

DEPARTMENT OF THE INTERIOR, CANADA

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R. H. CAMPBELL, Director of Forestry

REPORT

OF THE

DIRECTOR OF FORESTRY

FOR THE FISCAL YEAR ENDED MARCH 31

1919

OTTAWA
J. DE LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1920

CONTENTS

	PAGE
Report of the Director	5

APPENDICES

1 Report of the Chief of the Tree Planting Division	20
2 Report of the District Inspector of Forest Reserves for Manitoba	24
3 Report of the District Inspector of Forest Reserves for Saskatchewan	29
4 Report of the District Inspector of Forest Reserves for Alberta	33
5 Report of the District Inspector of Forest Reserves for British Columbia	43
6 Report of the Superintendent of the Forest Products Laboratories of Canada	48

ILLUSTRATIONS

	PAGE.
Stand of timber at Petawawa before trimming or thinning	8
Same stand as preceding after trimming and marking trees	8
Same stand as preceding, thinned and debris burned	9
Marking trees for identification	15
Foresters constructing a tree-line telephone system	15
Setting out evergreen seedlings in transplant beds	22
Wind-break of willow, southern Manitoba	25
Scotch pine plantation ten years old, Manitoba	27
Same plantation as preceding three years later	27
Cattle grazing on a Saskatchewan forest reserve	31
Typical ranger cabin and other forest protective improvements	34
Jack pine in transplant beds, 1916	39
Same plantation as preceding three years later	39
Picture showing results of tree seed collection	45

REPORT OF THE DIRECTOR OF FORESTRY

R. H. CAMPBELL

This report covers the work of the Forestry Branch for the fiscal year 1918-19, ended March 31, 1919.

The policy of economy which has been followed during the war was continued during the year. All controllable expenditure was kept to the lowest proportions possible and no new lines requiring large expenditure were opened up. The summer season was not a specially dangerous one for fire and the loss to the forests from this source was kept comparatively small.

While the practice of economy is necessary under war conditions, at the same time it may be pointed out that the expenditure of Canada on forestry, compared with the forest area, is the smallest in any progressive country of the world having any claim to civilization and desirous of taking its place in the world and the world markets as an important and permanent factor.

The position of Canada in the world as a forest country is a large and important one, and in the British Empire it is even more important. The authorities on forestry in the British Isles are laying stress on the unique position held by Canada in the British Empire for the supply of coniferous timber, and have been urging on the Imperial Government the necessity of providing fully for the proper protection and management of Canadian forests. The situation in Canada is complicated by the fact that the forests are divided in ownership among a number of governments which have independent jurisdiction, but it would seem that in response to the call from the Imperial Government some wider system of co-operation between the Federal and Provincial Governments might be worked out.

The legislation in Manitoba and Saskatchewan requiring the taking out of permits before setting out fire for the clearing of land has much improved the situation from the forest fire point of view. The authorities of the province of Manitoba authorized the Dominion forest service to administer the permit law and, on the whole, the system in that province has worked out well. In Saskatchewan no provision was made by the provincial authorities for an organization to carry out the law, nor did they give authority to the Dominion fire rangers to do so. In that province therefore this provision of the law has remained largely a dead letter. The province of Alberta has not as yet passed similar legislation.

The necessity for well organized research work in forestry becomes more and more manifest as the forests become more mature and timber operations develop. Forest research is an essential part of the forestry programme in all countries where forest management is taken up seriously, and if Canada wishes to remain in the van of progress and have her forest practice based on sound scientific and permanent principles, thorough scientific and careful study of the forests and forest trees should be organized on a basis adequate to the importance of the forest and to Canada, as one of the greatest forest countries in the world. A division in the Forestry Branch to initiate, organize, and develop such work should be established without delay. It seems clear that in the organization of scientific research the federal authorities should lead the way.

WHITE PINE BLISTER RUST

The committee appointed to deal with the white pine blister rust, as explained in last year's report, continued its operations during the year.

Sample areas for the special study of the disease were located in the provinces of Ontario and Quebec, and from these it should be possible in a short time to obtain accurate knowledge of the disease and the methods by which it spreads. Scouting for the location of the disease was also continued in Ontario, Quebec and in the Prairie Provinces. No new facts as to the spread of the disease were, however, ascertained.

During the coming year the scouting and the development of the sample areas will be continued. It is also proposed to restrict the movement of currant and white pine stock from nurseries in infected districts.

STAFF

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

Head office	42
District inspectors	5
Assistant inspectors	2
Forest supervisors	15
Forest assistants	5
Forest rangers	102
Chief fire rangers	11
Inspectors of tree-planting	9
Forest Products Laboratories, technical staff	18
Outside clerical staff	41
On military leave	21
Total	<u>271</u>

The total number of men who enlisted is 79.

APPROPRIATION

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

Salaries at head office	\$10,922 57
Salaries of officials on military leave	10,323 09
Travelling expenses	590 64
Printing and stationery	6,809 96
Miscellaneous expenses	8,632 54
Statistics	2,912 40
Fire-ranging	173,494 88
Forest reserves	311,698 90
Tree planting	55,977 12
Forest Products Laboratories	52,138 22
War appropriation	6,319 81
Total	<u>\$639,820 13</u>

NOTE.—The item of \$6,319.81 shown under War Appropriation was drawn from the Forestry appropriation and later refunded.

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

Manitoba	\$ 88,295 82
Saskatchewan	132,709 60
Alberta	165,825 38
British Columbia (Railway Belt)	98,362 98
Total	<u>\$485,193 78</u>

LIBRARY

In spite of the ever-widening range of interests which forestry is reaching the endeavour in the library has been to confine the literature strictly to forestry and to subjects pertaining to the administrative work of the branch. As regards current

forestry literature the library is pretty complete. Much has still to be done, however, in the way of collecting foreign forestry literature, particularly that relating to French forestry which has so favourably impressed many of the Canadian foresters who have lately been brought into contact with it in the army.

During the year 55 books and 457 pamphlets were received in the library. Forty-seven magazines and papers were regularly received through paid subscriptions and 45 by exchange.

The additions to the list of photographs numbered 448. A number of these were not negatives. The small amount of survey work undertaken last year and the reduced staff on the reserves fully account for the decrease in the number of photographs received as compared with other years. Sets of lantern slides in both the head office and the offices of the district inspectors of forest reserves received attention, as well as the revision of a lecture provided to accompany them.

PUBLICATIONS

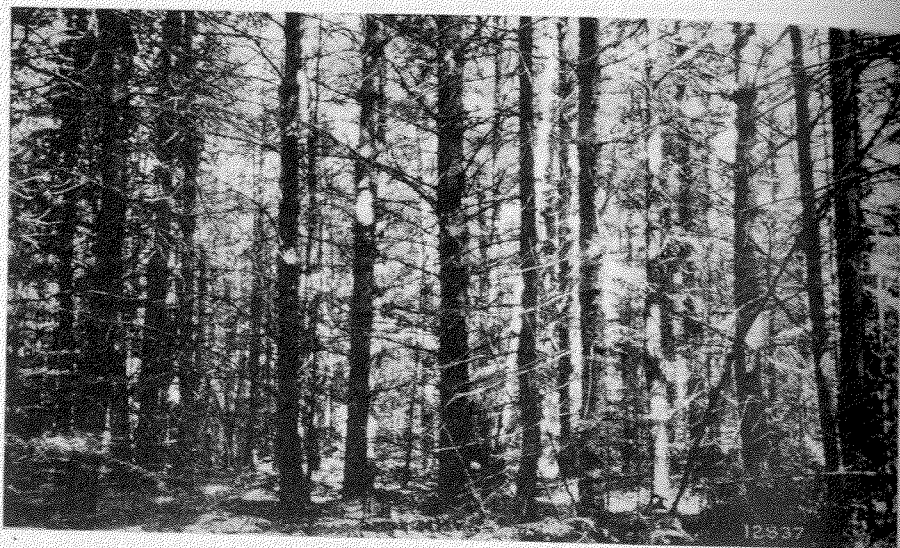
More than ever the effort has been to make the publication work as efficient as possible in order to secure the maximum of economy. The far-reaching changes introduced by the Editorial Committee have been loyally carried out, and while the information collected by the Forestry Branch has been made as accessible as possible to the public, as in the past, not an unnecessary page of letterpress or inch of engraving has been made. The steady demand for the bulletins issued shows that the public appreciate and make use of them. The standardizing of all printed forms used by the branch has been continued as each form comes up for reprinting, with ever increasing saving in time and money. The evidence of those in the field shows that publicity is the best means by which to fight forest fires and that an effective poster is one of the most powerful weapons used in this fight. The effort therefore to produce striking posters each year continues with experiments with new materials to obviate the use of those of which the price has been greatly raised by after-the-war conditions. The list of bulletins issued during the year is given below, and in addition there should be mentioned Bulletin 66, "Utilization of Waste Sulphite Liquor," upon which the work was practically completed, but the actual issuing of which was delayed by unavoidable causes until after the end of the fiscal year.

- Bulletin No. 63—Wood-using Industries of Quebec, in English and French.
- " No. 64—Forest Fires in Canada, 1914-15-16.
- " No. 65—Forest Products of Canada, 1917: Poles and Cross-ties.
- " No. 67—Creosote Treatment of Jack Pine and Eastern Hemlock for Cross-ties.
- " No. 1—Tree Planting on the Prairies of Manitoba, Saskatchewan and Alberta. (7th Edition, revised.)

STATISTICS

The work of collecting, compiling and publishing statistics relating to forest products, with the exception of poles and cross-ties, was taken over by the Bureau of Statistics of the Department of Trade and Commerce in 1917. The entire field was covered by the Bureau in 1918. The Forestry Branch co-operated in this work in the preparation of lists and schedules. The forms received were revised by the Forest Statistician of the Forestry Branch who also revised the reports before publication.

Owing to the fact that the Bureau of Statistics has legal authority to collect the desired information and has a large trained staff for the necessary compilation it is believed that this co-operative arrangement will result in the publication of more complete statistics than have been hitherto obtainable.



Petawawa forest experiment station. White pine stand about forty years old, before trimming or thinning



Petawawa forest experiment station. Same forest as preceding, after trimming and marking of trees and mapping

TREE PLANTING

The distribution of trees from the forest nursery stations at Indian Head and Sutherland, Saskatchewan, for planting on farms on the prairies continues steadily from year to year. In the spring of 1918, 5,765,000 trees were distributed to 4,388 applicants. In the southern parts of Saskatchewan and Alberta the early part of the summer was very dry with considerable wind, so that the conditions for the establishment of plantations were far from good. Such a season, however, brought clearly before the farmers the advantages of proper preparation of the soil and of thorough cultivation thereof after the trees were set out. Although there were considerable losses in some plantations the losses were small and almost negligible in places where proper preparation and cultivation of the soil were thoroughly practised. Since the inauguration of the system of distribution of trees to prairie farmers 49,849,271 trees have been distributed and in all cases where reasonable care was taken and instructions followed the plantations have been, and continue to be, successful. The number of trees ready for distribution in the spring of 1919 was 5,388,714.



Petawawa forest experiment station. Same forest as shown on opposite page after thinning. Cordwood piled for hauling and debris being burned

The number of trees planted in the forest reserves was 196,350, mostly white spruce, jack pine and Scotch pine. Most of these were set out in the forest reserves located among open prairie and agricultural lands and form part of a general scheme of reforestation. Some of them, especially on the Pines and the Riding Mountain forest reserves, were set out in small sample plots from which it is expected in time to derive valuable information as to the most economical and efficient means of establishing plantations.

Two experiments in seeding were also carried out, one in Manitoba and one in Alberta. On the Spruce Woods forest reserve in Manitoba ten acres were prepared by removal of the grass and disking, and were sown broadcast with white spruce and jack pine seed in the spring of 1918. Although the conditions for germination were unfavourable during a great part of the season it was found in the fall that sufficient of the seed had germinated to give 1,864 trees per acre. As this experiment was so successful in a bad season and as a method of reforestation it is comparatively

cheap, it is proposed to experiment further with it. Some five acres on the Cooking Lake forest reserve in Alberta were also seeded with spruce and jack pine with results that are decidedly encouraging.

TREE SEEDS FOR GREAT BRITAIN

In response to requests from forestry authorities in the United Kingdom tree seeds were collected in British Columbia by officers of the branch. These were forwarded to the Forestry Commissioners for Great Britain to be used in the carrying out of reforestation plans under way in the United Kingdom. The seeds included those of Douglas fir, Sitka spruce, alpine fir, and of other species which the British authorities desire to test.

FIRES

The early spring season of 1918 opened badly for forest fires. The snow went off early and this was followed by a few weeks of dry weather with high winds. In the southern parts of Manitoba, Saskatchewan and Alberta the dry weather continued throughout the greater part of the season. In British Columbia the dry spring was followed by some wet weather, but in the early summer it became dry again and in the fall there was another dry, windy spell of several weeks which, especially in the Coast district, resulted in several extensive forest fires. Fortunately in the northern parts of Manitoba, Saskatchewan and Alberta the season was generally a normally wet one and the danger or damage from fire was not great. A statement of all the fires combated by officers of the Forestry Branch both inside and outside of the forest reserves and the causes of them is given in the following table, together with a comparison of the percentage due to each cause in the last three years.

Cause.	Number of Fires,		Percentages.	
	1918.	1918.	1917.	1916.
Unknown	246	27	32	30
Campers and travellers	129	14	18	20
Settlers	205	23	22	18
Railways	204	23	17	20
Lightning	45	5	4	7
Lumbering	22	2	3	3
Incendiary	15	2	2	1
Brush disposal (other than by settlers)	13	2	1	—
Other known causes	19	2	1	1
Total	898	100	100	100

The educational work done by the forest officers and the forest and fire rangers is showing its effect in the greater care exercised in regard to fire by the public generally. A permit system for setting out fires for clearing land properly authorized by statute in every province and with proper arrangements for its enforcement will add very much to the efficiency of the forest fire prevention service and is one of the most important forward steps immediately possible and necessary.

