of co-operation. On the Bow river and Cooking Lake forests, also, the grazing resources are by no means fully utilized, the Bow River forest having several grazing divisions which are entirely unused—these, of course, being areas which are less accessible to the farming and ranching districts. On the Cooking Lake reserve there has been a very notable increase in the number of stock grazed, the increase for 1917 amounting to approximately 160 per cent. This reserve, however, is capable of carrying several times the total number of stock grazed last year for the six months grazing season. In connection with the three reserves above

referred to there is every prospect for very considerable increase in the number of stock to be run during the coming grazing season.

In regard to sheep grazing another small beginning was made, although the number of sheep grazed on the forest reserves did not by any means reach the number which had been expected. In view of the continuous agitation for sheep range on the part of some of the larger sheep-owners in the southern part of the province, it is advisable to state that, notwithstanding the fact that this branch has set aside an area which is estimated to be capable of carrying 20,000 head of sheep, this range was utilized last year to the extent of only 6,000 head. We are continually receiving direct and indirect intimations, and more or less criticism, that the department is not taking the proper steps to encourage the sheep industry by providing sufficient range. The record of our efforts in this direction clearly indicates that we have done everything which has been reasonably feasible, but unfortunately the sheep-owners have not seen fit to take full advantage even of the opportunities which have been offered. It has been stated in previous reports that there are areas of many thousands of acres of



Photo. 12684

Grazing on forest reserves. A herd of well-fattened sheep on Gap range, Crowsnest forest, Alberta

land contained within the forest reserves which are admirably suited to the grazing of sheep. It should be appreciated, however, that this question is one which must be approached in a business-like manner, taking into consideration the facilities which may be available for transporting sheep to the summer range. It should also be appreciated that it would be rather a senseless procedure on the part of the department to establish blanket regulations whereby the whole forest reserve area should be opened to sheep, when, as a matter of fact, such portions as are accessible and have been set aside for sheep-grazing purposes have not been utilized to the extent of more than one-third their capacity. During the present season it is expected, and greatly to be desired, that there will be more complete utilization of the areas which are reserved for sheep grazing, and it is pleasing to note that a considerable number of small owners comprising the Pincher Creek Wool Growers Association will probably take advantage of the facilities offered.

Speaking generally, the grazing season of 1917 was a favourable one. In the months of May and June there was an abundance of rainfall, although it was rather cold during these two months and the growth of forage was somewhat retarded. The

months of July and August were on the whole very dry. A certain amount of rainfall was again experienced in September and October, but the fine weather which prevailed late into the fall was exceedingly favourable to the grazing of stock. It is reported that, owing to the late spring, some cattle went on the range while the danger of poison weed was still considerable and that as a result of this there were some losses due to poison weed. Otherwise, the season was a successful one for stock and the cattle came off the range in a very satisfactory condition.

In addition to grazing lands there are many areas within forest reserves where provision is made for the cutting of extensive quantities of hay. In the mountain districts these areas are more or less restricted and as grazing is general practically over, all the hay lands, it is not feasible to go into the sale of hay on a very large scale. On the Cypress Hills and Cooking Lake reserves the utilization of hay is very considerable. The very large amount of hay annually produced on the benches in the Cypress Hills is of immense importance to the farming and ranching interests surrounding the reserve. Indeed, many of these interests are almost entirely dependent on the reserve for their supplies of hay for winter feeding purposes, consequently it has not been considered advisable to introduce a system of grazing on this particular reserve as such action would seriously reduce the quantity of hay available to the settlers of the district. The present utilization of hay on the Cypress Hills is so complete that it would be very difficult to provide for many newcomers. Grazing is allowed on the Cooking Lake reserve and this will in all probability be considerably extended. There are, however, still a few areas where it is possible to secure hay if applicants will undertake to do a certain amount of cleaning up in order to permit of harvesting operations.

SURVEYS

Owing to the limited staff no attempt was made by this branch to organize any extensive survey work. Advantage was taken of the opportunity, however, to have a certain amount of special survey work undertaken in connection with the location of important roads. On special instructions, also, a survey and cruise of part of Timber-berth No. 318, south of Banff, was undertaken for the Dominion Parks Branch. Past experience has shown that before proceeding with any expensive road-work it is essential that a considerable amount of preliminary survey work should be undertaken, in order to ensure that the locations will provide grades which will be satisfactory for the construction of first-class roads. Before starting the heavy work on the Red Deer road (which has been referred to under the heading of Improvements) a detailed survey was made, and the beneficial results of such work have already become evident. It has been previously stated, also, that road survey work was undertaken on the Clearwater reserve. Aside from these small and somewhat local road surveys no special survey work was undertaken by our own officers. On the request of the Forestry Branch, however, the Surveyer General has undertaken to conduct a system of traverse and topographic surveys in the Rocky Mountains reserve, and during the past year a certain amount of this work was undertaken on the north half of the Bow River forest. It is hoped, that by continuing work of this kind from year to year, good topographic maps of at least the more important districts will be provided within reasonable time.

EQUIPMENT

Attention has been given during the year to supplementing the equipment of the various reserves for both improvement and fire protection work. A beginning was also made in providing for an emergency outfit of fire-fighting equipment at Calgary. This special equipment is for emergency purposes only, and in case of serious difficulties on the Crowsnest or Bow River forests it would be put into commission. Toward the close of the year steps were taken to secure four of the special gasoline pumping outfits which have been designed for forest protection work.

