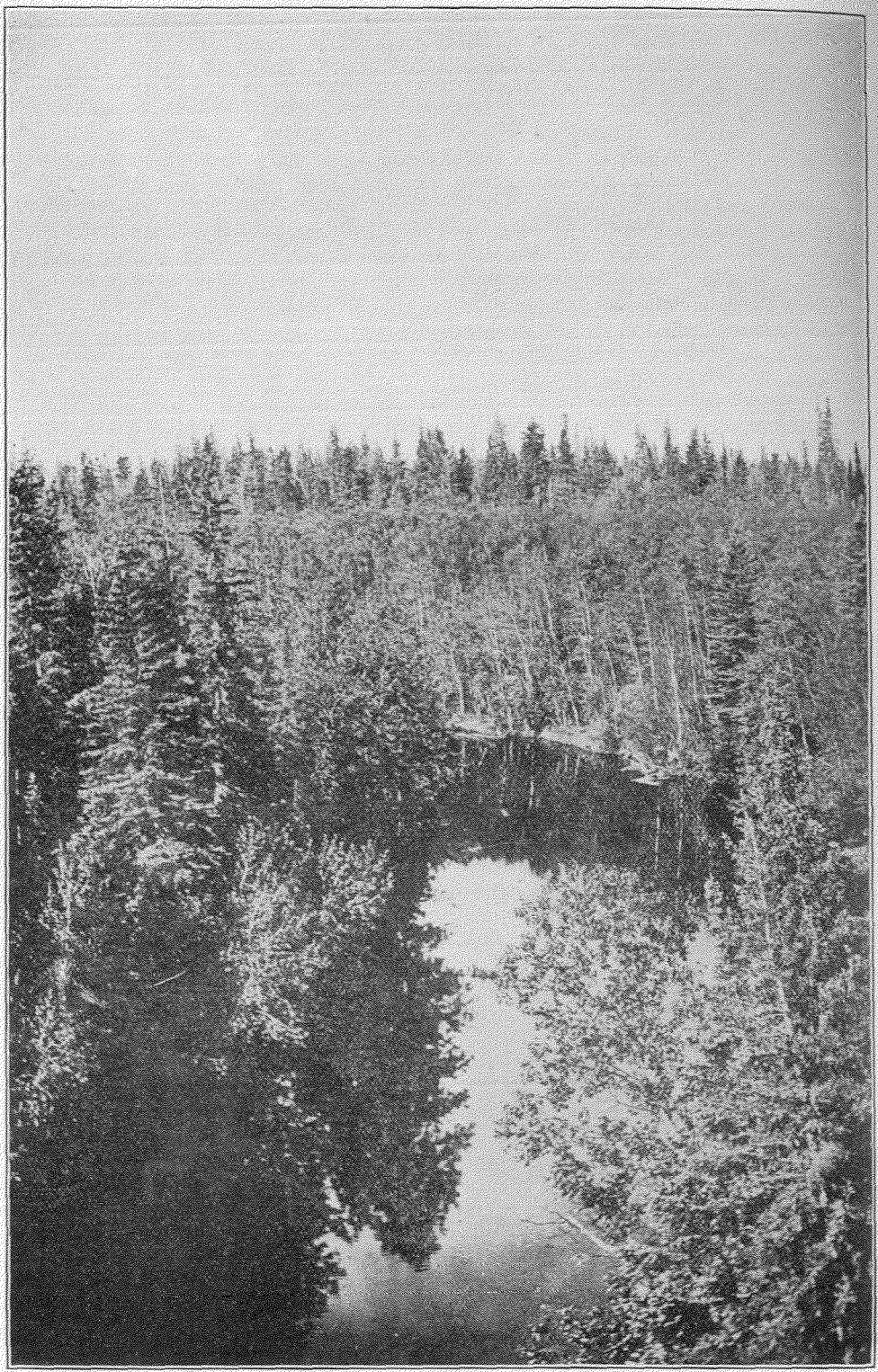

Forest Growth on Montagao River, Manitoba.

Photo by D. Greig.

DEPARTMENT OF THE INTERIOR, CANADA

HON. W. J. ROCHE, Minister; W. W. CORY, Deputy Minister

R. H. CAMPBELL, Director of Forestry.

REPORT

OF THE

DIRECTOR OF FORESTRY

FOR THE YEAR 1914

(PART VI, ANNUAL REPORT, DEPARTMENT OF THE INTERIOR, 1914.)

OTTAWA
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REPORT OF THE DIRECTOR OF FORESTRY.

OTTAWA, May 23, 1914.

W. W. CORY, Esq., C.M.G.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the report of the work of the Forestry Branch for the year 1913-14, to which are attached the reports of the officers in charge of the various subdivisions.

As far as control of the fire situation is concerned, the past year has been a very satisfactory one. The proportion of the area of the forest reserves burned over was only two one-hundredths of one per cent, and of the area outside of forest reserves nine one-hundredths of one per cent. While this is largely due to the favourable season, the good result is also due to a considerable extent to the increase in numbers and efficiency of the staff of rangers, to the increased facilities for preventing fire in the forest reserves, due to the improvements such as roads, trails, telephone lines, and lookout stations (which make access to the reserve easier and enable the rangers to reach fires quickly), to the education of the public as to the danger of fire, and to the enforcement of the special provisions of the Railway Act relating to railways. The organization of the work has been more thorough and on the whole, with some exceptions, the personnel of the ranger staff has advanced both in qualification and efficiency. If it were arranged that appointments were made on special qualifications for the work required and that appointments were to be permanent during good behaviour and efficiency, a decided forward step would be taken which should ensure the placing of the staff on a permanent basis of efficiency.

A decided advance has been made in the question of brush disposal after lumbering operations, and it is to be regretted that this branch has not been authorized to take up the matter as it relates to the timber berths held under license in the forest reserves. The photographs which accompany this report will show some of the methods of brush disposal.