FIRES AND RAILWAYS

The inspection of railways and the fire patrol along them was carried out as usual. The staff employed consisted of one permanent inspector having a general jurisdiction, and 7 temporary inspectors. The only railway about which it was necessary to make any severe criticism was the Edmonton, Dunvegan, and British Columbia Railway in northern Alberta. The fire patrols on the government-owned railways, such as the Hudson Bay Railway and the Transcontinental Railway, which do not come under the regulations of the Board of railway Commissioners, were furnished by this branch. The number of patrolmen employed was 7.

FOREST RESERVES

The forest reserves which are the areas unsuitable for agriculture which are set apart permanently for forest production include an area of 27,974,464 acres. The permanent staff employed thereon during the year was as follows: District inspectors, 4; assistant inspectors, 2; forest supervisors, 15; forest assistants, 5; forest rangers, 102: Total, 128. The temporary staff of rangers on the reserves numbered 63. This staff is too small for the large area to be protected and managed and it should be enlarged at the earliest opportunity. The class of men appointed as forest rangers has improved with the placing of appointments in the hands of the Civil Service Commission, who make qualifications for the work required the rule for appointment.

Improvements.—The construction of improvements such as houses, cabins, etc., which will enable the forest rangers to live in their districts, and such as roads, trails, telephone lines, lookout towers, etc., which improve communications and assist in the protection and management of the forests, has been continued. The systems of improvements have been planned carefully and when in the course of a few years the main systems are completed the protection and management of the forest should be carried out much more efficiently and with considerable reduction in cost. Following

is a statement of improvements completed during the year with the total and average cost:—

Class of Improvements—		Total.	Average.
Cabins	Number 8	\$ 2,341	\$ 293
Houses	" 3	4,887	1,629
Stables	" 7	2,250	321
Other buildings	" 15	3,614	241
Lookout towers	" 4	785	196
Telephone lines	Miles 144	11,922	83
Fireguards ploughed	" 131	914	7
" cleared	" 4	220	55
Roads	" 36	10,340	287
Trails	" 137	4,360	32
Miscellaneous projects, such as fences, etc.		1,580	
Total		\$43,213	

Timber operations.—There was a considerable increase in the timber operations in the forest reserves during the year. The high cost of lumber and the high cost and scarcity of fuel resulted in many more people than usual resorting to the forests for their supplies. The number of permits issued for wood and timber was 4,142, and the quantities cut thereunder totalled 6,783,104 feet board measure; 1,065,934 lineal feet, and 43,557 cords. The number of free permits was 1,715. There were twelve millsite locations on the forest reserves occupied for cutting lumber for settlers under their permits. Twenty-one timber sales were in operation during the year. The cut of saw-timber on such sales was 1,607,362 feet board measure; of mine-props, 2,188,767 feet board measure and 1,212,752 lineal feet; and of lagging, 1,455 cords and 400,000 lineal feet.

The operators are all conducting the timber operations more carefully. Stumps are cut low, trees are utilized as fully as possible, the brush is disposed of and the tracts operated are being left in good condition for protection against fire and for reproduction of the forest.

Fires.—There were 116 fires on the forest reserves as compared with 159 in 1917. Eighty-one of these fires, 70 per cent, burned over more than ten acres each. The total area burned over was 109,735 acres, of which 3,529 acres were covered with merchantable timber, and 26,472 acres with young trees.

A statement of the number of fires on forest reserves in 1918 and their causes is given below with a comparison of the percentage due to each cause in the last three years.

Cause.	Number of Fires,		Percentages.	
	1918.	1917.	1917.	1916.
Unknown..	46	40	31	34
Campers and travellers..	23	20	21	22
Settlers..	15	13	18	24
Railways..	13	11	14	9
Lightning..	4	3	5	2
Lumbering..	5	4	3	—
Incendiary..	7	6	4	6
Brush disposal (other than by settlers)..	3	3	1	2
Other known causes..	3	1
Total..	116	100	100	100

Forest Nurseries.—The supply of trees for reforestation on the forest reserves was obtained largely from the nursery stations at Indian Head and Sutherland, but, in order to develop such work on the forest reserves convenient to the places where planting is to be done and in order to give training in forest nursery and forest planting work to the staffs on reserves where planting is necessary, small nurseries have been started on several of the reserves. These include the Spruce Woods reserve in Manitoba, the Pines and Moose Mountain reserves in Saskatchewan, and the Cypress Hills and Cooking Lake reserves in Alberta. These reserve nurseries will not be increased to large dimensions, so as to be general sources of supply, but will be developed to serve the full requirements of the reserves on which they are situated.

GRAZING

The number of grazing permits issued during the year was 1,172 and the total number of stock grazed was 86,605. Of this total there were 10,575 horses, 48,420 cattle, and 27,610 sheep. These figures represent the striking increase over last year of 656, or 127 per cent, in the number of permits issued, and 58,714, or 210 per cent, in the number of stock grazed. The forest reserves in the Railway Belt in British Columbia are not represented in the above figures, as the Forest Reserve Regulations in regard to grazing have not yet been applied to the Dominion reserves in that province. A change of opinion has, however, been developing in British Columbia in favour of regulated grazing and a beginning in this direction will be made on provincial lands during the season of 1919. It is possible that similar action may be taken on Dominion forest reserves in the Railway Belt the following season.

The remarkable increase in the number of stock grazed on forest reserves during recent years indicates that the stock-owners are rapidly coming to appreciate the value of the range and the benefits of a regulated use of it. The regulations are designed to give special consideration to the small owner and to make the forage resources of the reserves available to the largest number of persons possible. This policy has led to a development in two directions, namely, the organization of settlers into stock or grazing associations, and the undertaking of grazing surveys and the formulation of working plans with a view to securing improvement and fuller utilization of the available forage.

The stock association is proving to be the best means of utilizing large areas, and its officers, acting in an advisory capacity, assist in the various problems incidental to range administration. The department passes upon the constitutions of these associations and is careful to see that the conditions of membership are not such as to debar any settler who is entitled by the Forest Reserves Regulations to obtain grazing privileges.

The increasing demand for grazing privileges on some of the reserves has made it necessary to obtain reliable information as to the carrying capacity of the grazing districts and for that purpose an expert has been employed in Alberta during the year

to make grazing reconnaissances on several of the reserves. On the information thus obtained working plans have been made, the adoption of which has already enabled many additional stock-owners to share in the benefits of the reserves.

A very serious feed crisis which arose in southern Alberta last summer brought the grazing resources of the forest reserves into prominence. Notwithstanding the serious conditions which existed generally throughout the province, the forage growth in the forest reserves was good, and by arrangement with the forest officers approximately 25,000 head of stock were taken into the reserves from districts where feed was scarce, and were brought through the crisis in excellent condition.

RECREATION

The summer resorts are proving their growing popularity by attracting a larger number of visitors each year. Building operations were suspended to a large extent during the war but are now being resumed and many attractive summer cottages are being constructed. A certain amount of roadwork is being carried out from time to time to make the resorts more easily accessible.

The policy of restricting methods of fishing to those of angling and trolling is producing results in the improved fishing to be found in the lakes in the vicinity of the summer resorts. There is no doubt that good fishing doubles the attractions of any summer resort, and the fact that the development of recreational use of the forest reserves is a means of securing public sympathy and support for forest protection is not overlooked in the administration of these resorts.

GAME

Many of the forest reserves are entirely, or in part, game preserves, established as such by provincial legislation; and in all cases the forest officers, while not primarily responsible for game protection, co-operate with the provincial authorities in the protection of the game. In many cases where for the protection of a particular species a closed season has been declared, the value of the forest reserves has again been demonstrated by affording sanctuary to the particular game in question and permitting their numbers to increase.

FIRE-RANGING OUTSIDE FOREST RESERVES

The fire patrol on wooded lands outside the forest reserves was continued as usual. Fortunately in a large part of the districts covered in the northern forests the season was generally favourable and the results for the season were on the whole satisfactory. The greatest damage was done in British Columbia but over 50 per cent of this damage was done by one fire which started south of the international boundary and, after burning for some days, crossed the boundary with a strong wind behind it on a three-mile front and was absolutely uncontrollable while that wind lasted.

The rangers did considerable work in the improvement of trails and other means of communication, erecting cabins and lookout towers and providing other means to improve the conditions of living in the forest and to assist in its protection.

The number of chief fire rangers employed was 11, each having charge of a large district and of about 20 fire rangers. The number of fire rangers and assistant fire rangers temporarily employed was 219. The number of fires which occurred was 782 compared with 926 in 1917. The total area burned over was 147,608 acres, of which 18,830 acres carried merchantable timber and 16,013 acres were covered with young growth.

Herewith is a statement of the number of fires outside the reserves in 1918 and their causes, together with a comparison of the percentages due to each cause in the last three years:—

Cause.	Number of Fires,		Percentages.	
	1918.	1918.	1917.	1916.
Unknown.....	200	26	32	30
Campers and travellers.....	106	14	18	20
Settlers.....	190	24	23	19
Railways.....	191	24	17	20
Lightning.....	41	5	4	7
Lumbering.....	17	2	3	3
Incendiary.....	8	1	2	—
Brush disposal (other than by settlers).....	10	1	1	—
Other known causes.....	19	2	1
Total.....	782	100	100	100

FOREST SURVEYS

Owing to the necessity of keeping expenditure as low as possible and to the difficulty of obtaining qualified men, the forest survey work has been reduced to as small dimensions as possible. The only forest survey party organized was the one carrying out the survey of the Petawawa reservation. It was hoped to complete the survey during the past season but toward the end of the season the party was broken up by influenza, and at the end of the season there still remained about one-third of the area to be surveyed. It is hoped to complete the survey during the coming year. The tract is a characteristic pine and spruce site and will give opportunity for valuable experiments in regard to the yield and the reproduction of these important species.

FOREST INVESTIGATIVE WORK

During the season several sample plots were set apart on the Petawawa forest experiment station, measured, mapped, and recorded for special study. These plots were marked and mapped according to the latest methods adopted by forest research institutes, and covered some of the principal types of stands, including white pine, red pine, and white birch, in various mixtures. Experiments in thinning were inaugurated on permanent sample plots. Continuous and careful observations and measurements on these plots will give valuable information in regard to the growth and yield of individual trees and of stands under differing conditions of soil, soil-moisture, density, light, and composition.

FOREST PRODUCTS LABORATORIES

The main laboratories at Montreal suffered seriously during the year through continued loss of staff, owing to better opportunities for salaries and advancement with industrial firms. The losses of men during the year included the chief chemist, the chief of the Pulp and Paper Division, and most of the staff in that division, the chief of the Division of Timber Physics, and finally the assistant superintendent and the superintendent of the laboratories. With these heavy losses in staff it has been difficult to carry on the work satisfactorily. The main lines of investigation have been continued and some completed.

On representations made by the Imperial Munitions Board which desired more complete and thorough tests of airplane timbers in British Columbia, the establishment of a branch testing laboratory at Vancouver was considered and finally an arrangement was worked out with the University of British Columbia for the establishment of such a laboratory. Mr. L. L. Brown, a member of the staff of the laboratories at Montreal, who had just returned from service overseas in the army, was placed in charge. This laboratory is first proceeding with tests of Sitka spruce and other airplane timbers and will later develop more general studies of British Columbia woods, such as may assist that province to compete in home and foreign markets.



Forest protective equipment. Forest rangers constructing a tree-line telephone system, Nisbet forest reserve, Saskatchewan



Petawawa forest experiment station. Marking trees and stencilling numbers for identification

TABLE 1.—Statement of Revenue, Forestry Branch for the fiscal year ended March 31, 1919

Reserve	Timber Sales	Timber fees and dues	Timber Seizures	Grazing permit and trespass dues	Hay permits and seizures	Surface Rentals	Special Uses	Nursery St ck	Unclassified	Total
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Turtle Mountain.....		76 75	13 96	2,046 50	245 85	70 00	7 00			2,460 06
Spruce Woods.....		45 00	11 00	765 75	90 35					912 10
Riding Mountain.....	184 00	12,521 00	651 29	862 95	725 70	67 80	615 00			15,630 74
Duck Mountain.....		3,208 16	1,637 84	167 60	253 95	210 00	3 25			5,480 80
Moose Mountain.....		254 60	55 00	590 65	558 20	90 00	10 81			1,559 26
Beaver Hills.....		248 00	74 25	321 50	451 20		1 00			1,095 95
Porcupine.....	482 91	579 63	105 90	99 85	251 75		4 50			1,524 54
Pasquia.....	4,034 58	4,178 73	376 75	181 80	188 20		5 25			8,965 31
Fort à la Corne.....	103 83	700 85	13 00	21 25	22 00		100 00			960 92
Pines.....		519 85		387 75	96 40		1 75			1,005 75
Nisbet.....		816 00	14 35	141 80	60 85		3 75			1,036 75
Big River.....		107 00		66 70	145 65		14 75			334 10
Steep Creek.....		57 75		25 25						83 00
Sturgeon.....		28 58		53 50	54 10		3 75			179 93
Keppel.....		324 85		656 10	67 60		3 75			1,052 30
Manito.....		139 90	8 00	765 65	78 75		7 00			999 30
Dundurn.....		17 25		302 35	53 00		2 00			374 60
Seward.....				534 45	86 80		4 75			626 00
Elbow.....		3 50		380 90	82 35		7 00			473 75
Big Stick.....		25		3,681 75	7 25		6 25			3,695 50
Cypress Hills.....	184 18	1,073 53	108 81	1,597 77	705 50	20 00				3,689 79
Cooking Lake.....		48 00		610 80	237 10		73 00			968 90
Crowsnest.....	1,977 27	1,156 42	76 41	5,751 07	64 50	53 55	796 20			9,875 72
Bow River.....		464 24	350 00	3,702 09	128 10		45 70			4,698 13
Clearwater.....	6,851 73	358 75	508 35	43 00	27 90	221 73	111 75			8,123 21
Brazeau.....	2,091 34	1,860 94	33 75		85	11 00	86 00			4,086 88
Athabaska.....		4 50					33 75			38 25
Lesser Slave.....	50 00				20 25		75			71 00
British Columbia Reserves.....	250 06	278 00	79 93	5 00	27 70	93 50	23 30			757 43
Indian Head.....								1,039 00	979 01	2,018 01
Total.....	16,212 84	29,072 03	4,121 59	23,803 78	4,732 15	837 58	1,970 01	1,039 00	979 01	82,767 99