FIRE-RANGING OUTSIDE FOREST RESERVES

For fire protection on Dominion lands not included within forest reserves the territory under administration is divided into three districts, the Edmonton, McMurray-Slave, and Mackenzie River fire-ranging districts. The Edmonton district covers an enormous area embracing all timber-lands 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. This very large area is in charge of a chief ranger who, with the assistance of three sub-chiefs, directs the operations of a staff of 38 fire rangers. The fire season of 1917 was a serious one, a total of 190 fires being reported. Of these the causes for 87 were not determined. As the district is one which is in a state of rapid settlement, 68 fires were caused by the clearing operations of settlers; campers were responsible for 26; saw-mills for 5; 1 is reported to have been of incendiary origin; and 3 were caused by railways. The figure for railway fires, however, is confined to lines which are not handled by the regular railway fire-protection organization the statistics for which are given later in this report. The Edmonton district is traversed by a large mileage of railway lines on which numerous fires occurred in addition to the three mentioned above. A total area of 58,662 acres was burned over. On 560 acres of this area merchantable timber was killed or damaged. Approximately 5,240 acres of young growth were destroyed or damaged. The total damage to timber as a result of such fires is estimated at \$14,340. An area of nearly 53,000 acres of grass lands and old "burn" was swept by fire with comparatively little damage. In parts of the Peace River district extensive prairie fires occurred which resulted in very serious personal loss to the settlers affected. To a certain extent the staff of this branch is subjected to criticism for allowing these fires to gain such headway. This, however, is due to a misunderstanding on the part of the public generally with regard to the responsibilities of the fire-ranging organization. As has previously been stated, the Forestry Branch is directly concerned only in the *protection of the timber resources of the country*. Responsibility for fire protection in the more settled districts which do not embrace timber, lies with the police and rural organizations under the direction of the fire guardian of the provincial administration. As has previously been pointed out, it is difficult, if not impossible, to build up a really efficient fire-protective organization on the very extensive lines which it is now necessary to follow in the Edmonton district. It is desirable that just as soon as possible the areas which it is proposed to administer as permanent forest units should be brought under forest regulations which will permit of proper administration and development.

An entire re-organization of fire-ranging operations in the McMurray and Slave districts was effected during the season of 1917. In previous years these two districts were administered as separate organizations, and while the McMurray district had been in charge of a temporary chief ranger the Slave district was under the control of the Government agent at Fort Smith, in both cases the results secured being unsatisfactory. During the season of 1917, Mr. J. A. Doucet took complete charge of the administration and in a very short time had things working very smoothly and on an entirely new basis. The steamboats belonging to this branch, which had previously been used only for patrol in the Slave district, were assigned to more comprehensive work embracing both the McMurray and Slave districts. In addition to carrying out the patrol of the main waterways they were used very extensively for the purpose of general supervision of the whole district. Whereas formerly, in the McMurray district, patrol of the Athabasca river had been conducted by men in canoes, in 1917 this work was almost entirely taken over by one of the boats, and the men previously used to patrol the river were required to make their patrols inland for the purpose of giving protection to the surrounding country. This rearrange-

ment, in addition to providing for a much more efficient organization, was responsible for material reduction in the number of men required and in the expenditure incurred. Conditions were dangerous at times, but a very successful season can be reported. The records indicate that only 8 fires occurred and that the area burned over was approximately 17,000 acres, the bulk of this area being the result of two fires. Towards the close of the season a permanent chief fire ranger was appointed to take charge of the operations in the district for this branch.

Fire-ranging operations in the Mackenzie River district are still confined to a rather extensive canoe patrol by a staff of six fire rangers, under the direction of the Government agent at Fort Simpson. This district is such a large one, however, that the efforts of these men to prevent fires are largely of an educational character.

RAILWAY FIRE PROTECTION

The work of railway fire protection continued on essentially the same basis and with almost the same organization as described for the previous year, District Fire Inspector McNaughton and his two district assistants being responsible for the supervision of operations. Twenty fires are reported as having occurred on the railway lines covered by this special organization; ten fires were directly attributed to locomotives, one to carelessness on the part of railway employees, and the remainder to outsiders. The statistics in connection with the railway fires indicate similar periods of fire danger which have been described as existing on the forest reserves. The total area burned over was approximately 3,000 acres and the total estimated damage \$1,059, of which \$620 covered the value of property, other than timber, which was destroyed. In addition to these fires which occurred on lines under the direct supervision of the railway organization, ten small fires occurred on the railway which traverses a portion of the Clearwater forest, and three in the Crowsnest pass. From the foregoing figures it will be seen that the damage resulting from railway fires is rapidly decreasing from year to year. This is entirely due to the detailed organization which has been built up during the past few years in co-operation with the Fire Inspection Department of the Dominion Board of Railway Commissioners. Notwithstanding the unfavourable season of 1917, and notwithstanding, also, the fact that on some lines inferior coal was supplied, the damage done was comparatively slight. For the past few years considerable attention has been given to the fire-protective appliances which are required on locomotives. In this particular direction very great progress has been made and as a general rule these appliances are kept in a good state of repair. Also, as a result of strenuous efforts to secure the clearing of right of way, the danger along railway lines has been considerably diminished.

APPENDIX No. 5

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR BRITISH COLUMBIA

D. ROY CAMERON

This report concerns British Columbia Inspection District for the fiscal year 1917-18. It covers the work done on British Columbia forest reserves and in the British Columbia Coast, Salmon Arm, and Revelstoke fire ranging districts.

The fire season of 1917 commenced with a cool, backward spring with ample precipitation except in portions of the Dry Belt of the interior where warmer weather caused a few fires to spread. June was also cool with well-distributed rainfall making the hazard during that month the lowest of the season. During the first week of July, however, the weather turned hot and dry. This condition continued practically without change until September 8. On this date cool weather occurred with some rain. The fall rains started about September 24, closing the fire season. The total number of fires reported from all districts was 284, an increase of 12 over last year. The proportion of these burning over ten acres, however, increased from 6.6 per cent to 34.8 per cent, consequently the damage and expense also increased greatly, being in fact the highest since 1914. The cause of this proportionate increase in large fires must be attributed to the much greater fire hazard than was experienced in 1916. Every fire starting was potentially dangerous and a much larger percentage got out of control.