The argument has sometimes been made that the holding of land for forest purposes is an obstacle to settlement and a check to the development of the country. That a country, especially a northern country, can reach its best development in population by the assistance of the forests is well illustrated by the following extract from a statement made by Mr. G. P. Gordon, B.Sc., Professor of Forestry, Glasgow Agricultural College, as a member of a deputation to theBritish Government:—

> " The contrast between one of our highland glens and a glen in the highlands of Europe is very marked indeed. We have in our typical highland glen a stretch, generally of indifferent pasture, with perhaps a dozen shepherds' cottages scattered along it. A similar continental glen supports a vigorous population of small holders. We find that it is the forest which maintains this population. It is thus not due to any greater advantage, either of soil or of climate. I make that statement with detailed agricultural knowledge of the conditions in both countries—Germany and Scotland. The forest effects this by the employment which it affords. The nature of forest employment is specially well adapted to keep people on the land. First of all, it is permanent

both in time and in place. The people, then, within its sphere of influence have security of employment and do not require to migrate. Secondly, the nature of the employment is very varied. You have people employed as wood-cutters, as saw-millers, as road-makers. You have them also employed in various forest industries. You see, then, that this gives great scope for the people of a district. Thirdly, in winter, when other employment on the land is scarce, the forest demands a larger supply of labour, and this labour is highly paid. For example, a typical wood-cutter in Germany earns 4 shillings a day during five or six months of the winter. The following is a concrete example: a forest of 10,000 acres, with 3,000 acres occupied by small holders attached. Such an area in the highlands of Scotland would support at the most about 300. This area in question actually supports a population of 1,500 in Germany. In 1907, 81 per cent of the persons employed in forestry were small holders. We see, then, that forestry forms the backbone of an economic system of small holdings.

"In this connection one should not lose sight of the fact that in forestry it is large areas which are truly economic, and this, I may say, is clearly demonstrated upon the continent of Europe. The objection to small areas is that they do not give the same amount of employment, nor give the same permanency. They do not provide the same amount of timber, and the management of small areas is much more difficult and more costly.

"These few observations would seem to show that in any economic system of land holdings, especially when dealing with poor land, the forest is of prime importance."

While in some of the tracts recommended to be set apart as forest reserves there may be lands that will eventually be suitable for agricultural purposes, such lands are isolated and of poor quality, and it is certainly good public policy to direct settlement to more favourable districts until the development of lumbering operations and the facilities for communication which will be provided as means of protection and handling the products of the forest will make successful settlement a greater certainty and will provide for it under conditions that will not endanger the forest.

The forest products laboratories established at Montreal in connection with McGill University have charge of all experimental work in the use of forest products, the finding of new uses for Canadian timbers, the improvement of methods of use and the lengthening of the time of use. The laboratories were established with Mr. A. G. McIntyre, B.A., B.Sc., as superintendent. Mr. McIntyre was editor of the "Pulp and Paper Magazine" and secretary of the Canadian Pulp and Paper Association, and from this and his engineering training and experience was specially qualified for starting the work. Owing to Mr. McIntyre having received an offer of a much more remunerative position from a commercial firm, he has resigned, and the position has been accepted by Mr. J. S. Bates, Chem. E., Ph. D., a graduate of Columbia University, who has been engaged specially in staff investigations relating to pulp and paper.

STAFF.

During the year, nine foresters having technical training were added to the staff and there were four resignations. At the present time there are on the staff twenty-four graduates of forest schools, and the total permanent staff is as follows:—

Head office at Ottawa	35
Inspectors	5
Forest supervisors	8
Forest assistants	13
Forest rangers	56
Inspectors of tree planting	10
Outside clerical staff	24
Forest products laboratories (technical staff)	8
Total	159

This staff is assisted during the summer by a considerable additional number of temporary rangers.

In January the head office of the Forestry Branch was moved into the Journal building, and the increased accommodation provided makes efficient work more possible.

APPROPRIATION.

The appropriation for the year 1913-14 was $556,713.30, and the refunds by timber-limit holders of their proportion of the fire-fighting expenditure brought the total amount available for expenditure to $571,798.28. The expenditure was divided as follows among the various services:—

Salaries at Ottawa	$12,183 81
Travelling expenses	1,545 40
Printing and stationery	24,047 86
Head office—Miscellaneous expenses	5,549 04
Forest surveys	22,149 89
Forest reserves	265,984 47
Fire ranging	178,134 25
Tree planting	47,181 70
Statistics	5,829 78
Forest products laboratories	9,192 08
Total	$571,798 28

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

Manitoba	$ 94,285 86
Saskatchewan	82,260 64
Alberta	175,425 95
British Columbia (railway belt)	108,305 86
	$460,278 31

ACCOUNTS.

The accounting methods have been more thoroughly systematized and have been developed to meet the present needs of the organization.

The ordinary departmental requirements in regard to accounts are sufficient to check whether expenditures have actually been made, but they do not furnish sufficient information to check or make comparison of costs. Special attention has been given to this matter, and a system of accounts and reports has been worked out which, when thoroughly understood and put into practice, will, it is hoped, ensure that expenditure is made so as to accomplish the work required efficiently and economically.

The accounting for revenues is not in as satisfactory a position. The necessity for reporting revenue through the Dominion Land offices makes a roundabout system which causes delay and confusion at times, as the agents do not always have the time to give the same consideration to this business as to the land-office business, and have little opportunity to get into the field and familiarize themselves with the outside work. While a careful and thorough system of accounting for revenue is necessary, the fact should not be lost sight of that the forests should be administered not only with a view to revenue, but with a view to the upbuilding of the districts in which they are situated and the convenience of the public, and that for that purpose the more directly and speedily the resources of the forest which should be used can be made available for this purpose the better. The system of accounting for revenue should be framed with this object in view as well as the other, and should be as simple and direct as possible. Any unnecessary number of offices through which the revenues have to pass will tend to hinder such a desirable result.

CORRESPONDENCE.

The letters received and sent out gy this Branch were as follows:—Number of letters received, 28,951. Mail sent out: letters, circulars, etc, 67,887; bulletins and reports, 28,123; parcels, 2,315. Total, 98,325.