TABLE 2.—Statement of Timber Permits issued for the fiscal year ended March 31, 1919

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	Cross ties	Mine Timber	Building Logs	Fuel Green		Fuel Dry
					Ft. B.M.		Lin. Ft.	Lin. Ft.	Cords	Cords	\$ cts.
Turtle Mountain.....	59	14		5,450	3,000			2,500		1,425	76 75
Spruce Woods.....	82	8								1,353	45 00
Riding Mountain.....	363	940	10,350	56,610	4,344,552			42,321	782	7,013	12,521 00
Duck Mountain.....	227	266	900	23,066	1,132,260			38,495		4,164	3,208 16
Moose Mountain.....	10	58	90	6,255				13,880	107	397	254 60
Beaver Hills.....	115	34	400	300	31,010			21,290		1,440	248 00
Porcupine.....	106	41	3,500	14,000	679,009			32,892	52	185	579 63
Pasquia.....	18	69	8,200	86,082	43,408			16,816		9,158	4,178 73
Fort à la Corne.....	92	94	10,298	12,068	193,763			23,699		1,957	700 85
Pines.....	22	49	975	9,413	21,836			2,510	66	742	519 85
Nisbet.....	59	78	2,650	3,650	12,754			2,414		2,078	816 00
Big River.....	15	5	3,300	1,500				2,800		620	107 00
Steep Creek.....	14	11	100	3,183						284	57 75
Keppel.....	27	136	900	2,035	1,000			11,500	484	500	324 85
Sturgeon.....	7	5	1,100	500	6,512			3,804			28 58
Elbow.....	8	1							5	66	3 50
Manito.....	75	65	4,950	14,460	10,000			5,250	185	1,012	139 90
Dundurn.....	8	5							30	188	17 25
Big Stick.....	1									10	0 25
Cypress Hills.....	223	359	59,997	51,675	2,400		1,200	48,160	533	3,632	1,073 53
Cooking Lake.....	18	9		2,800				2,500		462	48 00
Crowsnest.....	87	102	27,375	11,810	300,600		100,174	63,609		2,304	1,156 42
Bow River.....	54	43	6,841	8,500			10,000	29,373		1,455	464 24
Clearwater.....	8	7					70,000	10,063		365	358 75
Brazeau.....	4	11				1,140	123,000	346,654		75	1,860 94
Athabaska (Payment on timber cut previous year).....											4 50
British Columbia Reserves.....	13	17	5,420	2,080		1,000	30,542	10,488		428	278 00
Total.....	1,715	2,427	147,346	315,437	6,783,104	2,140	334,916	731,018	2,244	41,313	29,072 03

TABLE 3.—Statement of Grazing Permits issued on Forest Reserves in the fiscal year ended March 31, 1919

Reserve	No. of Permits	Number of Stock				Dues and fees collected
		Cattle	Horses	Sheep or Hogs	Total	
Turtle Mountain.....	115	1,800	299		2,099	\$ 1,923 50
Spruce Woods.....	45	881	52		933	765 75
Duck Mountain.....	15	610	39		649	167 60
Riding Mountain.....	48	3,119	94		3,213	840 25
Moose Mountain.....	72	2,034	159		2,193	590 65
Porcupine.....	7	415	56		471	97 35
Pasquia.....	18	712	22		734	181 80
Pines.....	13	1,406	42		1,448	387 75
Beaver Hills.....	56	984	97		1,081	321 50
Fort à la Corne.....	1	70			70	21 25
Nisbet.....	9	373	27		400	141 80
Big River.....	4	344	10		354	66 70
Sturgeon.....	7	249	31		280	98 50
Keppel.....	44	1,689	248	2,000	3,937	656 10
Manito.....	58	1,927	354	42	2,323	707 80
Pundurn.....	18	914	163		1,077	302 35
Seward.....	43	802	491	1,196	2,489	521 70
Steep Creek.....	1	100			100	26 25
Elbow.....	47	1,118	341		1,459	380 90
Big Stick.....	79	4,798	1,059	3,367	9,224	3,681 75
Cypress Hills.....	126	2,364	2,952	1,450	6,766	1,581 77
Cooking Lake.....	29	2,647	82		2,729	597 80
Crowsnest.....	211	10,329	1,801	19,555	31,685	5,713 68
Bow River.....	112	8,617	2,106		10,723	3,702 09
Clearwater.....	2	100	50		150	43 00
British Columbia Reserves.....	2	18			18	5 00
Total.....	1,172	48,420	10,575	27,610	86,605	23,518 29

TABLE 4.—Statement of Timber cut on Forest Reserves under authority of Timber Sales in the Fiscal Year ended March 31, 1919

Reserve	Previous Sales still operating	Sales made Current Year	Saw Timber	Mine Timber				Dues Collected.
				Props	Props	Lagging	Lagging	
Big River.....	1		Ft. B. M.	Ft. B. M.	Lin. Ft.	Cords.	Lin. Ft.	\$ cts.
Fort à la Corne.....	1		69,217					103 83
Porcupine.....	1	1	2,988					7 30
Pasquia.....	2	2	426,984					958 88
Brazeau.....	3				434,577	6	400,000	955 35
Clearwater.....	1		370,359	2,188,767		791		6,850 73
Crowsnest.....	6	1	615,025		778,175	658		2,192 92
Cypress Hills.....	1		122,739					184 18
Larch Hills.....		1						
Total.....	16	5	1,607,362	2,188,767	1,212,752	1,455	400,000	11,253 19

TABLE 5.—Statement showing the quantity of timber sold and revenue due during Fiscal Year ended March 31, 1919, on licensed timber berths within Dominion Forest Reserves

MANITOBA

Forest Reserve	Timber Berths	Area in Reserve	Quantity Sold			Revenue		
			Lumber	Lath	Other* Products.	Dues Payable	Rent Payable	Total Payable
			No.	Sq. Mls.	Ft. B. M.	No.		\$ cts.
Riding Mountain	4	44.33	576,953		11,182	365 98	222 15	588 13
Duck Mountain	11	99.98	11,704,835			4,872 93	499 90	5,372 83
Total	15	144.41	12,281,788			5,238 91	722 05	5,960 96

SASKATCHEWAN

Porcupine	47	944.09	37,262,064	5,865,100	14,204	15,984 68	4,261 95	20,246 63
Sturgeon	12	171.93	74,065,734	8,221,514	1,482	33,982 12	862 08	34,844 20
Big River	3	260.77	13,569,790	4,191,200		13,600 19	1,303 85	14,904 04
Nisbet and Pines	4	110.08	5,875		4,268	2,218 09	173 15	2,391 24
Total	66	1,486.87	124,903,463	18,277,814		65,785 08	6,601 03	72,386 11

ALBERTA

Crowsnest	11	259.94	6,886,721		525,295	3,573 69	1,374 70	4,948 39
Bow River	15	367.37	4,180,546		6,362	2,286 89	1,825 60	4,112 49
Clearwater	4	377.56					1,887 80	1,887 80
Brazeau	11	178.04				350 94	1,131 30	1,482 24
Total	41	1,182.91	11,067,267			6,211 52	6,219 40	12,430 92

BRITISH COLUMBIA

B.C. Reserves	11	133.57	175,283		1,900	158 58	667 85	826 43
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GRAND TOTAL

	133	2,947.76	148,427,801	18,277,814		77,394 09	14,210 33	91,604 42
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* The figures in this column indicate the number of units upon which the dues were calculated. They include the following: 11,182 logs, 6,957 fence-posts, 14,164 railway ties, 6,775 cords of wood, 521,430 lineal feet of mine timber, and 300 telephone poles.

APPENDIX No. 1

REPORT OF THE CHIEF OF THE TREE-PLANTING DIVISION

NORMAN M. ROSS

This report covers the fiscal year 1918-19, ended March 31, 1919.

The growing season of 1918 proved to be the most unfavourable since the inception of our tree-planting work in 1901. In fact many settlers who have lived on the prairies for more than thirty years state that conditions affecting plant growth were the worst in their experience. The winter was severe but spring opened exceptionally early, but this early warm weather was followed by very severe frosts and later exceptionally strong wind-storms and a long period of drought which was very general over the southern portion of Manitoba and the central southern parts of Saskatchewan and Alberta. Winter-killing of all but the very hardiest species was much more apparent than in average seasons, but where the tree-planting operations suffered most was in the cases of new plantations and those set out in 1917. The chief cause of injury was the terrific wind-storms. In many cases the young trees and cuttings were literally blown out of the ground; in others they were deeply buried in the drifting soil, or the soil was so completely blown away from around the roots that it was impossible for the young plants to survive. The conditions were, it is realized, very exceptional, but they undoubtedly will have the effect of very much discouraging many planters who were just making a start.

On the nursery the early opening of spring and the dry weather made a very favourable shipping season and enabled the general distribution to be completed much earlier than usual.

The shipping of broad-leaved seedlings and cuttings commenced April 8 and finished April 20. Evergreen shipments were all distributed by May 6.

Immediately after shipping the weather was quite favourable for the transplanting of evergreens from seed-beds to transplant plots, but following this there was a period of excessively high winds and dry weather which was very hard on the newly set out plants, the greatest injury being caused by the particles of drifting soil beating against the needles and in some cases even completely burying the small seedlings. The older transplants, however, made very satisfactory progress. For the first time in the history of the nursery there was almost a complete failure with the newly sown conifer seed-beds. The broad-leaved plots also received their share of injury, and, although well protected by shelter-belts and hedges, at least 60 per cent of the caragana, 40 per cent of one-year-old ash and 50 per cent of one-year-old maples were cut off by the particles of drifting soil. These severe winds unfortunately occurred at the very worst time when the young seedlings had just pushed up through the soil and were consequently in the very tenderest stage of growth.

With the exception of the eastern and northern portions of Manitoba and the northern districts of Saskatchewan and Alberta the prevalence of drought and wind-storms was very general. The districts which seemed to suffer most were southern Manitoba, southern Saskatchewan and southern and south central Alberta. In many of these areas field crops were an absolute failure, and it was not at all uncommon to hear of fields which were sown as many as three times and from which each time the crop was blown out. On many farms not a single bushel of grain was harvested. It is not to be wondered at therefore that many plantations failed; the really surprising thing being that even in the face of such adverse conditions so many of the trees survived. Mr. A. P. Stevenson, who has been practically interested in tree-growing and

general horticulture in southern Manitoba for nearly forty years reports: "Without doubt the conditions were the most unfavourable I have ever experienced in the West and it is a matter of surprise to me that any of the 1918 trees lived through the season."

We have now had to contend with two very dry seasons immediately following each other and many plantations have suffered. The older planters, however, who have consistently followed the instructions of the Forestry Branch now see the benefit of having the soil well prepared before planting and kept well cultivated after planting until the trees can become properly established. Such plantations as have been well handled have come through in practically all cases in splendid shape. Wherever cultivation had been neglected and grass and weeds allowed to get a foothold among the trees the belts very plainly showed the effect of such neglect, and in some cases practically died out from lack of moisture. Fortunately these cases are not very numerous. In the newly set out plantations, as might be expected, the cuttings suffered the most casualties. Wherever the ground was really well prepared and a fair amount of moisture stored up the rooted seedlings came along fairly well.

The following table shows the number of applicants who are to receive trees this spring (1919), the number of trees to be sent out, etc., as compared with last spring's distribution. It will be noted that the number of applicants is slightly higher, but the amount of stock somewhat less. This, however, could not be avoided owing to the exceptional loss of young stock in the nursery, as above mentioned:—

DISTRIBUTION OF BROAD-LEAVED STOCK

	1918	1919
Number of applicants receiving trees.	4,388	4,570
Seedlings and cuttings distributed.	5,765,000	4,501,300
Average number per applicant.	1,300	1,000
Number of applicants on inspection list.	8,990	8,059
Number of new applications received.	1,788	1,318

Labour conditions are at present most uncertain. We are receiving orders to cancel or reduce shipments every day as a consequence; therefore the figures given for 1919 are not absolutely final.

NURSERY WORK

Shipping of broad-leaved stock started at Indian Head on April 8 and finished April 20; at Sutherland nursery it began on April 11 and finished April 20.

Immediately after the broad-leaved distribution was completed at Indian Head a start was made lifting the evergreens. These were ready for shipping about the end of April and the last shipment was forwarded from the nursery on May 6. The weather during the packing season was very favourable for that particular class of work.

A total of 5,265,475 seedlings and cuttings was dug and heeled in in the fall of 1918 ready for distribution in the spring of 1919. The species consisted of maple, ash and caragana seedlings, and Russian poplar, and willow cuttings.

The evergreen stock for distribution in the spring of 1919 consists of 123,239 four-year-old and five-year-old transplants of Scotch pine, jack pine, lodgepole pine, and white spruce.

Collection of Seed.—The late spring frosts practically destroyed the entire tree seed crop throughout the Prairie Provinces. No ash seed could be secured at all, and only in one small district in Manitoba could we get any trace of maple seed, of which 650 pounds were secured. Of caragana seed 450 pounds were collected on the nursery at Indian Head.

Of the conifers no spruce seed could be secured. Of jack pine cones 253 bushels were collected in northern Manitoba and northern Saskatchewan, and about ten bushels of Scotch pine cones were picked from trees growing on the Indian Head nursery.

Douglas fir cones to the amount of 747 bushels were shipped to Indian Head from British Columbia and the seed extracted during the winter. The cleaned seed, amounting to about 500 pounds, was forwarded to Ottawa for shipment to the Forestry Commissioners for Great Britain.

Owing to shortage of seed none could be spared for general distribution with the exception of 110 pounds of caragana seed, which was sent out in one-pound packages on application.