The small net increase in the number of fires reported over 1916, a season during which the hazard was low, was due to the fact of fewer people being in the woods camping and hunting, owing to war conditions. This also accounts largely for the decrease in the percentage of campers' fires from 22 per cent to 14 per cent, although educational work by rangers must undoubtedly be credited in part at least for this decrease.

The 284 fires reported burned over 18,250 acres, destroying or damaging nearly 23,000,000 feet board measure of timber, 25,000 cords of wood and 4,700 acres of young growth, besides doing damage to private property.

Owing to the pre-occupation of rangers with numerous large fires it was not possible to pursue the investigation of the causes of fires to the same extent as previously. This is reflected in the increased proportion of fires ascribed to unknown causes which has risen from 25 per cent to 30 per cent. Railway fires which the preceding year were at the bottom of the list rose to second place with 16 per cent of all fires attributed to this cause. The reason for this is the lack of attention to right of way conditions, owing to labour shortages, and, in part, to the use of defective coal. Settlers burning brush in clearing land caused 10 per cent of all fires, showing need of further educative work. A bad feature of the season was the number of incendiary fires reported, viz: 22, amounting to over 7 per cent of the total. These resulted either from a desire to procure work or from advantage being taken by short-sighted individuals of the hot, dry weather to dispose of unwanted slashing or timber areas in order to make them available for agricultural or grazing purposes. Several prosecutions were instituted and in every case a conviction resulted.

AGRICULTURAL LANDS

The arrangement outlined in my report for last year in regard to the granting of forest homesteads to settlers, where this branch has approved the bona fide character of these lands for agricultural purposes, has worked out without difficulty so far as this branch is concerned and has been very well received by the general public.

FIRE PROTECTION

Fifteen fires were reported as occurring on forest reserves during 1917, with causes as follows:—Carelessness of hunters, 5; incendiary, 4; campers, 3; unknown, 2; spread from provincial lands, 1. Of these the majority, namely, fires caused by campers and hunters, occurred during or after September. This shows the need of a great deal of educative work to impress upon users of the forest its value in the permanent development of the community. The number of incendiary fires is an especially bad feature. In three cases the reason advanced by the ranger was the desire to clear off range to improve forage conditions.

Practically all of these fires were reported first from lookout stations and it was possible to get quick action in every case. Thus the value of the lookout service was fully demonstrated. With the establishment of lookout stations the day has passed when large fires, at any rate, can occur without knowledge of their existence being obtained. The lookout stations were of special assistance to the fire rangers in the Salmon Arm fire ranging district whose patrol areas are overlooked. A further extension of the system is desirable to bring under observation other areas at present not covered. Lookouts are especially needed on the Cornwall hills in the Hat Creek forest reserve, on Glossy mountain and Promontory hill in the Nicola forest reserve, on Porcupine ridge in the Tranquille forest reserve, and on Tuktukamin mountain in the Monte Hills forest reserve.

The ranger staff was supplemented by the appointment of five forest guards for patrol work during the fire season. This offset to some extent the handicap imposed by the extreme labour shortage. The peak of the fire season was reached just at a time when the farmers were competing for labour for harvesting operations, and great difficulty in securing men resulted. Indians were used on some of the larger fires with good results.

IMPROVEMENTS

Improvement work during 1917 was limited largely to completing ranger cabins begun the preceding year and clearing and fencing pastures in connection therewith. One new cabin was erected at Paul lake in the Niskonlith forest reserve. Two stables were also constructed, one at the Criss Creek ranger station on the Tranquille reserve and the other at the Vermilion cabin on the Yoho reserve.

Perhaps the most important project undertaken during the year was the completion of the Harrogate trail in the Yoho district. This trail crosses the Beaverfoot range through the Harrogate pass at an elevation of about 7,000 feet. It connects the Columbia valley south of Golden with the headwaters of the Kootenay river, and by means of the Moose Creek trail, previously constructed, with the Vermilion motor road and hence with the Bow River valley. Thus we have a forestry trail crossing the Rocky mountains from the Columbia river to the Bow river. This route is scenic in the extreme and will undoubtedly be much travelled by tourists as it becomes better known.

The administration of the Yoho forest reserve is much simplified by the opening of this trail. Formerly horses had to be shipped to Leancoil by train and access to the reserve from that point was cut off during periods of high water in the Kicking Horse river. Now horses, supplies, etc., can be brought in at any time from Harrogate station on the Kootenay Central railway.

SURVEYS

Survey work was confined to the definition of administrative site boundaries and to work in connection with the survey of project meadows. All work undertaken was performed by the regular staff.

SILVICULTURE

In my report last year mention was made of investigation work undertaken in connection with a proposed timber sale on the watershed of Gordon creek in the Fly Hills forest reserve. Subsequent to the writing of that section of my report, Mr. Manning, forest assistant attached to the office of the District Inspector of Forest Reserves at Calgary, was detailed to this work. As a result of his investigation it was found that the alpine fir (*Abies lasiocarpa*) on the area was subject to infestation by a boring beetle which was afterwards identified by Mr. J. M. Swaine of the Entomological Branch of the Department of Agriculture as *Dryocoetes confusus*, Swaine. This discovery had a very important bearing on the silvicultural conditions imposed in connection with this sale, principally to provide for control measures against this insect infestation. This was the first instance of the finding of this beetle west of the Rocky mountains in Canada. The pest is spreading somewhat slowly and has evidently been established for some years in this particular locality.

So far as the timber sale itself is concerned, agreement was reached with the applicant on the basis of silvicultural requirements in connection with the operations adequate to provide the necessary control measures. Unfortunately, however, labour conditions prevented the applicant from going ahead at the present time and the sale has not yet been consummated.