THE LIBRARY,

The rapid and substantial development of the special library idea throughout Canada and the United States has abundantly justified the establishment and enlargement of the library of the branch. Not only are similar libraries found in various Government offices, but many large private firms and associations occupying leading positions in the financial, insurance, and industrial world are instituting collections of the literature specially pertaining to their fields of activity.

In the field of forestry, on account of its rapid development on this continent and the fact that there are in the country so few large private or academic collections of the literature of the subject, it is particularly important for future students that the literature of the subject, much of which has appeared and is appearing in pamphlet and magazine form and must be promptly secured, should be collected in some central place and fully classified and indexed, and so made readily accessible. Not only will the administrative and investigative work of the branch be benefited thereby, but a work of much importance to students and workers in forestry in general will be done.

During the past year 108 volumes were added to the library by purchase, and about the usual number of volumes of magazines and pamphlets were bound.

This year seventy-one magazines are being received in the library. The list of magazines received on subscription is somewhat smaller than last year, several magazines having been dropped from the list as they did not seem to contain sufficient material of value to our work to warrant their continuance. A few new subscriptions were entered in place of those dropped. Twenty magazines are received either free or in exchange for the publications of the branch.

The greatest step forward in connection with the library during the year has been the institution of two branch libraries. One of these is connected with the office of the District Inspector of Forest Reserves at Calgary, and the other is connected with the Forest Products Laboratories at Montreal. The library at Calgary is specially strong in books and pamphlets dealing with the actual work of reserve administration, while the work of the laboratories, being of a very technical character, requires a fairly extensive library to meet its needs. Both these libraries are in some respects under the supervision of the head-office library, but latitude is allowed for the development necessary for the particular requirements of each.

The photographic collection of the branch contained on March 31 last, 5,065 good negatives. During the past year, 1,252 new negatives have been received, but as, on the separation of the Irrigation Branch from the Forestry Branch, 1,225 negatives which pertained properly to the irrigation work were transferred to the Irrigation Branch, the actual number of photographs in the collection remains about the same as at this time last year. During the coming year it is hoped to develop this collection so as to make it considerably more useful in the work of the branch.

PUBLICATIONS.

During the year the following publications were issued:—

Bulletin 1 (Reprint).—Tree Planting on the Prairies of Manitoba, Saskatchewan, and Alberta.

Bulletin 38.—Forest Products of Canada, 1912; Pulpwood.

Bulletin 39.—Forest Products of Canada, 1912; Poles and Cross-ties.

Bulletin 40.—Forest Products of Canada, 1912; Lumber, Square Timber, Lath. and Shingles.

Bulletin 42.—Co-operative Forest Fire Protection.

Bulletin 43.—Forest Products of Canada, 1913 (a combination of Bulletins 38. 39, and 40).

Circular 6.—Preservative Treatment of Fence-posts.

Circular 7.—Manitoba a Forest Province.

Circular 8.—The Forest Products Laboratories.

Circular 9.—Chemical Methods of Utilizing Wood Wastes.

There are also in press at the time of writing the following:—

Bulletin 41.—Timber Conditions in the Little Smoky River Valley, Alberta.

Bulletin 44.—Wood-using Industries of the Maritime Provinces.

STATISTICS.

In order to make authoritative statements as to the need of forest conservation, it is necessary to have some definite information concerning the rate at which the forest products are being produced and utilized. The Forestry Branch in the last year has collected statistics on the production of lumber, lath, and shingles, the consumption of wood for pulp, railway ties, poles and mining timbers, and the consumption of bark for tanning. These are all annual statistics that will be published each year in the form of bulletins for the use of manufacturers of lumber and the consumers of the products mentioned, as well as for the education of the public at large.

In addition to these annual bulletins, a series of studies of wood-using industries is being undertaken which will eventually cover the whole of Canada. Bulletins have been completed describing the industries that use wood as a raw material in Ontario and the Maritime provinces. A similar bulletin describing conditions in the three prairie provinces is to be completed during the coming summer. These bulletins are valuable for the purpose of showing the importance of wood as a raw material in manufacturing. They show which woods are used in greatest quantity and which cost the most to the manufacturer, and also show the sources from which these woods are obtained. Detailed descriptions of the uses to which different woods can be put are valuable as suggestions to manufacturers for new uses for their waste material. The Forestry Branch has been instrumental in many cases in putting manufacturers into communication with each other when one firm was actually burning up wood which formed the raw material of another industry.

During the year 1912 the Forestry Branch compiled statistics based on reports received from 2,558 saw-mill operators, 48 pulp-mill operators, 389 companies purchasing wooden poles (including telephone, telegraph, electric light and power concerns, and electric and steam railway companies), and over 600 firms using wood as a raw material. In obtaining these 3,595 satisfactory replies, at least 7,000 firms and individuals were corresponded with during the year, and a number of them were visited in person. The statistics compiled from this mass of correspondence are handled by a more or less temporary staff and much time is wasted in training new clerks. An adequate permanent head-office staff is needed for this work, augmented by a field staff of men familiar with the lumber business and the industries using lumber.

The statistics collected up to the present time for the calendar year 1913 are as follows:—

Canada produced in 1913 a total of 3,816,642,000 board feet of sawn lumber, valued at $65,976,438; 739,678,000 lath, valued at $1,783,283; and 1,485,279,000 shingles, valued at $3,064,641.

The total quantity of pulpwood produced was 2,144,064 cords, valued at $14,313,939. Of this over half was exported in the unmanufactured state to the United States, and the remainder, 1,109,034 cords, was manufactured in Canada into wood-pulp, producing approximately 854,624 tons of "air-dry" fibre.

The railways of Canada in 1913 purchased a total of 19,881,714 cross-ties, valued at $8,740,849; of these ties over sixteen per cent were reported as having been imported from the United States. Over ten per cent of the ties purchased were treated with preservatives before being laid in the road-bed.

Pole-line companies purchased 534,592 wooden poles in 1913, valued at $1,188,331, eighty per cent of which were the product of Canadian forests.