Conifers.—The following evergreens were sent out in the spring of 1918 under the usual charge of \$1 per 100: white spruce, 46,700; jack pine, 69,600; lodgepole pine, 31,500; Scotch pine, 29,300; a total of 177,100. In addition to these a considerable number of conifer transplants and seedlings were shipped for planting on the various Dominion forest reserves.

Permanent Plantations.—No new plantations were set out but older plantations are continuing to make good growth, especially the conifers. Measurements of growth were made in all the plantations as usual in the fall.

PLANTING ON THE RESERVES

Spruce Woods Reserve.—Thirty-two thousand two hundred (32,200) three-year seedlings of white spruce and 71,400 two-year seedlings of jack pine were shipped from Indian Head early in May, 1918, and planted on the Spruce Woods reserve.



Tree-planting on the prairies. Setting out evergreen seedlings in transplant beds, Indian Head nursery station, spring, 1919

covering an area of approximately 37 acres. Owing to the very dry and unfavourable season nearly 50 per cent of these failed to root and will have to be replaced in 1919.

Broadcast-seeding experiments with jack pine and spruce were started. Ten acres were prepared by first burning off all natural vegetation and then working up the surface with a double stroke of the disk harrow. As the sod is very thin on this sandy soil a good seed-bed can be prepared in this manner. The seed was sown with a cyclone hand-seeder and was then covered with a stroke of the drag harrows turned upside down. The seed was put in on April 22; 25 pounds of spruce and 33 pounds of jack pine seed being used for the ten acres. This is much heavier seeding than would be necessary under general conditions. The reason for putting on such a heavy

seedling was to more readily be able to find the young seedlings and note whether a fair stand might be secured by following these methods. Where there is a natural growth of grass and other vegetation it is a most difficult matter to find the small seedlings during the first summer. An examination was made in August and notwithstanding the fact that practically no rain fell during the early part of the summer an area of 20 yards square showed a count of jack pine seedlings at a rate of over 1,864 per acre. No spruce seedlings were found. This seed does not germinate quite so readily as pine and owing to the lack of rain the seed will probably come up this spring (1919).

Dundurn Reserve.—Four hundred Scotch pine seedlings, 8,600 jack pine seedlings and 11,000 white spruce seedlings were shipped to this reserve for filling in blanks in previous plantings. The plantings on this reserve also suffered badly from drought, heat, and strong winds.

Elbow Reserve.—Twenty thousand two hundred and fifty (20,250) each of Scotch pine, jack pine, and white spruce seedlings, were shipped to the Elbow reserve for additional plantings. From reports later in the season it appears that nearly 50 per cent of these failed on account of the exceptionally severe weather conditions.

Riding Mountain Reserve.—Conditions on the Riding Mountain are very different to those on the reserves previously mentioned. The soil is, as a general thing, much richer and heavier and there is a more or less heavy natural growth of scrub or aspen. Experiments on a small scale were started with a view to securing data as to cost and methods of introducing spruce under these conditions. Twelve thousand (12,000) white spruce transplants were shipped to this reserve and planted as follows:—

Near Grandview, 4,000 five-year transplants in deep, heavy clay loam, open prairie with light sod. The young trees were set in plough furrows and spaced approximately three feet apart each way.

Near Kelwood, 1,000 plants on deep, fairly moist clay, vegetable mould two inches deep where heavy growth of poplar had been burned off. Ground now covered with a rather thick growth of hazel. Plants were spaced three feet apart in holes made with a digging bar.

Near Dauphin, 4,000 plants altogether: (1) 2,200 in a cut-over clearing (debris burned off) where a strong reproduction of aspen may be expected; (2) 1,300 under a mature stand of poplar with a fairly heavy undergrowth of hazel which was cut off and burned; (3) 300 in hazel (immediately adjoining plot No. 2) without hazel undergrowth being cut out. The remainder of the plants were set out around the station headquarters.

Near Erickson, 3,000 plants altogether: (1) 2,200 on heavy sand, heavy sod and open prairie; (2) 800 on very moist, sandy loam, with a fairly rank growth of grass on an old "burn" of spruce and jack pine showing no reproduction of these species but a thin reproduction of aspen.

Heavy snowfall came just before these plantings were checked up in the fall so that no reliable report has been received, but a general report received this spring (1919) indicates that the majority of the plants are all living. In this district there was abundant rainfall and conditions generally were favourable during the growing season.

VIDAL'S POINT

Forty-six permits were issued for camping on the Government property known as Vidal's Point on the Qu'Appelle lakes.

APPENDIX No. 2

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR
MANITOBA

F. K. HERCHMER

This report covers the fiscal year 1918-19, ended March 31, 1919.

There are four forest reserves in this province namely, the Riding Mountain, Duck Mountain, Turtle Mountain and Spruce Woods, the boundaries of which remain the same as last year. These reserves cover only lands that are unfit for cultivation, are, or have been, covered with timber, and include the headwaters of numerous streams and are available to the public for any and all uses to which they may be adapted, such as a source of supply for lumber, building and fencing material, fuel, hay, grazing, hunting, use of locations suitable for summer resorts, and as general recreation grounds. The only restrictions are that permittees shall comply with the very reasonable regulations which govern the reserves, and pay the moderate dues demanded for benefits received.

At one time the general public supposed that the term "forest reserve" meant that these areas were reserved *from* the public, but education has changed this view, and it is now largely recognized that the aim of the department in creating and protecting these lands is to reserve them *for* the general use of the public.

IMPROVEMENTS

War conditions rendered it impossible to undertake any large projects, but one new stable was erected, and a 60-foot steel lookout tower was purchased. Practically all the reserves are provided with buildings which up to the present have met the requirements of the resident officers, but as the work is yearly extending it will be necessary to erect a few more houses and cabins.

Roads.—The road system was not enlarged, but improvements were carried out on the existing roads.

Fire-lines.—Many miles of fire-lines were either reploughed or disked, this being necessary each year in grass land or semi-open sections. There is a question as to the value of fire-lines, but in open or prairie country there is no doubt they are indispensable. In the wooded areas, however, the expense of keeping down the growth by hand is practically prohibitive, and careful patrolling, with instructions to the settlers, has been found to be the most practical method.

Telephones.—All the reserves are supplied with telephone lines. On the Riding Mountain, Turtle Mountain and Spruce Woods reserves there are connections with each ranger station, while on the Duck Mountain reserve, three of the stations, a lookout tower, and a rest cabin are connected. These telephone lines are found to be of great value, especially in the case of fire. An effort will be made to complete the Duck Mountain lines in order that all the rangers may be in close touch with the district office.

SILVICULTURE

There was in the past fiscal year a very great demand for timber of all classes, and a marked increase in the number of permits issued over former years. The heaviest business was done on the Riding Mountain reserve where five saw-mills operating on millsites were working on settlers' permits, while a number of other mills located

outside the reserve also sawed on permits. Operations were carried on in the bush fairly well, but few instances being met with where permittees or mill-men failed to conform to the Regulations, and a marked improvement was seen in the methods of brush disposal. Stumps were cut low and all useable tops taken out. Some operators at first attempted to disregard the Regulations, but on being shown that this could not be done, altered their tactics and met the requirements. The most satisfactory results were met with at such mills as were operated by men who could and did keep proper accounts, or where competent clerks were engaged; and in future it is felt that no millsite should be given to any one who does not have some employee capable of keeping all records clearly.

On the Duck Mountain reserve all lumber manufactured under permit was sawn by mills located outside of the reserve, a very considerable quantity having been taken out, while large amounts of fuel were applied for and secured.



Tree-planting on the prairies. Wind-break of willow in fifth growing season on a farm in southern Manitoba

On the Turtle Mountain and Spruce Woods reserves, fuel was practically all the timber taken out, there being little or no material suitable for lumber. The demand on these reserves was greater than usual, the high prices of imported fuel and poor crops in the vicinity causing many settlers to resort to the bush.

Timber, both for fuel and lumber, in the settled portions of the province is rapidly becoming scarcer year by year as land is cleared for cultivation. But few settlers think it advisable to leave a bush lot on their holdings, so that the demand on the reserves is growing in proportion.

PLANTING

On the Spruce Woods reserve 37 acres of new plantations were set out adjacent to the areas planted in the preceding years and the blank spaces in the 1917 plantation were refilled. The stock used was from the local beds and the Indian Head Nursery. A ten-acre plot was seeded broadcast to spruce and jack pine.

The area included in this reserve is, in my opinion, suitable only for forest growth and the question of more extensive reforestation should be taken up at an early date. Up to the present only very small areas have been replanted; these, however, have done

remarkably well, especially the Scotch pine plantation. It is most noticeable that in places on the reserve where spruce seed trees exist they are surrounded by very promising natural seedlings which are making good headway.

The spruce and Scotch pine plantation which was set out several years ago on the Turtle Mountain reserve and which up to last year was very backward, has taken a new lease of life and showed promising growth.

On the Riding Mountain reserve plots aggregating $4\frac{1}{2}$ acres were planted with stock furnished from Indian Head. These were doing well when seen last fall.

USES

Grazing.—The grazing areas on the reserves are attracting more stock-owners year by year as lands available in the settlements are becoming more difficult to secure, and it will be only a short time before our grazing areas will be fully stocked.

The increase in dues recently made will not in any way deter patrons from making use of the grazing areas as even at the advanced rates, the prices are far below those made by owners of private lands. The benefit of having grass and semi-open lands grazed is very marked in the prevention of fires, and on many areas grazed last season no fire could run; while the paths worn by stock going to and from water are a great assistance when fighting fires. It is also noticeable that stock generally graze along fences so closely as to form efficient fireguards. This was particularly remarked in connection with the inclosure on the Turtle Mountain reserve. Again each stock-owner, being desirous of protecting his feed, becomes a self constituted fire ranger, and in case of danger will turn out the force at his command.

Some 5,550 head of stock were grazed on the reserves. Of these the larger number were on the Riding Mountain, with the Turtle Mountain second in order. On the former reserve the owners cared for their own stock, while on the Spruce Woods and Turtle Mountain the majority were placed in the inclosures established by the Forestry Branch, where the stock are cared for by our officers.

So far the least attention has been given by stock-owners to the Duck Mountain reserve, though they are now making more inquiries as to the grazing areas that are to be found there; and one stock association has secured rights over a very considerable area which will be fenced this summer.

All the stock carried were found to be in first-class condition in the fall and the loss was very light.

I consider grazing a very important part of forestry policy and that the elimination of any areas adapted for this purpose from the reserves would not be justifiable.

Summer Resorts and Fish and Game.—The summer resorts on the reserves are attracting more visitors each year, particularly on the Riding Mountain, Duck Mountain, and Turtle Mountain reserves, where there are most attractive lakes, and where it is found that efforts towards improving the roads and laying out lots are greatly appreciated.

Fishing is good in all the lakes, and good catches were reported from Madge lake in the Duck Mountain reserve, and Clear lake in the Riding Mountain reserve. Lake Max in the Turtle Mountain reserve was also very popular, and the fishing there was reported to have improved considerably.

Big game hunting again fell below the former average. But few parties succeeded in securing their quota while a number failed to get any. The close restrictions on elk are still in force. This species of deer is practically confined to the Riding mountain though more were noticed in the Duck mountain than in former years. There is no question but that this noble game animal is rapidly decreasing.

Prairie chicken and partridge, which have been on the closed list for the past two years, are again increasing, quite numerous flocks of the former being seen in all the reserves while the latter which were thought to have been almost extinct, are now to be found in most parts. Rabbits have been very scarce for several years.



Photo 10227

Planting on forest reserves. Ten-year-old Scotch pine plantation on Spruce Woods forest reserve, Manitoba, spring, 1916



Planting on forest reserves. The same plantation as shown in preceding picture, three years later, April, 1919

FIRE-RANGING OUTSIDE FOREST RESERVES

The fire-ranging work as carried on on lands outside of the forest reserves was, as in former years, divided into three districts, namely, Manitoba South, Manitoba North, and the Pas. The past season has been the most satisfactory one from a fire standpoint that I have reported on during my term of office. In all we had 32 fires reported. Of these 25 were designated small fires as they did not cover more than ten acres each. No expense was incurred in extinguishing these fires and no damage was done to timber or property. The seven large fires that we had, covered an area of 1,480 acres and cost, outside of ranger labour, \$78.20 to extinguish. As this was our most successful season I think it would be well to mention that in my opinion the educational policy as carried on by the supervising officers coupled with the improvement in the personnel of the staff was to a large extent responsible for the results attained. The weather was favourable throughout the season. Three new lookout towers were constructed in the Pas fire-ranging district, these towers being erected on hills which command a view of a large tract of territory, and no doubt this will add greatly to the protection of the areas in the northern part of the province.

FIRES INSIDE FOREST RESERVES

The district was very fortunate in not having many fires to contend with during the year. At the commencement of the fire season the prospects were far from being favourable, this being due to the early spring break-up. The weather conditions were indeed very much against us as high winds prevailed for several weeks and we experienced a heat wave in the early part of the summer. The fire situation appeared so grave that it was necessary to put temporary fire patrols on the Riding and Duck mountains. These patrolmen made a constant patrol of the boundaries of the reserves and were on the lookout at all times for fires coming from the outside. The good work done by the patrolmen was in no small measure responsible for the results attained as only one fire was reported as having come from the settled districts adjacent to the reserve. In all there were thirteen fires which burned over an area of 14,907 acres. The area burned over was principally old "burn" and grass land, very little damage being done to timber. The total timber area affected was only 1,125½ acres, this total being made up of 1,125 acres of young growth and one-half acre classed as merchantable. Very little money was expended on fighting fires, the total expenditure being \$318.95, exclusive of ranger service. On the whole the season could be termed a satisfactory one, and I have no hesitation in saying that the publicity work carried on by the officers of the Forestry Branch is largely responsible for the good results attained.

In conclusion I would say that we are gradually receiving more co-operation from the settlers who are in residence close to the reserves. The only difficulty we have is with the foreign settlers, as it is very hard to educate them and make them understand the real value of the forest.