While on the subject of insect infestations it may be mentioned that the Douglas fir bark beetle has been found also on the Fly Hills forest reserve in some numbers in one locality.

Timber-permit business, while still small, picked up considerably during the year, largely owing to the demand for timber in connection with the development of mining claims. The staff shortage has prevented any inspections of permit cutting other than that given by the ranger for the district. This is not sufficient to ensure efficient administration and demonstrates the need of assistance in the supervisor's office.

A considerable quantity of seeds of forest trees were collected during 1917. Shipments were made to the Norwegian Forest Experiment Station at Bergen, Norway, to the Home-grown Timber Committee of the British Isles, to the University of Nanking, China, and to the Nursery Station of the Forestry Branch at Indian Head, Saskatchewan. The species of trees of which seeds were collected were western white pine, Douglas fir, red cedar, western hemlock, lodgepole pine, Sitka spruce, Engelmann spruce and lowland fir.

GRAZING

The status of grazing on forest reserves has not altered since my last report. Many signs point to the use of forest range in increasing degree by sheep. It is probable that some ten thousand head will be placed on summer range during 1918. A large part of the area so used is bona fide cattle range and under range management should and would be closed for sheep grazing. At the same time there is plenty of true sheep range for any development in that industry which is liable to arise in the next few years. Several complaints have been made to the department by cattlemen, protesting against the Forestry Branch allowing sheep on cattle range. It is obvious, however, that if they desire the protection of regulated grazing they must be prepared to agree to regulations, such as are in force in the other provinces. It is possible that the entrance of sheep will change the viewpoint of the cattlemen in this district and lead them to see that the department really had the permanent interests of their industry at heart in endeavouring to establish range management.

The Departmental Regulations authorizing the issuance of permits for fenced pastures for breeding or dairy stock under certain conditions proved very attractive to a number, and many permits have been issued.

The Project Meadow Regulations have been taken advantage of in several cases, also, and such meadows will undoubtedly be used to a much greater extent after the war when the small ranchers, a large proportion of whom are overseas, return.



Photo. 12624

Protecting Canada's forests. Fire rangers, who patrol by canoe, gathered for conference at Norway House, northern Manitoba

USES

The status of the surface rights involved in mining claims staked on British Columbia forest reserves under the provisions of the British Columbia Mining Act caused considerable controversy and correspondence during the year. The question was finally settled so far as claims staked prior to the creation of the reserves in which they were situated were concerned, by a ruling that title in fee simple should be issued for surface rights and mineral rights. For claims staked since the reserves were established, an amendment to the Forest Reserves and Parks Act has been passed enabling the department to issue Crown grants for mineral rights only. The surface rights of such claims must be secured under the Forest Reserves Regulations. The placing of these rights on a definite status enabling owners to understand the procedure necessary will go a long way toward establishing better co-operation between mining interests and this branch.

BOUNDARIES

The only alterations in forest reserve boundaries effected during the year were those caused either by the alienation of lands granted to homesteaders under the arrangement with the Land Office detailed in my last report, or by the cession of surface rights for which Crown grants have been issued as stated above. As mentioned in previous reports it is urgent that additional areas in the Dry Belt be set aside as permanent forest reserves for the protection of watersheds of streams used in irrigation.

TRAINING RETURNED SOLDIERS

The statement was made in my last report that it would be good policy for the Government to establish a vocational course in forestry for returned soldiers. A start was actually made along these lines during the early spring of this year by the Vocational Training Branch of the Military Hospitals Commission in co-operation with the Dominion and British Columbia forest services and a number of foresters in other governmental or private work. A three weeks' preliminary course was started on March 25 with an attendance of about forty returned soldiers. Arrangements were made with the Military Hospitals Commission by which all applicants were required to pass a medical examination meeting our requirements as to physical capacity for the work before being granted permission to take the course. About half of the men in this course will be employed in this district during the coming summer. The Military Hospitals Commission have under consideration the establishing of a much more comprehensive course, of from four to six months duration, during the coming winter. Men who have made a success of field work during the coming season will be given permission to take the extended course which will be designed to fit them to occupy positions as permanent forest rangers of the forest reserves.

As the short course given this spring is the first attempt at a ranger school in which the department is interested the following details may be of interest:—

The first week's instruction consisted of the elements of land surveying, use of chain and compass, Abney level, staff compass, and similar instruments. Lectures were given on the systems of land surveys used by the Federal and British Columbia governments so that the men would be able to orient themselves in the field without difficulty. Some general instructions on mapping methods were also given. About half the time was spent in field-work.

During the second week lectures were given on the nature of the forest, characteristics of species, with field demonstration on identification; forest types, with special reference to British Columbia; scaling; forest mapping and timber estimating. Field-work was also undertaken in mapping, cruising, and scaling. Some general lectures on forest economics and utilization gave the men some idea as to correct forestry practice, in what respects present methods of exploitation fall short of these ideals, and the reasons therefor.

The third week was taken up largely with forest protection including a discussion of fire hazards, fire detection, prevention, and control. General lectures were also given on organization of Dominion and British Columbia forest services, lumber grading, and grazing.

It was realized by the instructors that the time was too short to cover the subjects discussed in an adequate manner but it was felt that the course would serve at least to give the men, most of whom had never concerned themselves with forestry, an opportunity to grasp the point of view, aims, and ideals of the forest organizations in this country. I think it may safely be said that this object was attained. The men were very keen and enthusiastic and showed by their questions that they were thinking seriously over the subjects brought to their attention.

EQUIPMENT

New equipment secured was limited to that required to replace old stock worn out by use. Requisition was made for a portable gasoline pump which will be of great value in certain localities.