Mining companies used 34,802,000 lineal feet of round mining timbers at a value of $509,602.

The following is an estimate of the total value of forest products in Canada for the calendar year 1913:—

Lumber, lath and shingles	$71,000,000
Firewood	55,000,000
Pulpwood	15,000,000
Fence-posts and rails	10,000,000
Cross-ties	9,000,000
Square timber exported	500,000
Cooperage	1,900,000
Poles	1,800,000
Logs exported	900,000
Tanning materials	20,000
Round mining timbers	600,000
Miscellaneous exports	400,000
Miscellaneous products	11,000,000
Total	$177,120,000

These figures have been rounded off to even thousands, allowance having been made for discrepancies in data gathered, although the total figure is still a conservative one.

FIELD ORGANIZATION.

The Tree Planting Division, which manages the work of tree planting on farms in Manitoba, Saskatchewan, and Alberta, is under charge of Mr. Norman M. Ross, with head-quarters at Indian Head Sask.

The forest management division of the field work of the Forestry Branch has been organized on a provincial basis with a district inspector in charge of the work in each province. The districts and inspectors are as follows:—

Province.	Headquarters.	Inspector.
Manitoba	Winnipeg	F. K. Herchmer.
Saskatchewan	Prince Albert	G. A. Gutches.
Alberta	Calgary	W. N. Millar.
British Columbia (Railway Belt)	Kamloops	D. R. Cameron.

The fire ranging outside of the forest reserves in the provinces of Manitoba, Saskatchewan, and Alberta, has been organized under charge of an inspector, Mr. E. H. Finlayson, with a chief fire ranger in each of twelve districts into which these provinces have been divided.

It is considered that in the final organization of the forestry work of the department it will be advisable to leave the detail and administrative work largely in the hands of the field staff, under regulations established under the authority of the Forest Reserves Act, and to have the head office staff mainly composed of experts in special lines, such as accounts, forest management, silviculture, forest investigations, who will visit the outside offices regularly, check the work and records of these offices, and assist in the development of their organizations and methods.

TREE PLANTING ON FARMS.

The interest in tree planting on the farms is sustained and increasing. The number of applications for trees received last year was 7,350, the number of applicants receiving trees, 3,585, and the number of trees distributed, 3,729,765. The average number of trees supplied to each applicant was 1,008. Owing to dry weather in the spring and early summer there were more partial failures of new plantations in some localities than usual.

The distribution of conifers was continued, 74,000 trees being sent out. The success of this class of stock has been good where proper care was taken in selecting the location and preparing the ground. Coniferous trees furnish such good shelter, particularly in winter when it is most needed, that their general planting on the prairies is most desirable, and only the necessity for holding them in the nursery for a longer period than the deciduous species, thus greatly restricting the output and increasing the cost, makes it impossible to provide for a more general distribution.

I would call particular attention to the example, cited by the superintendent of the Tree Planting Division, of the results in the production of fuel obtained from a plot of three eighths of an acre of a plantation of Russian poplar set out in the spring of 1906, which was cut this year, producing 6¾ cords of wood, which, at the average, price of $4.50 per cord, would show a yield per acre of $81 after eight years' growth. This plantation was not the most favourable, either as to species or condition, but it shows a return of over 5 per cent on the outlay, reckoning full charges for all items of expenditure.

A very interesting development in connection with the tree-planting work is the active interest taken by many farmers, as evidenced by their applications to the office at Indian Head, in the proper laying out and beautification of their home grounds. While the department will assist in this matter as far as possible, it is of course rather outside of its work. It shows, however, that the object of the department, that is to assist in increasing the interest in the beauty and comfort of the homes on the prairie farms, is meeting with success.

The development of the new nursery station at Sutherland is being carried on, most of the new buildings required have been erected, and it is expected during the coming year to have the ground in condition for starting the growth of nursery stock, so that by the spring of 1916 at latest there should be a large additional stock for distribution.

FOREST RESERVES.

By an amendment of the Dominion Forest Reserves and Parks Act passed at last session, additions were made to the forest reserves amounting to 10,762 square miles. These additions were recommended after careful examination of the lands had

been made by forest survey parties sent out by the department. The additions are as follows:—

	Square Miles.	
Province of British Columbia—		
Long Lake	74.21	
Monte Hills	76.75	
Martin Mountain	16.25	
Miskonlith	193.50	
Tranquile	141.60	
Hat Creek	135.25	
Fly Hills	223.75	
Nicola	505.75	
Mount Ida	45.25	
Arrowstone	255.00	
Total		1,667.31
Province of Alberta—		
Rocky Mountains	2.683.65	
Lesser Slave	5.023.00	
Total		7.706.65
Province of Saskatchewan—		
Fort à la Corne	513.00	
Pines	12.15	
Porcupine No. 2	204.75	
Nisbet	134.55	
Total		864.45
Province of Manitoba—		
Duck Mountain No. 1	58.25	
Porcupine No. 1	465.50	
Total		523.75
Grand total		10.762.16

The organization of the forest reserves already established has been steadily developing. The permanent forest-reserve organizations consists of the following officers:—

District inspectors	5
Forest supervisors	8
Forest assistants	13
Forest rangers	56
Total	82

On the whole the staff are taking a more earnest and active interest in the work on the forests, and have a better realization of the public service they are rendering, but this spirit and the efficiency of the work could be developed to a much higher degree if the special qualifications necessary were made the basis of appointment, and if efficiency and good conduct assured permanency of tenure of office.

IMPROVEMENTS.

Work has gone on steadily during the year in the improvements necessary for the protection and utilization of the reserves. The better knowledge of the reserves gained through the year has enabled a more intelligent planning of the system of improvements, and their construction is now being pushed forward as rapidly as funds will permit.

The construction of houses on the reserves for the forest rangers has resulted in keeping them close to their work, and eliminating a great loss of time previously occasioned.

Particular attention has been given to developing a system of trails throughout the reserves, and the standard of the trails constructed has been materially improved without an increase of cost, through a better knowledge of the character of the trails required and greater experience by the rangers in their construction.