APPENDIX No. 3

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR SASKATCHEWAN

C. MacFAYDEN

This report covers the fiscal year 1918-19, ended March 31, 1919.

In spite of the fact that the disorganization brought about in the years of the war was probably most acute during the past year, the work in the Saskatchewan district has progressed with a fair degree of satisfaction. A district, which from the time of its creation has lacked its due share of technically trained foresters capable of organizing and planning in advance was bound to feel the results of war exigencies to a greater extent than those which previous to the war had their staffs organized and brought to a higher degree of efficiency. An organization already broken into by war conditions was found handicapped in the year past by the resignation of the district inspector and the necessity of securing a substitute, and the absence of the assistant inspector on military leave. Towards the close of the year the new inspector was appointed and the assistant inspector resumed his duties. In the last three months, there has been a marked increase in the number of more nearly properly qualified men available to carry on the work and it is hoped that before long, the whole staff will be made up of more highly qualified men than it has been necessary to employ in many cases during the years of the war. I may here state that returned soldiers now form a very large part of the personnel and in most cases, where otherwise properly qualified, they are proving a very desirable type.

Much as the losses are to be regretted, the war has been a concrete object lesson in the plea for the conservation and regulated use of the forest and, it seems evident, has given a decided impetus to the forestry movement in Canada.

FIRE PROTECTION

Unlike most parts of the Dominion, this district experienced on the whole only an average fire season in 1918. Conditions were quite unfavourable for a time in the first part of April, but were again made safe by heavy rains and cool weather in the latter part of the month. Dry weather and the constant high winds, however, gave rise to an extremely dangerous period in the last part of May and the first part of June. Fall months as usual had their quota of fire, but they were very small compared with those occurring in the previous period mentioned. On the fifteen forest reserves and the two fire-ranging districts within the province there were during the season reported a total of 124 fires, of which roughly two-thirds were large fires, or over ten acres in area each. It is estimated that there was in all an area of only a little less than 100,000 acres burned, of which 6,500 carried stands of merchantable timber, the remainder being reproduction, slashed area, grazing land, or muskeg. It is gratifying to note that, large as these figures are, they are decidedly less than those for the year previous. Within the reserves, the majority of the fires continued to be caused by the carelessness of travellers in leaving camp-fires or in throwing down lighted matches or tobacco. Within the fire-ranging districts, in spite of the new Provincial Burning Permit Act, settlers burning in connection with their clearing operations are responsible for a very high percentage of the fires getting beyond control. The bulk of the fire-fighting done on reserves is in combating fires which come in or threaten to come in from the settlements.

IMPROVEMENTS

Improvements have been in the year past cut down to those works most urgently needed or that could be largely completed by the staff without an expenditure for outside labour. Considerable progress has been made, especially on the Pasquia, Porcupine, and Fort à la Corne reserves. It is expected that in the course of another two or three years the necessary improvement work aimed to facilitate the general administration of the reserves will be completed. The major part of the work remaining consists of the construction of roads or trails and telephone lines, especially in the Pasquia, Porcupine, Sturgeon, and Big River reserves.

Housing accommodation for the field staff has, with some few exceptions, now been fairly well provided for, and expenditures in this direction should be considerably less in the future. The workmanship on a number of the buildings has not been all that could be desired, and it is thought that in future it will be more satisfactory if our standard six-roomed houses are reduced to a smaller, more compact plan and great care taken in their construction, that they may be more comfortable and require less renovating.

With the increase in number of rural telephone lines in the surrounding settlements the reserves are gradually being linked up and their administration greatly facilitated by this means of communication. Connection with the rural lines not only is a benefit to the forest officers, particularly in the fire season, but these facilities are used to no small extent by the public having business with the reserve officials, especially in connection with grazing and timber permits. On the smaller southern reserves, connection of the headquarters with the nearest rural line is in most cases all that is necessary, but on the larger northern reserves, we must not only provide this connection but also have a sufficient system on each reserve to make the headquarters readily accessible from all parts. The primary trunk lines of such systems are now completed on a number of the reserves and provision made for their construction on the others, except the Big River, during the coming year. No lines have been built outside of the reserves, but it is felt that, in some of the more northern fire-ranging districts where there is but small hope of rural lines being built for a long time to come, the Forestry Branch would derive sufficient benefit to justify the expense of their construction.

Lookout towers in this comparatively flat country have received considerable attention and there are now a large number in use, both on the reserves and in the fire-ranging districts. Towers erected in the latter are of timber and were put up by the rangers during periods of little fire-danger. On the reserves, the more permanent steel towers are being used, although wooden towers are used in the more remote districts. Two reserves, the Pines, and Nisbet, are now completely controlled by two eighty-foot towers on the latter and three eighty-foot towers on the former. So far these towers have been used entirely as lookouts with little attempt to derive from them their fullest benefit as points from which to locate accurately fires by a system of triangulation. The addition of range-finders to those on the Nisbet and Pines reserves is now contemplated.

The more northern and more heavily timbered reserves, such as the Big River, Sturgeon, and Pasquia, are as rapidly as possible being made accessible in all parts by a system of roads or trails. These improvements are of primary importance in any plan for fire protection. The roads or primary trails have been for the most part built with the aid of outside labour, but the secondary trails are entirely cut out by the rangers or assistant rangers during periods of little fire-danger. Work of this nature done in the southern fire-ranging districts is small, but in the northern districts, the cutting out of trails over portages takes up a large part of the rangers' time when not actually on patrol duty. The work on primary roads and trails was, during 1918, cut to a minimum, owing to the shortage of labour and the funds available. Considerable progress, however, was made in the work of opening up secondary trails and portages.

GRAZING

The increased use of the public domain on forest reserves for grazing purposes has been remarkable within the past few years. The public are fast coming to realize the benefits that may be derived from the utilization of the range that has in the past gone to waste, been burned off, or occupied by a few large stock-owners. Under the grazing regulations the small stock-owners are encouraged and adequately taken care of in preference to the large owners. The total or partial crop failure in the past few years has encouraged the stock business and attracted numerous people to the northern parts of the province, where forage and hay are abundant and may be depended upon from year to year. Likewise the farmers bordering the prairie reserves are placing less confidence on their grain crops and more on their live stock, thus accelerating the use of the forest reserve range in their vicinity.

The remarkable increase of the use of forest reserve range is demonstrated by the fact that in the year 1915 only 4,500 head were grazed under permit, while in 1918 the numbers had increased to 24,000 head, of which in round numbers 10 per cent were



Grazing on forest reserves. Cattle on Big Stick forest reserve, Saskatchewan

horses. About 5,000 head of sheep were grazed in addition to the above. Approximately only 50 per cent of the available range is now used and the forest reserves can conveniently carry from 25,000 to 30,000 more head of stock. The prairie reserves are fast becoming fully stocked and the largest amount of unused range is in the northern reserves. The demand for range in the small prairie reserves has become very active and very careful supervision is needed to properly cope with the situation, prevent misunderstanding and guard the range against overgrazing and misuse. Blackleg, mange, and other stock diseases are becoming prevalent in certain localities and it will require careful supervision to suppress their spread.

Twelve live-stock associations are in operation at the present time and several more are forming. This method of co-operation in the use of the range is fast taking hold and is solving many problems that otherwise are a continual irritation to the officials. It is fast proving itself the best solution for the use of the larger areas where the associations are permitted to fence the range. Small grazing areas only, when in isolated parts, are permitted to be fenced by individuals. It has proved the best policy not to cut the larger ranges up into a number of small pastures, but to incorporate them all into one large area with drift-fences where necessary. Most of the

associations employ a fence-rider or herder to look after their stock and in this way the fences are kept in repair and the stock properly taken care of. This is an advantage to the reserve in that this man acts as an additional fire-guardian, and it has been also noted that the paths worn by the stock along the fences and the grazing over the different areas greatly reduce the fire-risk and prevent the spread of fire.

Hay is in great demand and usually accompanies the grazing. Numerous permittees put up hay and winter their stock on the reserves. This is a more prevalent condition in the northern reserves than in the south, where most of the settlers take their stock home and winter them on their own places.

SILVICULTURE

Owing to a decreased staff and particularly to the lack of technically trained foresters the work falling under this division has not been receiving the attention that its importance justifies. The relationship existing between the demand and the available supply of forest products in this province would indicate that a system of intensive forest management will exert itself here earlier than in any other province in the Dominion. One need only look at the class of lumber sawn, the class of fuel-wood burned and fence-posts used, to realize the urgency of closer utilization and protection of the present supply, and the need of making provision for the supply of the not distant future. The gap between wasteful exploitation and regulated use, however, is not to be spanned in one short jump. Outside of the timber-berths on the reserves, we have now reached a stage where the need for brush disposal and protection of the young growth is recognized and provided for in some measure. A good start has been made in the definition of cutting areas and the material to be taken, and with very satisfactory results. Extensive occurrence of the dwarf mistletoe, parasitic on the jack pine, especially on the Pines, and Nisbet reserves is being vigorously combated and with good hopes of its eradication. At every opportunity permits are issued for the cutting of areas so affected, and, to hasten the work as opportunity offered, the rangers on the Nisbet reserve cut the material themselves, which the Forestry Branch sold locally at cost price. In the issuing of permits, a special effort is being made to reduce the amount of fire-killed material, thus not only salvaging what would otherwise go to waste, but materially reducing the future fire-risk. The better timber species, the pine and spruce, are being encouraged by reducing their cut to a minimum and increasing that of the inferior species, especially poplar which forms the cover of such a large area of the reserves.

There were in operation on the reserves six timber sales during the year, five having been carried over from the year before and one new sale made this year. The timber-sale contract in each case provided for the piling and burning of all débris caused by the operations, and it is gratifying to note that this is being done in each case in a highly satisfactory manner.

In addition to those mills operated in connection with timber sales there were permits issued for the operation of six mills to saw material taken out by settlers under permit for their own use.

PLANTING

The planting work carried out during the year was limited to experimental plots of ten acres on the Elbow, six acres on the Pines, in addition to some replacements made in older plantations and some ornamental planting in the vicinity of some of the ranger stations. In some cases the plantations show an abnormally high death-rate, but on the whole, the results have been quite satisfactory, and there is sufficient evidence that the work may be undertaken on a larger scale with every assurance of success, especially if the older class of transplants are used.

APPENDIX No. 4

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES
FOR ALBERTA

E. H. FINLAYSON

This report covers the fiscal year 1918-19, ended March 31, 1919.

The operations of the Dominion Forestry Branch in the Alberta inspection district consist in, (1) the administration and protection of Dominion Forest Reserves, and, (2) fire protection of timber occupying Dominion lands not as yet included within forest reserves. The latter, namely, the fire-ranging organization, extends far northward into the Mackenzie River region of the Northwest Territories. The fire-ranging administration includes a sub-organization for fire protection along railway lines, the latter work being handled in co-operation with the Dominion Railway Commission, all expense except that for actual inspection being defrayed by the railway companies concerned.

The total area of forest reserves and parks within the province of Alberta is approximately 27,500 square miles. This area was set aside by Act of Parliament for the purpose of perpetuating the timber supply within this province; for the protection of the headwaters of rivers rising in the province, thereby regulating and stabilizing stream-flow; and, so far as the parks are concerned, for the maintenance in their natural state of recreation grounds for the citizens of this country, and visitors from foreign lands. The area reserved involves, roughly, 10 per cent of the entire provincial area. The land comprised within the forest reserves is non-agricultural by reason of its elevation, topography, or by the character of the soils. As a result of surveys made by the Forestry Branch in the province of Alberta, it may be stated that at least 20 per cent of the total land area is absolutely non-agricultural in character, and that as such it should be devoted to forest production. As time goes on it will undoubtedly be found that even additional areas are incapable of agricultural production and might well be given over to forest production. For the time being, however, if 8 or 10 per cent of the land area be added to the forest reserves already created, bringing the total to perhaps 18 or 20 per cent, Alberta might well be considered as having a reasonable proportion of her area assigned to forest purposes. Assuming that a reasonable forest cover were established, and forest management placed on a rational basis, the *annual yield* of timber, as a result of *growth*, on such an area would be sufficient to supply the domestic requirements in forest products of a population several times that of the present. This is, of course, with the exception of special classes of timber not native to this province which must necessarily be brought in from outside. It will take many years of painstaking work to restore the forest cover to a state of normality. If adequate fire protection is afforded, we may to a large extent depend upon natural regeneration. If, however, the fire problem remains unsolved, and if more satisfactory methods of utilization are not adopted, it is quite within the bounds of probability that artificial regeneration, i.e., planting, may become a pressing necessity over very extensive areas. Artificial regeneration is an exceedingly expensive proposition, and it is nothing less than a sacred duty of the present generation to so conduct forest activities and to so protect forest resources that, at the very least, the remarkable power of self-regeneration may be preserved to the forests.

THE FOREST RESERVES

Strictly speaking there are but four forest reserves in the province of Alberta, the Rocky Mountains, Lesser Slave, Cypress Hills, and Cooking Lake. The first of

these, however, is so large, extending from near the international boundary far north to the Peace River district, including the mountain and foot-hill sections, that it is more familiarly known as five distinct forests—the Crowsnest, Bow River, Clearwater, Brazeau, and Athabaska. The Crowsnest forest extends from near the boundary northward to and including all the drainage of the Oldman and Livingstone rivers; it also includes the Porcupine hills which lie just east of the main Livingstone range. The Bow River forest extends from the Highwood basin northward to and including the James river. The Clearwater forest adjoins the Bow River and extends northward embracing the drainage of the North Saskatchewan and its tributaries, and also the Blackstone river. Still farther north lies the Brazeau forest, including the territory to the watershed between the Macleod and Athabaska rivers. Finally the Athabaska forest extends far north to the sixteenth base-line, including the drainage of the Smoky and Porcupine rivers. Throughout this large reserve conditions vary greatly. The Crowsnest and Bow River forests are widely known and extensively used; settlement comes close to their boundaries and these forests are rather intensively used for



Forest protective improvements on forest reserves for shelter, storage and protection of equipment. Picture of Southesk Cabin, Brazeau forest, Alberta, showing pasture and telephone line

hunting, trapping, camping, fishing, timber-cutting, grazing of live stock, and all manner of uses. The Clearwater forest is not so widely known although it contains a wealth of resources which ultimately will come to more intensive use. It contains some of the finest hunting and camping country to be found in the Rockies. The Brazeau forest is fairly well penetrated by railway branch lines and is very extensively in use for mining purposes. The Athabaska forest is the least known and least developed in the Rocky Mountains reserve. In addition to including fine country for the camper, hunter, and trapper it contains a wealth of coal resources which before long will see development.