PUBLICITY

As in 1916-17, the members of the staff did as much as possible in the midst of their other work to awaken an interest in forest conservation. Organized publicity work, much as it is needed, is out of the question under present staff conditions.

FIRE PROTECTION ON DOMINION LANDS OUTSIDE OF FOREST RESERVES

In the Coast district a further reduction of one ranger was made in the staff, leaving 20 fire rangers and 1 chief ranger to carry on the work. Ninety-five fires were reported during the season, 35 of which caused damage or expense. These fires burned over a total area of some 2,000 acres, of which 350 acres were timbered. The total loss of timber was slightly over 1,000,000 feet. The damage to young growth was very slight, only some 17 acres being destroyed. The cause of 20 per cent of the fires could not be ascertained; 19 per cent were due to the carelessness of campers; railways were responsible for over 15 per cent; logging operations for about the same; and 11 per cent were incendiary.

The lookout station on Lookout mountain demonstrated its usefulness very strongly. Through the efficiency of the officer stationed there a very dangerous fire was controlled just before it reached a twenty-mile stretch of the finest Coast timber. It is certain that but for the information obtained from this source nothing short of a catastrophe would have been avoided in the upper Chilliwack valley. It can be safely said that the investment in the lookout was repaid a hundred times last season by this instance alone.

Following the usual procedure, a ranger meeting was held in New Westminster at the close of the season which was attended by lumbermen, officers of the provincial forest service, and representatives of newspapers, as well as by all the rangers. A most beneficial discussion took place as to the most efficient means of securing forest protection.

In the Salmon Arm district 109 fires occurred, of which 15 were handled by the forest reserve organization. Of these 50 caused damage or expense. The total area burned over amounted to 9,175 acres; 2,124 of these contained timber, the total loss being estimated at 225,000 feet board measure. Nine hundred and sixty-five acres of young growth were burned also. Approximately 40 per cent of the fires were from unknown causes. Settlers clearing land started over 20 per cent of the fires, campers about 18 per cent, and railways about 15 per cent.

In the Revelstoke district weather conditions were slightly more favourable for fire prevention. Thirty-five fires started, 11 of them causing damage or expense. About 3,000 acres were burned over during the season, the greater percentage of which was old logging slash, so that benefit rather than harm resulted. Only 50 acres of timber were damaged but the young growth on 750 acres was killed. Most of this, however, was on alienated land on which clearing operations are under way, consequently the net loss to the Crown in this district was exceedingly small.

A very successful and well attended ranger meeting was held in Revelstoke on October 6, during which the year's experience was correlated and the results of the season's work discussed in detail.

RAILWAY FIRE RANGING

Co-operative work in the supervision of railway patrols under General Order No. 107 of the Board of Railway Commissioners was continued during 1917. The work was extended to cover the Canadian Northern Pacific railway which came under the jurisdiction of the Board early in the year.

Dearth of labour caused an appreciable slackening in right of way clearing operations with the result that the amount of inflammable débris has increased on the average over all lines.

The use of a defective grade of coal caused an outbreak of fires on the Canadian Pacific railway west of Kamloops, necessitating special patrols. Motor-speeder patrols were established but were not very satisfactory. The great volume of traffic over the main lines caused many delays, because motor-speeders are required to run on train

schedule and were side-tracked for all trains. No blame is attached to the Canadian Pacific railway for the fires. The coal used was the best obtainable under war conditions and the engine protective-appliances were all in perfect order as evidenced by several inspections.

Sixty-six fires chargeable against railways were reported during the year. Of these nearly 50 per cent were due to sparks from coal burners. Approximately 25 per cent were due to unknown causes. Nine per cent were due to careless smokers tossing burning cigar ends or matches from trains. Oil burners were charged with five fires but no definite proof could be adduced in any case.

PROPOSED FOREST PRODUCTS LABORATORY

Acting under instructions from the Director of Forestry a conference was arranged by the undersigned with representatives of the Imperial Ministry of Munitions, the British Columbia Forest Branch, the University of British Columbia, the British Columbia Lumber Manufacturers Association, and the British Columbia Logging Association to discuss co-operative plans for the establishment of a timber-testing laboratory in Vancouver, especially with the view of aiding in the greater production of airplane spruce. Satisfactory preliminary arrangements were drawn up and resulted in the detailing by the department of the Assistant Superintendent of the Forest Products Laboratory at Montreal to go to Vancouver to formulate definite plans.

APPENDIX No. 6

REPORT OF THE SUPERINTENDENT OF THE FOREST PRODUCTS LABORATORIES OF CANADA

JOHN S. BATES

This report concerns the progress of work in the Forest Products Laboratories of Canada for the fiscal year 1917-18.

During the year the laboratories have been reduced to what might be termed a minimum war basis. Earlier in the war the losses of staff were due mainly to enlistments for active service, whereas more recently the organization has felt the competition of the industries for technical men. Although the staff is not engaged directly in war work or necessary administrative work, there is strong reason for contending that research and authoritative study of wood utilization should not be interrupted but rather pushed vigorously in readiness for the reconstruction period. In any case experience has plainly shown the importance of a broader view of scientific work on natural resources and of an adequate basis for the investigative branches of the government service. One requirement is sufficient flexibility of salaries to allow the appointment of first-class technical men to take charge of the main divisions and, furthermore, to ensure the retaining of these leaders for periods of five or ten years at least. There is also the problem of co-operation with wood-using industries financially and otherwise, in such a way that the laboratories may serve the industries most effectively and at the same time the industries may take their share of the responsibilities as well as of the benefits of scientific work. This whole subject is receiving careful consideration.