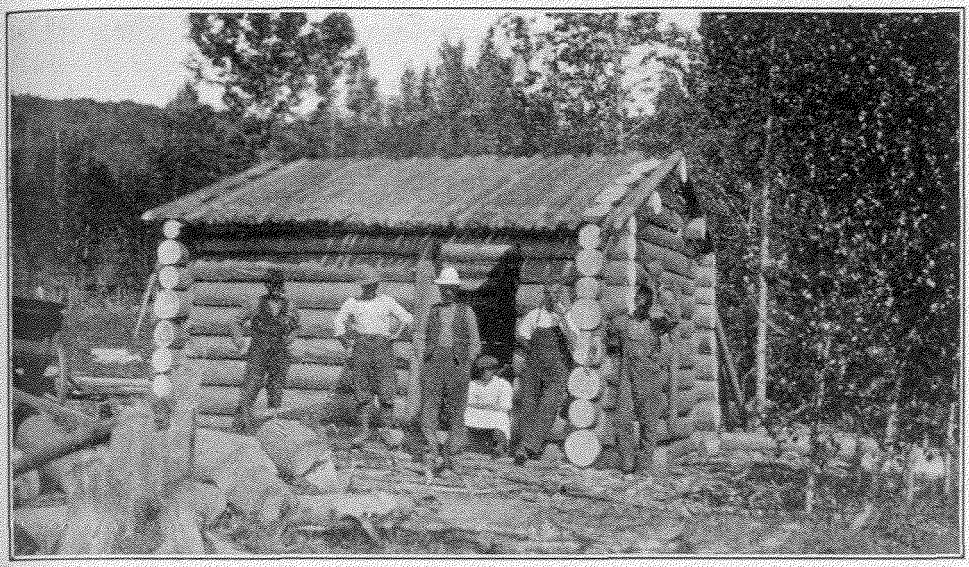


Photo by J. Y. Greenwood.

Boundary Cache, Red Deer River, Bow River Forest, Alberta.

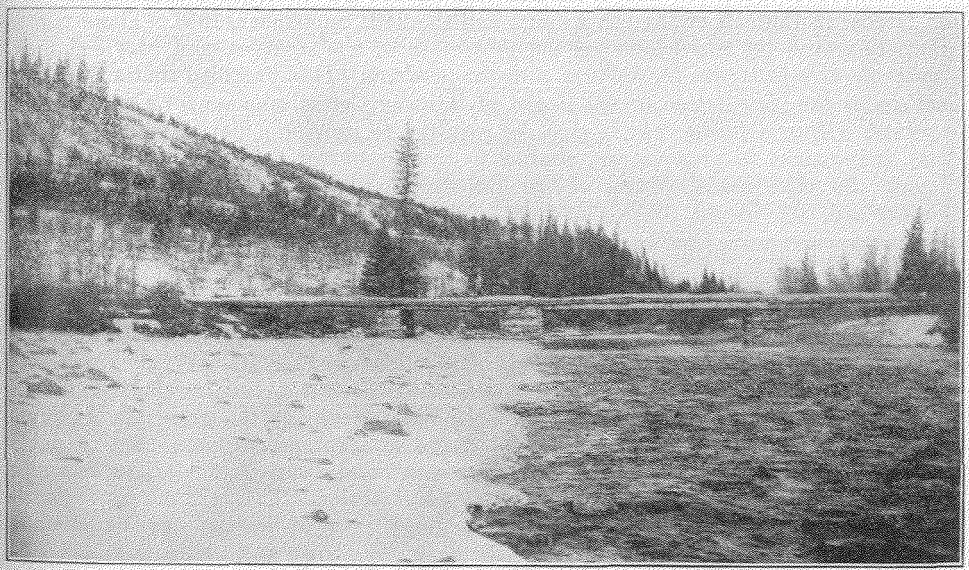


Photo by R. M. Brown.

Bridge over Livingstone River, Crowsnest Forest, Alberta.

While considerable work has been done in constructing telephone lines, this part of the work has been delayed until a fuller knowledge of the reserves would enable a better and more permanent location of the lines.

The following is a tabulated statement of the improvements and their cost:—

Improvement.	No.	Total Cost.	Average.
		$ cts.	$ cts.
Rangers' houses	12	15,096 88	1,258 73
" cabins	27	7,471 81	276 73
" stables	23	4,131 38	183 99
Tool caches	5	550 07	110 01
Lookout towers	3	304 91	101 63
	Miles.		
Telephone line	99	6,644 26	67 11
Bridges	8	1,175 28	146 90
Fire-guards—			
Cleared	118	6,714 77	56 92
Ploughed	119	1,934 20	14 24
Roads—			
New construction	245	13,452 17	56 00
Maintenance	44	442 52	10 04
Trails—			
New	467	21,850 78	46 74
Maintenance	321	1,719 44	5 35
Corrals	4	170 90	43 09
Pasture fencing	15	1,567 42	103 83
Boundary demarcation	125	484 10	3 87

REGULATIONS.

New regulations for the administration of the Forest reserves were established by Orders in Council of the 8th August and the 24th September, 1913. These regulations improved the provisions for the protection of the reserves, and provided much more effective measures for dealing with the products. It is provided that any railway not under the jurisdiction of the Board of Railway Commissioners for Canada which operates within a forest reserve shall be required to provide a patrol and take necessary precautions to prevent fire, similar to those required by the regulations of the board. By this means control of the fire situation along the railway lines will be maintained.

TIMBER.

The regulations of the Forest reserves relating to timber had been framed when the main requirement was a supply of timber to settlers, and were framed with that requirement in view. The establishment of the reserves on the Rocky mountains and in British Columbia made it necessary to furnish further provisions for timber disposal. Provision was therefore made in the regulations for the granting of annual permits, not only to settlers, but to miners and prospectors, for municipal or public works, for the erection of schools and churches in rural districts, for irrigation works, for timber on rights of way, and for railway construction. This will supply, with the least possible delay, the main requirements for timber in smaller quantities which will be needed.