The Lesser Slave reserve embraces an area of approximately three and one-third million acres. Although its timber resources have been terribly depleted by devastating fires, it is still a great potential resource for forest production. It is little known and the uses of it exceedingly limited, except for hunting and trapping; before long it will enter into the reckoning as a grazing forest. The Cooking Lake reserve is a very small area lying to the north of the lake of that name. It formerly was well

timbered but at the present time there is practically no merchantable timber. It is a concrete example of what repeated fires will do in destroying the power of natural regeneration; and reforestation of the area will of necessity be by artificial means. It is being extensively used for grazing and perhaps on that ground alone justifies its existence, as the lands are essentially non-agricultural. In the Cypress Hills forest reserve in southeastern Alberta, and extending into southwestern Saskatchewan, we have perhaps one of the most unique forest areas on the continent. Formerly well timbered, it also has suffered greatly as a result of fires, the last extensive fire occurring in 1886. It is important from the standpoint of timber supply, situated as it is in a country otherwise destitute of forest products; and it is of primary importance in the protection of stream-flow, being the headwaters of numerous streams which traverse the irrigated district. On this reserve it will be necessary to resort to artificial regeneration, although to a considerable extent natural restocking will be of great help in establishing the forest cover. The reserve has for many years been intensively used for timber-cutting and hay. Latterly, however, it is being patronized a very great deal for grazing. From the standpoint of technical forest management the Cypress Hills offers opportunities for scientific investigative and administration work perhaps unequalled on the continent.

Each of these forest reserves is in charge of a forest supervisor who directs the work of a staff of permanent and temporary forest rangers. As rapidly as they become available technically educated assistants are being introduced into the administration. The reserves are administered under a definite and comprehensive set of Regulations providing for all necessary and legitimate uses. The foregoing remarks may possibly serve in a small way to dispel from the public mind an entirely erroneous conception that the forest reserves were established or are being administered to prevent use. The substance of the Regulations, however, is that the facilities available must be used conservatively and along such lines as to preserve continuity.

IMPROVEMENTS

Due to a very much depleted regular staff and to the difficulty of hiring suitable temporary rangers it was found necessary on the majority of reserves to confine attention to and concentrate on a very few important projects. Important road-work was undertaken on the Bow River, Clearwater, Crowsnest, and to a lesser extent on the Cypress Hills and Cooking Lake forests, with a view to rendering the reserves more accessible for fire-protective purposes. On the Lesser Slave reserve we have not yet approached the stage where high-class road construction can be attempted, but it is necessary to provide pack-trail facilities, and a very considerable mileage of such trails was constructed, with the result that certain parts of the reserve, hitherto practically inaccessible, have been made moderately easy of access. The construction of telephone lines was confined to the Crowsnest, Bow river, and Athabaska forests. On these three a total of approximately sixty miles of telephone line was constructed, materially adding to the means of rapid communication on the forests concerned. On all forests of the district a large amount of time was devoted by the regular and temporary staffs to the maintenance of previously constructed roads, trails, and telephone lines. Due to a decreased appropriation, and to the difficulty in securing labour, comparatively little work was undertaken in providing additional building facilities.

In the construction of improvements on the forest reserves the most important consideration is, of course, that of fire protection. However, if a forest is equipped with the improvements necessary for a reasonable plan of fire protection, it is co-incidentally well equipped for administrative purposes and for the travelling public. It is the aim of the organization to bring each ranger district headquarters within reach, by automobile, of the supervisor's headquarters and also within reach of the towns and settlements where a supply of labour is available. The ranger district headquarters form the hub around which fire-protection plans for that district should revolve

and they are also the centre of administrative activities. On the Crownsnest, Bow River, Cypress Hills, and Cooking Lake reserves, it is now possible to reach each of the ranger district headquarters by motor-car. On reserves farther north, however, the settlements are for the most part considerably removed from the forest boundaries and development of this kind is not so simple. After rendering the headquarters accessible from outside, it is most important that each ranger district should be provided with a system of trails which will provide for reasonably rapid travel within the district, by saddle-horses and pack-horses. Finally, it is necessary that the rangers of a reserve should have such facilities as will permit of very rapidly communicating with each other and with the supervisor of the reserve. For this purpose the telephone lines have been and are being constructed. From time to time inquiries are received as to the reasons for proceeding with the construction of telephone lines when the possibilities for development in wireless telephony and telegraphy are so great. So far as the latter have been developed at the present time, however, there are several features in connection with each of them which lead to the conclusion that, unless some remarkable changes take place in essential features, it is entirely doubtful that they will absolutely supplant wire telephone lines. It is recognized of course, that there will be use for both forms of wireless in forest fire protection and it is probable that we shall depend to a certain extent on this form of rapid communication. Wireless development to date, however, has not been such that we could afford to let time pass without also providing more wire telephone facilities.

In the past seven years considerably over two thousands miles of roads and trails and over four hundred miles of telephone lines have been constructed. When it is stated that the mileage of trails must be increased by at least 50, 75 or 100 per cent, and that the mileage of telephone lines must be tripled, or perhaps quadrupled, it will be appreciated that much important work requires to be done before the reserves of the district can be considered as properly equipped with rapid communication facilities. Most of the work, so far as actual mileage is concerned, must take place on the northern reserves, while on the southern reserves facilities already provided require to be brought to a higher standard and some new work undertaken.

FIRE PROTECTION

The organization entered upon the fire season of 1918 under the most unfavourable conditions possible. Each successive year of war had brought about reductions in staff and changes in personnel, until, by the season of 1918, some reserves presented almost an entirely new line-up of forest officers. The operations of fire protection are divided under three main heads, *prevention*, *detection* and *control*—and the most successful forest fire organization is that which realizes the significance of each of these three factors and takes all possible steps and develops every possible means to bring each as near as possible to a state of perfection. It is true that in a great many cases these three factors are inextricably bound up together, and frequently we may depend on one staff, or even one man to exercise all three functions. The clearer the distinction which is drawn between them, however, and the more thought and energy devoted to solution of the problems of each, whether by a staff or by one man only, the nearer may one expect to come to a solution of the whole fire problem. Conditions in 1918 operated materially against all three factors. With so much unrest in labour conditions, particularly in mining communities, foreigners took advantage of off-days, fishing and picnicking in the woods; in the rush of war production branch railways carried a much larger traffic in freight, thereby increasing the hazard; in the clearing of land, and lacking a sufficient supply of labour, people resorted to the use of fire without the necessary precautions; in the absence of sporting events large numbers of people, who previously had seldom repaired to the woods, took recreation in the forest reserves.

All these things increased the actual fire-hazard, and under ordinary conditions of personnel would have demanded much greater attention to the function of *prevention*. That we finished the season as successfully as we did may reasonably be taken as an

indication that the fire-preventive propaganda undertaken for the past few years has at least left its mark in the public mind. The function of *detection* is largely dependent for success on a fully-manned staff, with each individual thoroughly familiar with the territory under his control, and having a thorough knowledge of existing fire-hazards. Scarcity of men, and lack of familiarity with the country by a large number of those actually on the staff, operated against *detection*. Finally the function of *control*, which in itself embraces three distinct phases—preliminary *organization*, *mobilization* and *suppression*—and which is in the final analysis the true test of fire-protective organizations, was the source of very considerable misgivings and worries.

Notwithstanding the difficulties just referred to, the fire season of 1918 was a successful one for this organization. Very fortunately the weather conditions which prevailed on those forest reserves least prepared for emergencies were favourable to fire protection. The Lesser Slave reserve experienced a serious emergency in the spring season due to the entire lack of precipitation till the month of June. The Athabaska and Brazeau forests experienced brief periods of fire-danger, but at no time did conditions become really acute. After the dry spring season passed, the Cooking Lake reserve met with no difficulties. On the Clearwater, Bow River, and Crowsnest forests, however, long dry spells were encountered throughout the season, but fortunately few fires occurred and the situation was well controlled. The total number of fires handled by the forest reserves organization was 43, of which 33 occurred within the boundaries of reserves, and the other 10 on lands adjacent to the reserves where there was considerable possibility of fire spreading to reserve lands. In the Rocky Mountains reserve the total area burned over was limited to some 550 acres. On the Lesser Slave one large fire occurred which, however, was confined to extensive grass lands, burning over a total area of 11,520 acres with little, or no damage to timber. The Cooking Lake reserve experienced similar grass fires the total area burned over being approximately 5,500 acres. Fire statistics for the reserves indicate that railways were responsible for the majority, and that of other known causes campers were the most prolific source of fires. Reports indicate that no fires whatever resulted from lightning. The foregoing figures of course, have no reference to fires, in the fire-ranging districts. The figures clearly indicate that the percentage loss was exceedingly low.

The war over, and some of our more experienced men returning, with the possibility of increased appropriations, and with an improving labour situation, it may reasonably be hoped that the organization will steadily improve. It is almost undoubtedly the case that scientific and mechanical development, brought about by the pressure of war requirements, may offer at least some solutions to the difficult problems of fire protection. That airplanes will play an important part in at least some phases of fire protection I have not the slightest doubt, and it is sincerely hoped that arrangements may be made for airplanes in this district; at the same time they must be considered as adjuncts to, rather than as substitutes for, modern methods of fire protection.

SILVICULTURE

The disposal of timber under competitive sales and permits was maintained on practically the same level as in previous years, and it is not possible to report any material development either in the amount or in the character and administration of sales. No new sales of any account were inaugurated, and operations were conducted under previously existing contracts. The bulk of the timber permit business is still confined to the Cypress Hills, Crowsnest, and Bow River forests. During the course of the year a complete revision of timber permit regulations was effected, largely as a result of representations from forest officers of this district. One essential feature of the new regulations provides for a greatly simplified routine in disposing of fire-killed timber, and already a considerable amount of dead timber has been disposed of, which under previous regulations would probably have passed beyond the stage of utility before it could have been marketed. Previous reports have fully indicated the serious problem which confronts the administration in this district in

securing markets for the fire-killed timber available. It is hoped that with the return of more normal conditions and the stabilizing and further development of the mining industry, it may be possible to dispose of this class of timber in greater quantities. The coming year may also see development in timber sales in the Bow River forest, where to date there has never been a competitive sale inaugurated by this branch.

Shortage of staff generally, and of technical men particularly, prevented any large amount of technical investigative or experimental work. In a small way, however, work of this character was inaugurated on the Cooking Lake reserve. An experimental plot of five acres was surveyed, cleaned up, and fenced and a small beginning made by direct seeding of white spruce and jack pine. Quite satisfactory results were secured with the pine, very few gaps occurring; the spruce sowing, however, was not successful. Small nurseries were established on the Cooking Lakes and Cypress Hills forest reserves to provide material for future plantings, but owing to various causes the results for the first season were disappointing. In addition to nursery and planting work, there are certain areas in the Cypress Hills covered with a very fine natural reproduction of lodgepole pine which call for technical treatment in thinning. Opportunity is ripe for investigative work, also, in some of the dense stands of reproduction in the Rocky Mountain forests.

GRAZING

From the standpoint of grazing the past year has been one of extreme importance and interest. Previous reports have indicated what was, after all, a comparatively limited use of the grazing facilities of the forest reserves. Notwithstanding the fact that large areas of very excellent grazing lay dormant, the greatest number of horses and cattle grazed on all the reserves of this district prior to last season was approximately 10,000 head. It was the natural outcome of these conditions that, when the very serious feed shortage arose in this province in July, 1918, grazing on the forest reserves should come very much more into prominence, and that there should be an exodus of stock to the Rocky Mountains and other forest reserves. The stock industry, indeed, faced a serious crisis. To a very appreciable extent the grazing facilities available on forest reserves had an ameliorative effect, and large bands of stock, which previously had never seen mountain range, entered the forest reserves under our regulated system of grazing. The increase amounted to approximately 150 per cent, and altogether something over 25,000 head of cattle and horses found grazing on the forest reserves of this district. Notwithstanding the serious conditions outside, there was a most favourable growth of forage on the reserves. It might naturally be expected that succeeding and more favourable seasons might bring about a falling off in the use of forest range. Very evidently, however, the stockmen have learned a fact which is of great economic importance to the industry; namely, that the forest reserves, and particularly the Rocky Mountains reserve, can be depended upon to produce annually an immense amount of forage entirely suited to stock grazing.

In addition to the large increase in horses and cattle, there was a notable increase in sheep, over 22,000 head being summer grazed on the reserves, as against 6,000 in the previous year. It is not anticipated that the present season will see an increase in sheep grazing as, owing to extremely careless herding and range management, the sheep-men suffered some considerable losses. A temporary reaction against grazing sheep in the mountains may, therefore, be expected, but by the training of herders capable of working under mountain-grazing conditions, and by more careful attention to the details of proper range management, it may definitely be anticipated that the mountain grazing of sheep will eventually come into its own. More particularly in the Rockies there are large areas of range where the summer grazing of sheep is practicable and where it can be provided for without prejudice to the cattle and horse industries.