Beyond the consideration of a single government section such as the Forest Products Laboratories there is the larger question of co-ordinating the various government agencies concerned with the scientific development of Canada's natural resources and industries. The Federal Government is the largest and most influential corporation in Canada engaged in scientific work and it should be the leader and model. The introduction of some contact among the scattered scientific branches is not only desirable for efficiency and development of *esprit de corps*, but would do much to arouse public opinion to an appreciation of the service which is available.

Publication of information in such a way as to reach the public and the industries that can benefit from the results of scientific work is not an easy problem for a government institution. The usual medium is the government bulletin which is sought and used by relatively few Canadians. The fault lies largely with the public, but by modern methods of advertising the government might train the citizens to make wider use of the wealth of material available in the various departments. By reason of the call for economy in government printing and the delay in carrying bulletins through the regular channels, these laboratories have relied more and more on scientific journals and trade magazines for the early publication of results of investigations. This is an effective form of publicity in any case, and also allows the presentation of short articles on minor topics which would not be extensive enough for formal bulletins.

LIBRARY

The library is steadily growing and the indexing of technical journals has been kept up along with the preparations of progress reports. Further consideration has

been given to the appointment of a technical assistant in the library in order that reports on special subjects may be written up more regularly and extensively and information of a varied nature supplied systematically for publication through available channels.

EXHIBITS

Trunk bark specimens have been prepared from 29 species of trees during the year, bringing the total to 65 species. Hand specimens of 40 species of Canadian woods have been prepared. About 2,200 specimens were made, numbered and labelled. This brings the total to about 2,800 specimens of 51 species, ready for distribution.

Process exhibits have been prepared to show the products in their true proportion from the distillation of hardwoods, hardwood waste (Seaman process) and red pine. Derivatives from these products are also exhibited. A process exhibit was installed to show the mode of preparation of ethyl alcohol from wood waste. An exhibit of wood-destroying fungi has been set up, and a set of marine wood-boring organisms has been mounted. Specimens of a number of products and materials have been received. They include sets of essential oils from trees, gums and resins used in varnish manufacture, starches and dextrans used in paper making, glues used in cabinet work and joinery, and wire nails used for woodwork.

TIMBER PHYSICS

The special investigations are discussed under that heading later in this report. A large amount of miscellaneous work has been done by this division including detection of rot in balsam fir and other woods, microscopic examination of fungus in structural timbers, study of fungus-fruited bodies, collection of fungus specimens, preparation of manuscript for proposed bulletin on wood-destroying fungi, photographic prints made directly on fresh newsprint paper, examination of fast-growing white spruce, relative absorption of water by frozen and unfrozen green spruce and balsam fir, and the distribution of special slides of Canadian woods and fibres to companies and other laboratories.

TIMBER TESTS

The main work of the division is covered under "Testing Clear Specimens" and "Nova Scotia Mine Timbers" in the discussion of special investigations. Miscellaneous testing work included the strength of fibre board and vulcanized fibre in connection with the manufacture of shoe heels and counters, and the determination of loss of strength by the method of incising wood for preservative treatment.

The division has been called upon to consider the testing of airplane woods in connection with their use as war material. An arrangement is now awaiting approval whereby a branch laboratory would be established in Vancouver in co-operation with the University of British Columbia to handle special timber-testing investigations for the Imperial Munitions Board.

PULP AND PAPER

An experimental pulp-mill has been constructed as an addition to the present paper-mill and wood-shop. This two-story extension will provide accommodation for semi-commercial pulp-making apparatus, which will allow large-scale tests on the conversion of Canadian woods into paper pulp.

The main work of the division is discussed under "Waste Sulphite Liquor," "Pulpwood Measurements," and "Chemistry of Wood" in the list of special investigations. There have been a number of miscellaneous experiments, including the examination of two grades of spruce pulpwood which were considered to give different yields of pulp in the mills. Considerable information was collected and reports were

submitted to the proper authorities in connection with the proposed development of two new industries in Canada for the manufacture of war materials, namely, toluol from sulphite turpentine and ethyl alcohol from waste sulphite liquor. Information has also been obtained on other new processes for the recovery of valuable by-products from waste materials in the pulp and paper industry.

WOOD PRESERVATION

The main work of the division has been confined to one special investigation discussed under "Ties." Miscellaneous experimental work included the treating of maple lasts with paraffin wax and linseed oil to prevent rapid deterioration in the manufacture of rubber footwear, penetration of special emulsions of creosote oil and rosin soap mixtures in hemlock and birch, seasoning tests on hemlock and jack pine ties in Ontario, and inspection of railway track in connection with "shimming" as related to preservative treatment of ties.

MISCELLANEOUS WORK

The requirements for a systematic study of the lumber industry have been outlined in previous reports. This important field has hardly been touched by the laboratories on account of the small staff and lack of response from the industry itself.



Photo. 11513

Protecting timber for the use of settlers. Clean brush disposal on settler's cutting. Porcupine forest reserve, Saskatchewan

Commercial information was collected during the year regarding the use of hemlock bark by Canadian tanners and the imports of "spruce extract" or concentrated waste sulphite pulp liquor for tanning sole leather, etc.

Some examinations were made of imported samples of wood flour as used by manufacturers of dynamite, toys, etc. Assistance has been given to parties interested in taking up the manufacture of wood flour in Canada and it is gratifying to note that at least one company has ordered machinery to turn out the product on a small scale.

SPECIAL INVESTIGATIONS

Testing Clear Specimens.—No testing was done on this investigation during the year as the staff of the Timber Testing Division, greatly reduced in numbers on account of the war, was occupied for the entire year on the testing of Nova Scotia mine timbers. Samples of black spruce, white spruce, white pine, and red pine have been air-drying since last year and will be ready for test early this coming summer. The testing of the corresponding green material was finished last year. Forestry Branch Bulletin No. 60, "Canadian Douglas Fir", has been received from the printer and is available for distribution. This publication is of particular interest since it not only deals with our most important species but is also the first publication of a series which will eventually be produced and which will cover all Canadian woods.