Provision is also made for sales by tender of timber in quantities not exceeding five million feet, board measure, being about the average quantity on one section of land with a time limit for removal not to exceed five years. Advertisement of such a sale must be made for a period of not less than thirty days in a newspaper circulating

in the district where the timber is situated. This provision was intended to meet cases where the annual permit would not provide sufficient timber or where the timber is not sufficiently accessible to be handled on a permit basis. Thirty-three sales have been held under this section of the regulations, and operations have been carried on by small mills in connection therewith, which have supplied various demands for lumber.

Owing to the development of large coal-mining operations in the Rocky mountains, which require a supply of timber larger than the five million feet, board measure, authorized for sale by the regulations and for a longer period than three years, it has been necessary to arrange for the special authority of Council for the sale of a large area.

The Brazeau Collieries, Limited, applied to purchase the timber on an area of 7,360 acres in the valley of the Clearwater river, convenient to their operations. A careful examination of this tract was made by a forester, and it was found that a large proportion of the timber which was of a size suitable for cutting into lumber was over 200 years old and consequently overmature, and that it was advisable that the sale should be made. The tract was estimated to have a stand of 4,500,000 feet, board measure, of timber, and 9,700,000 lineal feet of mining props. This tract was therefore put up for sale by auction, at an upset price of $2 per thousand feet, board measure, for a period of eight years, and the price realized was $2.60 per thousand feet, which bid was submitted by the Brazeau Collieries. The sale was made subject to the following conditions:—

(1) That no trees shall be cut which are designated by the forest officer as being required to ensure the reproduction of the timber, the protection of the watershed, or any other beneficial public service;

(2) That the purchaser shall take out all material that is merchantable from the timber cut and shall not cause any unnecessary waste of timber;

(3) That no unnecessary damage shall be caused to the young growth or to any trees that are designated as not to be cut;

(4) That the débris of logging operations shall be piled and burned or otherwise disposed of in accordance with the instructions of the forest officer;

(5) That the purchaser shall take all necessary precautions to prevent the starting or spread of fire from his operations;

(6) That for fighting fire in the vicinity of, or threatening, the tract, the purchaser shall give, free of charge, the assistance of the men employed by him.

Sales were also made to the Mountain Park Coal Company and the Yellowhead Pass Coal and Coke Company.

The arrangement for allowing small mills on the Riding and Duck Mountain Forest reserves to cut on settlers' permits has been continued, but cannot yet be considered as having established itself as a successful method of management. The difficulties have been due; first, to the fact that there has not been as active a demand by settlers for timber permits during the past two winters; and, secondly, to the fact that some of the operators appear to consider the privilege granted as merely a basis and opportunity for irregular operations. The experiment will, however, be continued further.

It will be noted that the policy adopted in regard to the timber is to provide for its disposal as required by the people or the industries in the district. It is not the policy to withhold timber from sale, but to dispose of what is mature and suitable for use, and to protect the timber that is still immature and adding to its value by growth. Such disposal is made, however, so as to encourage the industries, such as coal mining, which are dependent on the forest, and to furnish a convenient and reasonable-

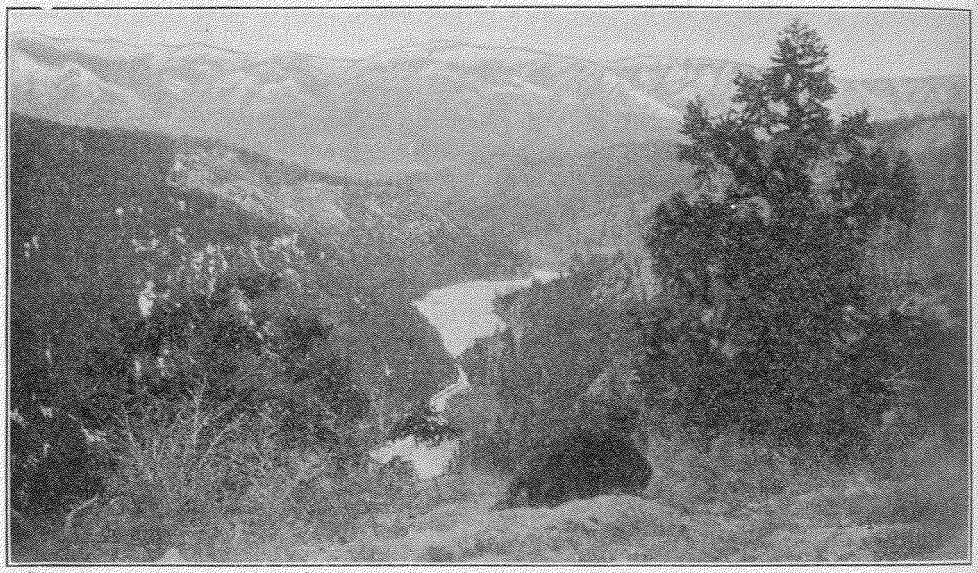


Photo by D. R. Cameron

Langley Canyon, Oregon Jack Creek, Hat Creek Forest Reserve, British Columbia, showing Lowland Grazing.

Summit of Clear Mountains above Timber-line showing Highland Grazing, Hat Creek Forest Reserve.

priced supply to the shelter for the present and the future, when the timber will be still more in demand, and to furnish it as directly as possible to the persons or companies requiring it for use so as to eliminate merely speculative holding of timber as far as possible.

Considerable advance has been made in the disposal of the débris of the lumbering operations on reserves which are in charge of this branch. In all such operations the brush has been piled or scattered so as to lie flat on the ground, thus materially decreasing the fire hazard. This is particularly the case in connection with operations on the Riding and Duck Mountain reserves in Manitoba, on the Pines and Nisbet reserves in Saskatchewan, and on the Crowsnest forest in the Rocky mountains. The disposal of lumbering slash in the Railway Belt in the province of British Columbia has also been taken up with the lumbermen, and there is fair prospect of a more general movement to dispose of such débris, although there is still considerable difference of opinion among lumbermen as to the desirability or advisability of using fire for the purpose. Some of the lumbermen are, however, now regularly burning the slash after operations and, through the efforts of the officers of the branch, some of the most dangerous places have been cleared up.