Photo 10244

Planting on forest reserves. Four-year-old jack pine in transplant beds, spring, 1916



Planting on forest reserves. The same jack pine plantation as shown in preceding picture three years later, spring, 1919

With the serious limitations being placed on open range grazing, as a result of settlement in the western provinces, the stockman is beginning to appreciate that the old method of grazing stock, year-long on open range, must give way to a more intensive use of lands under his control. He is learning that under the old system it becomes necessary for him to reduce his holdings of stock or run serious chances of seeing the profits of several favourable seasons wiped out in a season of adverse conditions. It is still comparatively easy to find stock-men, who, realizing the necessity for winter-feeding at least in a small way, depend for such winter feed upon the rather scanty growth of wild forage grasses which may be found on lands occupied by or available to them. In numerous cases which have come under observation, men have been known to go considerable distances, and to almost any amount of trouble, to cut a few acres of wild hay, the average yield of which would not be greater than one-half or three-quarters of a ton per acre (and that only once in two or three seasons) when as a matter of fact it would have been quite possible, by the application of little more than an equivalent amount of work to lands occupied by them, to render such lands capable of producing, *annually*, two or three times the weight of forage available on an equal area of the wild lands; and pound for pound the domestic crop would be much cleaner and more nutritious than the wild hay. The proper economic development of the stock industry demands that stock-men generally should realize that year-long open grazing is at best a hazardous undertaking, for hard winters produce emaciated cattle that require almost an entire summer to regain normal condition. Winter-feeding may be expensive, yet, in the increased weight of the animal it produces profits in excess of the cost of such feeding. Also, although grazing land may be held vacant during summer in order to provide winter range, the cattle are as a matter of fact unable to use one-half of the actual grazing value of such land.

The grazing administration inaugurated by the Dominion Forestry Branch results from recognition of the principles briefly and rather inadequately outlined above. It so happens that the forest reserves annually produce a great amount of forage. This forage, if unutilized, operates as a direct fire-hazard, and, if allowed to accumulate from year to year, results in an exceedingly inflammable mat which only requires some careless action on the part of an incautious individual to start a conflagration. While the protection of this hay crop, and allowing it to be cut for winter feed, might be more pleasing to the backward rancher who does not believe in applying himself to the work of growing his own winter feed, it would nevertheless constitute a practice of actually encouraging what is nothing more or less than a fire-hazard on lands which have been set aside for the protection of timber and stream-flow. Furthermore, the proportion of actual hay lands in the reserves is exceedingly small, and as protection of such lands for hay would greatly limit the possibilities of summer grazing, and would thereby reduce the actual amount of forage consumed, it is considered necessary that the forest forage areas should be given over so far as possible to grazing rather than to hay production. Moreover, administration of forage areas on this basis makes possible the regulated grazing of very large amounts of stock for the summer months, and thereby makes it possible for ranchers to reserve and develop their home lands for wintering purposes and for the production of large amounts of winter feed. It is therefore evident that the policy adopted is one which is in the best interests of the stock industry, and also is best suited to proper forest management.

The past year has been a successful one, not only as a result of natural conditions, but to a very considerable extent because the services of a very efficient grazing man were secured. Already numerous pieces of reconnaissance work have been carried out, and plans of range management evolved which were almost un hoped for a year or more ago. One of the most essential steps for successful range management consists in the organization of small stock associations comprised of grazing permittees whose interests are of a community character. In one or two outstanding instances, through co-operation with such associations, plans of management have been prepared, and are being put into effect, which so far as grazing in Canada is concerned will be

unique. The two necessary factors for the proper management of community range are proper methods of salting and the employment of sufficient experienced range-riders; by both means the proper distribution of stock is made possible, and thereby the most thorough, and at the same time conservative use of the range is secured.

Figuring quite conservatively, the forest reserves of this district are quite capable of supporting, for the summer grazing period of from five to seven months, upwards of 100,000 head of cattle and horses, as well as a very large number of sheep. It is true that a considerable part of these grazing resources are at present rather difficult of access, and it cannot be expected that they will be made use of immediately. The figures will indicate, however, that the grazing resources of the forest reserves may well be considered as having an important economic bearing on the development of the stock industry of this province.

SURVEYS

During the past two seasons it has not been possible to carry out any extensive plan of surveys, and work of this character has been confined to a few odd road surveys and the delineation of administrative sites, performed by the regular officers of the staff. Through co-operation of the Surveyor General's office, however, Mr. Bridgeland, D.L.S., continued his photo-topographic and traverse survey work, with the result that very considerable data has been secured and maps are under preparation covering part of the northern Bow River forest, more particularly in the basin of the Red Deer river.

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 Wabiscaw 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 forty fire rangers. Fire statistics for the Edmonton district are not quite complete but reports for the 1918 season to and including the month of September indicate that 141 fires occurred, only 10 of which burned over an area greater than ten acres or did damage to timber. The total area covered by these fires was approximately 5,440 acres. These figures must not be taken to indicate either the total number of fires nor the total fire damage which occurred within the boundaries of the Edmonton fire ranging district. This branch is responsible only for the protection of timber and, owing to the limited staff at our disposal, no attention is given to fires which occur in the more settled farming districts except those which threaten more or less directly the safety of timber resources. In parts of the Peace River district, as well as in other parts, numerous prairie fires occur which result in 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-protection organization on the very extensive lines which it is now necessary for us 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 the Forest Reserve Regulations which will permit of proper administration and development.

A favourable season was encountered in the McMurray-Slave district and no serious fires occurred. During the season the steamer *Rey* developed serious defects as a result of which it was necessary to discontinue patrol with that boat. The *Rey* has pretty well served her time and it is doubtful that she can again be operated successfully. It is altogether probable that her place will temporarily be filled by a motor-canoe patrol. The amalgamation of the two districts, McMurray and Slave, under one administration has resulted in greater efficiency of operation and proportional reduction of expense. 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. It is hoped that the very existence of some organization at work will have at least some effect in preventing serious fires until such a time as a more intensive and better-equipped organization can be provided.

APPENDIX No. 5

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR
BRITISH COLUMBIA

D. ROY CAMERON

This report covers the fiscal year 1918-19 ended March 31, 1919.

The British Columbia, inspection district embraces the Dominion forest reserves in British Columbia, and the Coast, Salmon Arm, and Revelstoke fire-ranging districts.

The fire season of 1918 showed markedly abnormal characteristics so far as occurrence of hazards is concerned. The spring opened hot and dry the last week in April, giving rise to a pronounced danger period, culminating about May 10. Of the total number of fires 24 per cent occurred at this time. The latter half of May was cool and cloudy with considerable precipitation, partly snow on the higher elevations. This weather continued well on into June. It was followed by another hot, dry spell in July during which the peak of the danger season was reached. August was most unusually cool and wet, only one-third the average number of fires occurring. About September 1 another distinctly dry and hazardous period ensued which lasted until nearly the end of the month and resulted in a renewed outbreak of fires especially in the Coast district. Although precipitation in October was under normal, the temperature remained low and the weather cloudy, so that the fire season practically finished by the end of the first week.

The total number of fires reported from all sources as occurring in the Railway Belt was 285, an increase of 1 over 1917. The proportion of large fires, i.e., fires burning more than ten acres, decreased from 34.8 to 31 per cent, and the proportion of fires of unknown origin also decreased from 30.3 to 24.5 per cent. These figures are an indication of a renewed trend to better control of the situation, which had slackened somewhat during the preceding two or three years.

Reviewing the causes of fires of known origin we find that carelessness of campers again heads the list with 15.4 per cent as against 14.2 in 1917. This comparatively slight increase is, on the whole, not discouraging, because there has been a steady, though slow, tendency to a reduction in the percentage of fires from this cause during the last four years. The marked decrease in incendiary fires from 7 per cent to 3 per cent is a gratifying feature of the 1918 records. Lightning fires jumped from sixth place in 1917, with 5.1 per cent, to third place in 1918, with nearly 10 per cent. The percentage of fires from this cause is a fair index of the comparative intensity of the fire-hazard as between seasons, for the reason that hot dry spells are generally broken by severe lightning storms with consequent outbreaks of fires from that cause.

The 285 fires noted above burned over 26,320 acres, destroyed or damaged fifty-five million feet of timber and 4,100 acres of young growth. These figures show a great increase over 1917, but when it is remembered that one fire, fanned by a gale, crossing the international boundary near Cultus lake on a three-mile front was responsible for over 50 per cent of the total loss, the season on the whole may be considered as satisfactory.

RESERVATIONS

Mention has been made in previous reports of the urgency of setting aside additional areas, especially in the "dry belt," as permanent forest reserves. The sudden, successful termination of the war has in Canada brought up the problems of reconstruction in an unexpected manner. The most urgent question resulting from the stoppage of war industries and the return of our troops from overseas is a solution of the labour problem during the preliminary period of readjustment. The Kamloops district has sent overseas a proportionally large percentage of men, who are returning

daily and require positions. The present time is most opportune for proceeding with the development of forest administration by establishing further forest reserve areas for the reason that such action will help substantially in providing life occupation or temporary employment for a large number of returned soldiers.

That forestry is a favoured pursuit in the mind of the returned men is evidenced by the demand for vocational training which has necessitated the establishment of a forest ranger school by the Department of Soldiers' Civil Re-establishment in Vancouver. A considerable number of returned soldiers will be available this spring with special training which will be of great value in our administration.

Administrative reasons for creating further reserves have been quoted in previous reports. The demands of reconstruction give to them an added importance. To recapitulate briefly they are as follows: The forests in the Railway Belt, owing to their comparative accessibility to transportation facilities, will be the first to be drawn upon in the inevitable industrial development in the lumber industry, and they are therefore a very valuable tangible asset. Adequate protection cannot be provided under a temporary fire-rangng organization, because it is not expedient to expend money for the provision of an improvement plant to give proper protection—which must be considered as disbursements chargeable to capital account—on lands the status of which is not clearly defined on the basis of permanent retention in the Crown. Finally, most of the timber in the Railway Belt not at present under reserve will have to be handled in small operations which the Forest Reserve Regulations in regard to timber are designed to facilitate. These differ from the timber-berth policy in that the Government assumes the carrying charge, thus enabling small operators to enter with a minimum capital outlay. The Government assumes the carrying charges because with adequate protection the fire-risk is greatly reduced, and the supervision of logging in a systematic manner under the regulations prevents the accumulation of slash and the consequently increased fire-hazard.

SEED COLLECTION

Collection of seed of forest trees was undertaken on a much more extensive scale than formerly. Operations in connection therewith were handled from the inspector's office with field men specially detailed from the reserves and fire-rangng staffs. The seed was collected for shipment to Great Britain and included Douglas fir, Sitka spruce, and some small lots of other species, the total amounting when cleaned for shipment to just about five hundred pounds.

FOREST RESERVE ADMINISTRATION

As stated in last year's report the supervision of administration in the forest reserves in this district devolved on the inspector during the greater part of the fiscal year. The development of work on the reserves makes urgent the appointment of a forest assistant for technical investigations. At present the pressure of routine administrative work prohibits any attention being paid to the scientific aspects of forestry in this district.

FIRE PROTECTION

Nineteen fires were reported as occurring on forest reserves during 1918. As happened last year the majority of these fires occurred during or after the opening of the hunting season in September. Unfortunately an abnormally intense fire-danger aggravated conditions during this time. A great deal of educational work is still to be done in this respect, townspeople out for a day or two in the woods being probably the worst offenders.

The three lookout stations on the reserves were of the greatest assistance. Returned soldiers were used in these lookouts and the result again proves that a few men, suitably chosen, even when suffering from some physical disability, can by

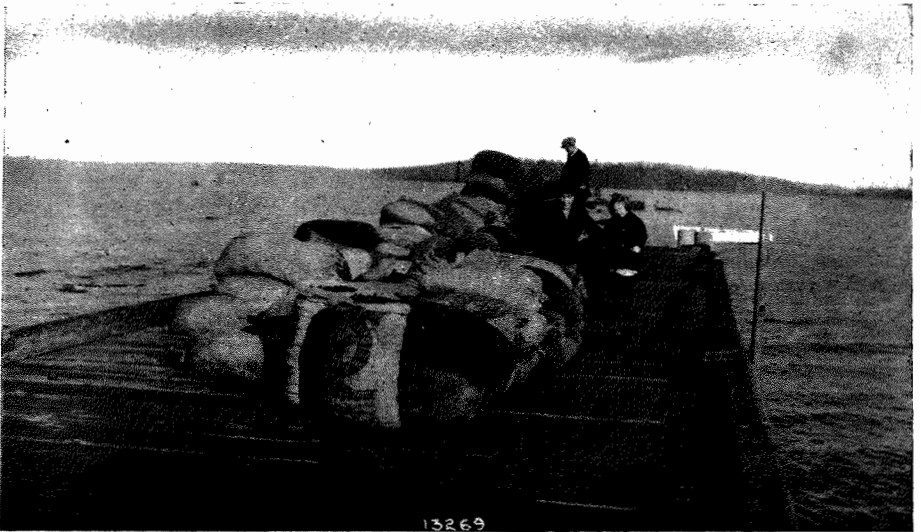
this system locate and report fires with less loss of time than a much larger force on patrol. An extension of the lookout system is planned during the coming year to bring under observation additional areas.

The forest rangers were assisted by four temporary forest guards whose time was spent largely in fire-patrol work. An extreme scarcity of labour threw the responsibility of controlling outbreaks of fires on the unaided efforts of the rangers and guards to a very considerable extent.

IMPROVEMENTS

Owing to war conditions improvement work was largely restricted to upkeep of the existing plant. Two headquarters stables and one ranger cabin were constructed, and two ranger headquarters houses and eight cabins were completed during the year.

Two new telephone lines were constructed; one six miles long, to connect Paul Lake cabin with Lolo Mountain lookout, and the other, twelve miles long, to connect Pillar Lake cabin with the Fly Hills headquarters on Upper Charcoal creek. Five



Tree seed collection. The Forestry Branch has been collecting seed for reforestation work in Great Britain. The picture shows a portion of the season's collection of six hundred sacks of Sitka spruce cones on the wharf at Port Clements, Queen Charlotte Islands, British Columbia

miles of line were also strung on the Government Telegraph Service poles from Heffley lake to the Louis Creek ranger station to connect the latter headquarters with Lolo mountain.

Under the heading "Trails and Other Improvements" the principal expenditures were in connection with clearing and fencing pastures at headquarters and cabins. The only trail work outside of maintenance was the completion of the trail over the Harrogate pass in the Yoho reserve. A short stretch of road was constructed to connect the Cache Creek headquarters with the Pass Valley wagon road.