Nova Scotia Mine Timbers.—Strength tests on 270 props and booms of black spruce, red spruce, balsam fir, yellow birch, white birch, and jack pine were completed in 1915. Corresponding samples were allowed to season in our yard until air-dry and were tested during the past year. Half of the samples were seasoned with the bark on and the other half were peeled. Both lots were under exactly the same conditions so that some very interesting and valuable data have been derived from this part of the work. All the testing in connection with this investigation is now complete.

Drying of Wood.—Working with oven-dried samples of the heartwood and sapwood of black spruce, white spruce, red pine, white pine, and heartwood of Douglas fir, the rate of absorption of moisture of these woods in an atmosphere saturated with water vapour was studied.

Working with green and air-dry white spruce, air-dry Douglas fir, natural and resin-free Southern pine and sulphite pulp, determinations were made of the moisture content when in equilibrium with atmospheres of various relative humidities.

Waste Sulphite Liquor.—As planned last year, no experimental work was attempted on waste sulphite liquor but a great deal of work was done in collecting, abstracting and classifying the literature of the subject. The compilation of this material was a very much more extensive undertaking than was at first anticipated. The work is now complete and the manuscript has been forwarded for publication as a bulletin. To those interested in the manufacture of pulp and paper, one of the greatest of our Canadian industries, this should prove an extremely valuable book of reference, covering as it does all the available literature of waste sulphite liquor and the attempts to utilize it. This literature has appeared mostly in the form of short papers scattered throughout technical literature in the English, Scandinavian, German, and French languages, and it has all been covered up to the end of 1917. It is hoped that this work will prove of help to those working to stop this great waste of valuable material, amounting as it does in Canada to some 2,000,000 gallons per day containing 1,000 tons of organic matter originating from the wood.

Railway Ties.—Experimental work was continued on the investigation of the possibilities of preservative treatment of jack pine and hemlock railway ties. It was found possible to give a satisfactory creosote treatment to jack pine by methods already in commercial use for other woods, provided that the material is sufficiently dry. A study of the rate of drying of ties under commercial conditions has been started so as to provide data as to the time and expense incurred in bringing the material to a suitable condition for treatment. It was not found possible to secure a satisfactory treatment of hemlock by any means now in use without going beyond the bounds of expense imposed by practical considerations. By means of a new

method and apparatus which have been worked out at the laboratories, however, it has been possible to give a satisfactory treatment to hemlock at a moderate cost. The same system applied to other woods, including jack pine, will give a satisfactory treatment at a much lower cost than now prevails. A bulletin descriptive of the work and results is in preparation.

Pulpwood Measurements.—In connection with the investigation of the possibilities and advantages of the system of barking, chipping, drying, and baling pulpwood for shipping to the pulp mills, an installation of a Hess drier in Wisconsin was inspected during a test run and information was obtained at first hand as to the costs and operation of baling presses. This information, together with that previously at hand, led to the conclusion that it should be possible to effect a saving by handling pulpwood in this way under certain circumstances. The work has already borne fruit and the Davison Lumber Co., Bridgewater, Nova Scotia, are already using the system on a commercial scale. When the commercial possibilities are sufficiently demonstrated the system may be expected to spread to a great extent. Its main value is in making available as pulpwood, material such as slabs which are now wasted, and in opening up districts where species suitable for pulp are now growing but which are too far from the mills to allow of the pulpwood being shipped under the present system.

Chemistry of Wood.—Efficient and reliable methods of analysis of woods have been developed and standardized, and preliminary data regarding the composition of black spruce, white spruce, red spruce, balsam fir, jack pine, and poplar have been obtained. A study of the resin content of black spruce, white spruce, balsam fir, hemlock, and jack pine and the effect of river driving and of storage on the resin content has been started. Besides investigating the resin content, the plan also includes a determination of the composition of the wood and an investigation of the factors concerned with seasoning of pulpwood.

Oil for Ore Flotation.—While no further work has been done at the laboratories on the investigation of Canadian wood oils as regards their possibilities in connection with ore flotation, it is worth noting here that since the last annual report the hardwood distillation oils recommended as a result of work by these laboratories in co-operation with the Mines Branch have been tried commercially and found satisfactory. This result is very gratifying since not only are the mines rendered independent of imported pine oil but a use has been found for a Canadian product which was previously wasted.

Durability of Wood.—Work was continued on the study of decay of wood but no conclusions of value can be drawn as yet. A set of 335 pieces of 12 different species of wood was placed in a specially prepared fungus bed and will be examined at appropriate intervals to note the comparative rates of deterioration.

Fibre Measurements.—Work on the measurement of the fibre dimensions of Canadian woods has been continued and studies of the fibre of red pine, white pine, jack pine, white spruce, black spruce, balsam fir, and hemlock have been completed. Approximately 11,000 measurements have been made during the year on these woods and the data obtained cover the variation in length of fibre both at different ages of the tree and at different heights from the ground.

PUBLICATIONS

The following are the publications of the year:—

Forestry Branch Bulletin No. 60, "Canadian Douglas Fir; Its Mechanical and Physical Properties," by R. W. Sterns.

"Present and Possible Products from Canadian Woods," by J. S. Bates (read before Canadian Society of Civil Engineers, Montreal, April 19, 1917, and published in the *Transactions* of the Society, Vol. 31, Part 1, 1917; copied under various titles in *Pulp and Paper Magazine of Canada*, June 7, 1917; *Weekly Bulletin* of the Department of Trade and Commerce, June 18, 1917; *Canadian Forestry Journal*, June and September, 1917, etc., and also available in reprint form).

"The Decay of Timber in Buildings," by R. J. Blair (read before National Association of Cotton Manufacturers, Boston, April 25, 1917, and published in the *Transactions* of the Association, No. 102, 1917).