GRAZING.

In defining the boundaries of the reserves, the endeavour was made to exclude as far as possible any land that is not absolute forest land. Lands that are better fitted for grazing than for forest purposes were excluded where it was possible to do so, but there are still left within the reserves some grazing areas, particularly the long narrow valleys stretching into the mountains and the grassy areas above timber-line.

It is important also at the present time that the development of the live-stock industry should be encouraged, as the scarcity of the supply of live stock has become a matter of serious moment.

Regulations have, therefore, been established providing for the use of such areas for grazing stock. In framing the regulations the following points were kept in view:—

(1) Flexibility so as to provide for meeting changing conditions. Consequently, annual permits were provided for, with a fixed charge for each head of stock covered by the permit, instead of leases for terms of years.

(2) The encouragement of the small holder. This is provided for by fixing a grazing unit, which is the number of stock which it is estimated can be carried during the winter on a homestead or small ranche and enacting that all grazing permits may be gradually reduced to this unit.

(3) Protection from overgrazing by fixing the maximum number of stock which may be grazed in any district.

As these regulations did not come into force in time to be effective during the year 1913-14, no report can be made as to how they are working out, but the principle of management is based on tried experience in the forest reserves of the United States, so that, while changes in detail may be necessary, it is expected that the main basis will be found of permanent application. Owing to objection and misunderstanding of the grazing regulations in the Railway Belt of the province of British Columbia, their application in that district has been suspended for the present.

An important section of the regulations relating to grazing is that which provides for the establishment of local stock associations which may be considered as advisory committees in the management of the grazing in their districts. Several such associations have already been formed with good prospects of usefulness.

Photo by H. I. Stevenson.

Roblin Steel Lookout Tower.

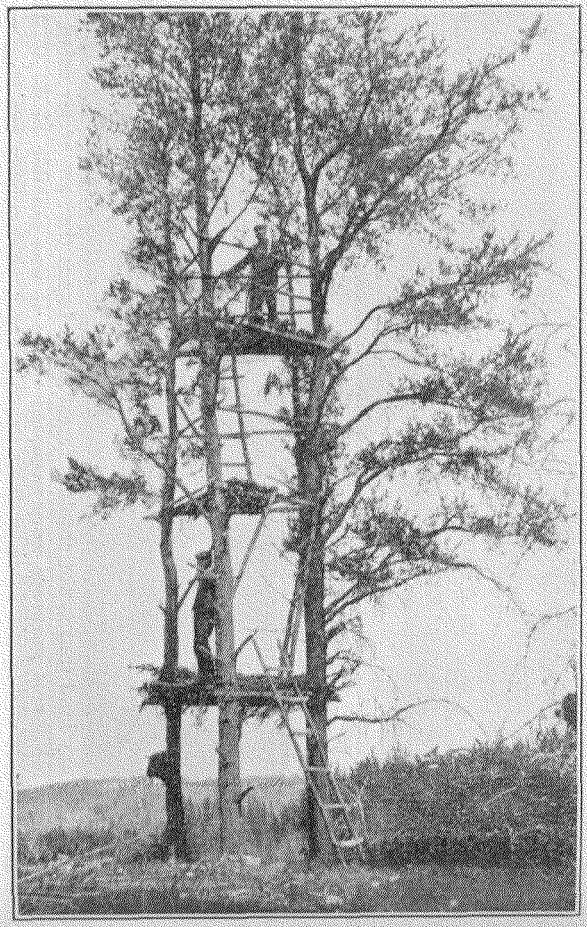
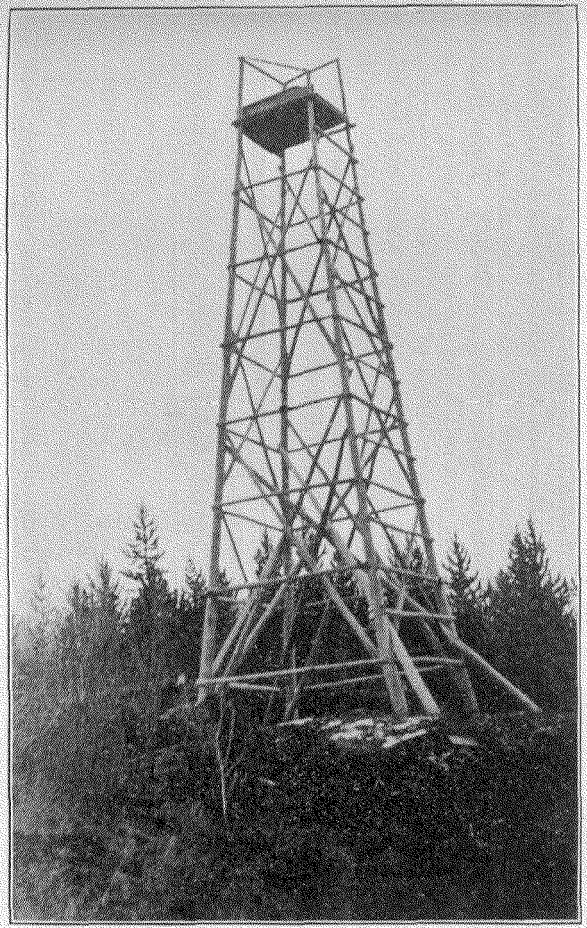


Photo by E. H. Roberts.

Lookout Tower on Pines Forest Reserve (N.E. ¼ Sec. 6, Tp. 47, Rge. 1, W. 3rd mer.)



Leanchoil Lookout Tower, British Columbia.