SURVEYS

As was the case last year no survey work was undertaken other than small projects required in connection with routine administration, all of which were performed by the regular staff.

SILVICULTURE

Only one timber sale application was received, being a request for cedar piling on the Larch Hills reserve. This sale was put through but owing to labour shortage operations have not commenced to date.

Timber permits are increasing steadily each year though the aggregate amount is still small as compared to other provinces. The reason for this lies in the large number of homesteaders having timber on their own lands. It is only when such timber is used up that applications are made for the more inaccessible material in the forest reserves. Inspection of permit operations was again restricted to the ranger staff owing to absence of any supervising staff on the reserves.

GRAZING

The grazing regulations remained a dead letter so far as this district was concerned. The inauguration of regulation of range on provincial lands will be effected during the season of 1919 and from present indications it should be possible to enforce the reserve regulations starting in 1920, if arrangements now in view to obtain a competent man to conduct a grazing reconnaissance this summer can be perfected.

USES

Trout lake and Paul lake continue to be used to an increasing degree as refuges from the summer heat of the lower elevations, and the intimate contact with the reserves administration afforded serves to acquaint the public at large with the policy and results of our work. The fishing in both lakes was above the average last year and anglers journeyed from all parts of the country to try their skill. The development of recreational use of the forest reserves is a most important means to secure public sympathy and support for forest protection.

RETURNED SOLDIERS RANGER SCHOOL

The short course in forestry mentioned in my last report was supplemented this last fall and winter by a full five months' course of instruction given at the University of British Columbia by the Department of Soldiers' Civil Re-establishment. A trained forester secured from the United States Forest Service handled the forestry subjects and a qualified Dominion and British Columbia land surveyor gave thorough instructions in surveying and drafting. Six of the men taken on by this service last spring took the more extended course and, with the training and field experience they now have, will be exceptionally valuable in the future.

EQUIPMENT

Outside of replacements to offset articles worn out the only additions made to fire-fighting equipment were two portable gasoline pumps. These have not yet been tested to any extent under actual field conditions but should prove of marked value not only in fire-fighting but as an aid in burning logging slash. Their use will enable burning to be done in drier seasons when better results in the removal of débris can be secured without the old danger of fire getting away.

PUBLICITY

A great step in the direction of giving publicity to our work was taken in the filming of a picture now issued under the title of "The Enemy of the Forest". This project was undertaken with the co-operation of the Publicity Bureau of the Depart-

ment of Trade and Commerce. It shows very graphically the danger of carelessness with fire as well as the organized protection system for coping with the emergencies resulting therefrom. The film has been shown in several towns in British Columbia and its value is indicated by the requests received from moving picture operators for permission to run it.

RAILWAY FIRE-RANGING

Co-operative work under Order 107 of the Board of Railway Commissioners was handled as formerly. Not much improvement in general right-of-way conditions over 1917 can be mentioned, dearth of labour and economy due to war conditions being the cause. Patrol requirements were, however, carried out by the railways concerned in a uniformly satisfactory manner. Of the fires occurring on or adjacent to railways 35 per cent were reported as due to sparks from coal-burning locomotives, and 38 per cent to causes unknown. Inasmuch as there is a strong probability that a majority of the unknown fires were caused by sparks from coal-burning engines it may safely be stated that over 50 per cent of the fires resulting from the operation of railways in this district may be attributed to that cause. This is a strong argument for the use of oil as fuel in timbered districts.

APPENDIX No. 6

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

R. W. STEARNS

This report covers the fiscal year 1918-19, ended March 31, 1919.

Notwithstanding the handicap of inadequate accommodation and greatly depleted staff, much has been accomplished. Following is a brief review of the activities of the various branches of the laboratories during the year:—

LIBRARY

The library has grown steadily, between two and three hundred standard works of reference having been added during the year in addition to progress reports on investigative work and memoranda on specific subjects compiled by members of the staff. The more important trade journals of all the wood-using industries were received and indexed regularly.

The appointment of a technical assistant for work in connection with the library has been recommended, but as yet, has not been approved.

EXHIBITS

Sets of hand specimens of Canadian woods which were in course of preparation at the beginning of the year were added to so as to include in all sixty-nine species. These are now reasonably complete and will be distributed shortly to the various forestry schools and institutions for which they were intended. One hundred smaller sets of twenty species each have also been prepared and boxed ready for distribution to Canadian manual training and technical schools.

An exhibit of wood products was prepared and installed at the Canadian Pacific Railway, Windsor Station, Montreal, as part of an exhibit of Canadian natural resources. This has attracted considerable attention from the public and has given rise to many inquiries.

A large exhibit sent by the Forestry Branch to Lyons, France, for the Fair held there in March, 1919, was largely prepared at the laboratories, a number of firms very generously co-operating in supplying materials and manufactured products.

A number of instructive new displays illustrative of defects in wood, the normal characteristics of wood, special uses for wood, miscellaneous products from trees, and other similar subjects, have been added to the permanent exhibit at the laboratories. Most of these exhibits were prepared during the year. Maps and diagrams have been prepared to illustrate processes of manufacture and the geographical distribution of certain industries. The exhibits room has been visited by persons interested in the promotion of industries and by students of technology and economics, and is now sufficiently well furnished to justify greater publicity than it has been given heretofore.

TIMBER PHYSICS

Progress in the regular investigative projects undertaken by this division is reported below in a discussion of these projects under the headings: "Durability of Wood," "Fibre Measurements," and "Wood Sections."

Considerable miscellaneous work was also carried out by this division during the year, including analysis and examination of samples of pulp and paper, of foreign woods, and of samples of Sitka spruce.

TIMBER TESTS

In co-operation with the Imperial Ministry of Munitions and the University of British Columbia a branch laboratory was organized in Vancouver, B.C. This laboratory had as its primary object the investigation of airplane timbers in connection with the war-time inspection work of the Ministry of Munitions. The war, however, came to an end before the laboratory was ready for operation, and the Ministry of Munitions withdrew from the arrangement, with the termination of its inspection work in British Columbia. The laboratory is being continued as a branch of the Forest Products Laboratories of Canada in co-operation with the University of British Columbia and is now engaged on a series of tests of Sitka spruce in accordance with the standard method for the testing of small clear specimens.

The main work of this division is dealt with under "Testing Clear Specimens" and "Nova Scotia Mine Timbers" in a discussion of investigative projects below.

Miscellaneous work conducted by this division during the year included a series of 130 tests on woods from British Guiana suggested as possible substitutes for black walnut for gun-stocks. This investigation was made at the request of the Militia Department officers at the Quebec arsenal. A report on these tests was sent to the Government of the Colony of British Guiana and evoked from them an inquiry as to the possibility of having similar tests made on other timbers of the colony.

PULP AND PAPER

The main work of this division is discussed under "Waste Sulphite Liquor", "Chemistry of Wood", and "Australian Pulpwood" in the list of investigative projects below.

Miscellaneous divisional work included analyses of paper samples; examination of a Mexican wood for pulp possibilities; experimental sulphite cooks in connection with waste sulphite liquor; and co-operation with a local firm in beating tests of a special pulp with a stone roll.

WOOD PRESERVATION

The bulk of the work undertaken by this division was in connection with two important investigative projects which are discussed below under the headings "Railway Cross-ties" and "Paving Blocks."

In addition, however, considerable miscellaneous work was done on seasoning tests of railway cross-ties under commercial conditions and on studies of the preservative treatment of wooden articles for specific uses.

MISCELLANEOUS WORK

During the year special studies of available information on a variety of topics were made by members of the staff, in connection with inquiries.

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

INVESTIGATIVE PROJECTS

1 *Testing Clear Specimens.*—It is the purpose of this investigation to provide complete data regarding the mechanical and physical properties of all Canadian woods. Forestry Branch Bulletin 60, "Canadian Douglas Fir: Its Mechanical and Physical Properties" published early in the year gives the results of tests on Canada's

most important structural timber, together with an illustrated description of the methods followed in making the tests. Similar results are available in unprinted form for black, "grey", and white spruce, and for red pine and white pine. During the year a series of tests on air-dried material of the last named five species were completed.

2 *Nova Scotia Mine Timbers.*—This investigation, undertaken to determine the relative strengths of the various timbers used in the coal mining region of Nova Scotia for pit-props, or possibly suitable for such use, was completed as far as actual testing work is concerned just before the beginning of the fiscal year, some 800 tests on full-sized mine timbers having been made. As a practical result of the work done on this project, jack pine, previously considered unfit for pit timber, has been successfully employed for this purpose by at least one of the large mining companies of the province, considerable stands of what had been considered a "weed tree" being thus made available for use.

3 *Waste Sulphite Liquor.*—A comprehensive review of the literature of the world on the subject of waste sulphite liquor and its utilization, prepared last year, has been published and distributed as Forestry Branch Bulletin 66 "Utilization of Waste Sulphite Liquor." This should prove a most valuable book of reference to pulp and paper manufacturers and all interested in the elimination of waste in this important industry.

4. *Beating of Pulp.*—Manuscript has been prepared for a memorandum on the beating of paper pulp which it is hoped to publish as a Forestry Branch bulletin. In this will be given the results of experiments made some time since at the laboratories on the technique of beating.

5 *Railway Ties.*—Forestry Branch Bulletin 67, "Creosote Treatment of Jack Pine and Eastern Hemlock for Cross-ties," prepared and published in the course of the year gives the results of experiments made at the laboratories on these two important Canadian tie woods. The experiments showed that jack pine could be treated by any of a number of common commercial processes but that a satisfactory penetration could not be secured in the more refractory hemlock by any processes at present in commercial use. A method was, however, worked out which made it possible to treat hemlock quite satisfactorily after incising by a simple mechanical method developed in the laboratory. Seasoning studies on hemlock and jack pine ties, under commercial conditions are being made to supplement the laboratory work.

6 *Chemistry of Wood.*—A study of the resin content of the five most commonly used Canadian pulpwoods has been partially completed. This work is being conducted in such a way as to determine not only the normal resin content of the freshly felled wood but also the effect upon the resin content of the "river driving" and exposure in storage through which commercial pulpwood commonly passes.

Systematic analyses of trees of each of these same five species as regards cellulose and lignin content, and proportion of water-soluble, and furfural-yielding constituents are also being made. The results of this investigation when completed should be of the greatest value to the pulp and paper industry, from the point of view of utilization, and also of conservation and reforestation, as showing which species are the best producers of pulp-making materials.

7 *Paving Blocks.*—A study of the suitability of Canadian red pine as a material for creosoted wood block pavement has been begun. Blocks manufactured at the laboratories for the purpose from selected logs were treated with three different creosote oils recommended as standard for this purpose by the American Wood Preservers' Association, and test areas of pavement have been laid in the yard precisely as they would be in commercial practice. These areas are being kept under observation for "bleeding", and measurements to determine the amount of swelling which occurs

are being made regularly. Laboratory tests on blocks similarly treated are also being made. So far the results of the tests have been quite favourable to red pine as a material for this purpose.

8 *Durability of Wood*.—Fungus-bed tests in which specimens of various species of woods were exposed for a period of sixteen months in soil containing mycelia of a number of dangerous wood-destroying fungi, were continued during the year. Further experiments will be necessary before definite conclusions can be arrived at.

This experimental work has been supplemented by extensive studies of cases of "dry rot" in mill and factory buildings, much valuable information being obtained in this way.

9 *Fibre Measurements*.—Studies of the fibre dimensions of various Canadian woods have been interrupted by the resignation of the microscopist in charge of this investigation. All work outstanding has, however, since been completed and the data so far accumulated in the course of the investigation is being prepared for publication.

10 *Wood Sections*.—The preparation of a complete reference collection of microscopic slides of all Canadian woods of commercial importance, with photomicrographs to correspond, has been begun. Such a collection will be very valuable as a basis for comparative studies of anatomy, and as an aid in identification.

11 *Australian Pulpwood*.—At the request of the Government of Australia, an examination of a species of eucalyptus (*Eucalyptus rubida*) with regard to its suitability for use in the manufacture of paper pulp, has been undertaken.

TECHNICAL ARTICLES AND ADDRESSES

During the year the members of the staff prepared articles on subjects directly connected with the work of the laboratories and these articles were published in technical journals, chiefly Canadian. Members also gave addresses before scientific and technical societies.

PUBLICITY AND CO-OPERATION

Between two and three hundred visitors called at the laboratories during the year to see the institution and learn of the work which it is doing, or to inquire for specific information. Among these, technical students and those interested in the pulp and paper and other wood-using industries were most numerous. In this connection our exhibit room is proving increasingly useful.

The General Advisory Committee of the laboratories, which has rendered valuable assistance, held one meeting during the year at which the general status and work of the institution was gone into.

The Special Advisory Committee to the Division of Pulp and Paper from the Technical Section of the Canadian Pulp and Paper Association was able to get together for a meeting only once during the year. The committee was, however, very active by correspondence, and by individual work and informal meetings between certain of its members from time to time.

INFORMATION FURNISHED

Preparing replies to technical inquiries received from time to time from the public occupies no small portion of the time of the chiefs of the various divisions. Two hundred and twenty-five special reports of this kind were prepared during the year. It is an encouraging indication of the growing usefulness of the laboratories and of greater popular appreciation of the value of the institution that the number of inquiries received increased steadily through the year. There were 12 per cent more inquiries this year than last, notwithstanding a much decreased technical staff.

The war being now concluded, it is to be hoped that the reorganization of the Forest Products Laboratories can be undertaken, and that the institution will be placed upon a satisfactory basis of operation. A point which should be emphasized is the fact that the operation of a laboratory of this kind is many times more efficient if carried out on a fairly large scale. As at present constituted the facilities available are altogether inadequate in proportion to the importance of the industry served, and even in comparison with the research activities of other Canadian industries at the present time. The work of the United States Forest Products Laboratory is a very practical example of what can be accomplished in this field, and the fact that this institution by its work, during the period of the war alone, saved its Government amounts many times the cost of its operation, should leave no doubt of the value of investigative work in forest products if conducted on an adequate scale.