"Decayed Wood and the Fungi therein as seen with the Microscope," by H. N. Lee (read before National Association of Cotton Manufacturers, April 25, 1917, and published in the *Transactions* of the Association, No. 102, 1917).

"Injurious Rosin in Sulphite Pulp," by B. Johnsen (published in *Pulp and Paper Magazine of Canada*, June 14, 1917).

"Douglas Fir Fibre with Special Reference to Length," by H. N. Lee and E. M. Smith (published in *Pulp and Paper Magazine of Canada*, July 26, 1917).

"Wood Structure," by H. N. Lee (published in *East and West*).

"Canadian Wood Oils for Ore Flotation," by R. E. Gilmore and C. S. Parsons (published in *Monthly Bulletin* of the Canadian Mining Institute, October and November, 1917, and available in reprint form).

"Differences in the Texture of Whitewood," by W. B. Stokes (published in *Canadian Woodworker*, December, 1917).

"Fast-growing White Spruce in Quebec," by H. N. Lee (published in *Canadian Forestry Journal*, December, 1917).

"Waste Sulphite Liquor and its Conversion into Alcohol," being translation by O. F. Bryant of "Die Sulfitablauge und ihre Verarbeitung auf Alkohol," by Dr. Erik Hägglund, Sweden (published in *Pulp and Paper Magazine of Canada*, December 6, 13, and 20, 1917).

"The Estimation of Cellulose in Wood," by B. Johnsen and R. W. Hovey (read before Society of Chemical Industry, Montreal, January 25, 1918, and also before Technical Section of the Canadian Pulp and Paper Association, February 1, 1918; published in *Pulp and Paper Magazine of Canada*, January 31, 1918).

"The Waste Sulphite Liquor Problem," by B. Johnsen (read before Society of Chemical Industry, Montreal, January 25, 1918, and published in *Pulp and Paper Magazine of Canada*, April 4, 1918).

"Forest Products in Canada," by J. S. Bates (read before Canadian Forestry Association, Montreal, February 7, 1918, and published in *Canadian Forestry Journal*, February, 1918, under title of "Finding New Uses for Our Woods").

"The Fuel Value of Wood," by W. B. Campbell (published in *Canadian Forestry Journal*, April, 1918).

"Absorption of Water by Frozen Green Wood as Compared with that of the Wet Green Wood," by H. N. Lee (published in *Pulp and Paper Magazine of Canada*, April 25, 1918).

During the year a number of unpublished papers have been prepared by members of the staff for presentation before various societies, a list of which is as follows:—

“Determination of Mechanical and Physical Properties of Wood,” by J. A. Coderre (read before Society of Forest Engineers, Quebec, April 11, 1917).

“The Work of the Forest Products Laboratories of Canada,” by W. B. Campbell (read before Junior Section of the Society of Chemical Industry, Montreal, May 18, 1917).

“Common Wood-destroying Fungi,” by R. J. Blair (read before Natural History Society, Montreal, February 25, 1918).

“A Piece of Wood,” by W. B. Stokes (read before Commercial and Technical High School, Montreal, March 16, 1918, under the auspices of the Natural History Society).

“Pulp and Paper,” by J. S. Bates (three lectures to students of McGill University during March, 1918).

PUBLICITY AND CO-OPERATION

During the year several hundred visitors, including those engaged in wood-using industries and a large number of technical students, have come to the laboratories to see the work which is being carried on. Among the visitors from other countries may be mentioned a member of the Indian Forest Service, who spent a month studying our methods of examining woods.

The general Advisory Committee to the laboratories held one meeting during the year and has continued to give valuable assistance in matters of policy.

The special Advisory Committee to the Division of Pulp and Paper from the Technical Section of the Canadian Pulp and Paper Association held two meetings during the year and in addition the individual members gave a good deal of time. Their assistance has been invaluable in connection with the design of new pulp mill and equipment, advice on investigations being carried out and organization of the division. The response from the pulp and paper industry has been most gratifying and offers an opportunity to try co-operation of government and industry in scientific work on a large scale.

The superintendent has served again as Chairman of the Technical Section of the Canadian Pulp and paper Association, member of the Committee on uses of Wood in Building Construction of the National Fire Protection Association, member of the Committee on Publicity of the American Wood Preservers' Association, member of the Executive Committee of the Society of Chemical Industry, and has been appointed member of the Associate Committee on Chemistry of the Honorary Advisory Council for Scientific and Industrial Research.

INFORMATION FURNISHED

The answering of inquiries regarding woods and their uses has occupied a considerable portion of the time of men in charge of divisions. About two hundred special reports of this kind were prepared during the year.

The information desired was mainly on the following subjects: strength and durability of various Canadian wood species; fuel values of woods; moisture content of wood for interior finish; recovery of tannin from pulpwood bark; production of essential oils and gums; chipping and baling of pulpwood; manufacture of vul-

canized fibre; strength and preservative treatment of telephone and transmission line poles and cross-arms; balsam fir for mine timber and silo staves; Canadian woods for shipbuilding; blue beech, ironwood, and mountain laurel as substitutes for briar-root for tobacco pipes; water-soluble preservatives for mill timbers; various by-products from waste sulphite liquor; artificial limbs from wood-pulp; Canadian woods for airplane timbers; iron pyrites as substitutes for sulphur in sulphite pulp-mills; utilization of sawdust, shavings, and other wood waste; hardwoods for ground wood pulp; identification of wood species and paper fibres; construction of wooden buildings in America; strength and water absorption of fibre-board and the use of peat for this purpose; hardwood and resinous-wood distillation; hard maple for rotary veneer; species suitable for wood pipe. In addition a large number of minor inquiries from all parts of the country have been answered.