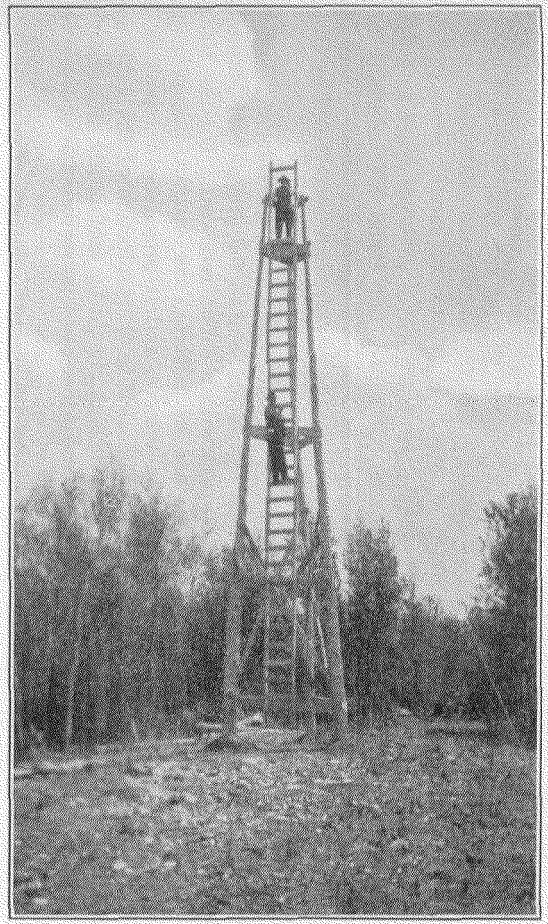


Photo by C. W. Wellman.

Baldy Mountain Lookout Tower, Duck Mountain Forest Reserve, Manitoba.

GENERAL USES.

Provision was also made for the granting of leases or permits for other necessary uses of the reserves not previously provided for, such as surface rights for mining claims, hunters' cabins, mill-sites, logging railways, flumes, and other similar purposes.

GAME.

The regulations provide that in any part of a forest reserve set apart as a game preserve, no game shall be hunted, taken, or killed, but forest officers shall have authority at any time to destroy predatory, noxious, or dangerous animals. Any further necessary regulations are made when the game preserves are established by Order in Council.

The forest reserves in the province of Saskatchewan have all been made game refuges both by Dominion and provincial legislation, and in the province of Manitoba several game preserves have been set apart within forest reserves. On the Rocky Mountains Forest reserve in the Province of Alberta, the district inspector has been making a thorough inspection of the reserve, and is preparing a report as to conditions, which, among other things, will deal with the protection of the game and make recommendations as to further areas which should be established as preserves. A recommendation has already been submitted for a game preserve north of the international boundary within this reserve.

FISH.

The regulations established at the instance of the Department of Fisheries on February 12, 1912, for the protection of fish in the provinces of Alberta and Saskatchewan were not made applicable to the forest reserves. As it was decided, too, that the fishing regulations for the Province of Manitoba probably had no effect within the reserves, and that there was authority to establish regulations in regard to fishing in the forest reserves under the Forest Reserves Act, steps were taken to establish such regulations. The Department of Fisheries was consulted in the matter, and the regulations were approved by that department before being established. These regulations do not prohibit the taking of fish but require the taking out of a permit for fishing, fix close seasons similar to those in the regulations of the Fisheries Department, fix the size limit and the number of fish that may be taken in a day, and prohibit the taking of fish in any other way than by angling or trolling.

In the administration of these regulations, arrangements are being made to co-operate with the Department of Fisheries as fully as possible.

FIRES.

The number of fires reported on the forest reserves and their causes were as follows:—

Lightning	3
Railway locomotives	18
Settlers clearing land	8
Campers or trappers	7
Miscellaneous	8
Unknown	11
Total	55

These fires were all checked before they caused any serious damage, and the total area burned on the reserves was not two one-hundredths of 1 per cent.

SURVEYS.

In order properly to locate and map the timber and improvements on the Brazeau and Clearwater divisions of the Rocky Mountains Forest reserve, it was found necessary to have traverses made of several rivers in the Brazeau, Clearwater, and Bow River forests. This was done by two survey parties, with the result that it was necessary to materially change the location of these rivers on the map. Further traverses will be made during the coming year, and will complete the work necessary on these divisions so as to make it possible to have a reconnaissance survey to locate and map the timber types and bodies of timber accurately. The eastern boundary of the Crowsnest and Bow river forests was also marked on the ground.

A reconnaissance survey was begun on the Duck Mountain Forest reserve in the Province of Manitoba, and one-half of the work was completed. The survey will be completed during the coming season.

Reconnaissance surveys were also carried on on some of the forest reserves in the Province of British Columbia.

REFORESTATION.

Reforestation has not as yet been taken up actively on the reserves in general, as the work of protection has been given first consideration. The only work on any noticeable scale which has been done in this respect is on the Spruce Woods Forest reserve in the province of Manitoba, which is a sandy tract largely denuded of trees. On this reserve a forest nursery has been established for the purpose of providing stock for the reforestation of the reserve. In this nursery there is now the following stock:—

Lodgepole pine	25,000
Bull pine	8,000
Scotch pine	18,000
European larch	7,500
Silver fir (Nordmann's)	8,500
Norway spruce	13,000
Jack pine	24,500
White spruce	108,000
Douglas fir	2,000
Tamarack	1,000
Total	215,500

Much of this stock has now reached a stage when it may be set out, and the work of reforestation will be begun immediately.

The advisability of establishing a nursery in this vicinity for the supply of stock for the reforestation of all the reserves in Manitoba was considered, but no action in that direction has yet been taken.

Several of the smaller reserves which are recommended to be established in the province of Saskatchewan are of a similar nature, sandy and denuded of trees, and if these reserves are established it will be necessary to take steps at an early date to provide for their reforestation.

FOREST SURVEYS.

The exploratory surveys to determine the lands that are suited best for forest production, and should be included in forest reserves, were continued during the season by eight parties. The districts examined are in Manitoba between lakes Winnipeg and Manitoba, the territory in Saskatchewan forming the watershed between the Assiniboine and Saskatchewan river-systems, and between the Saskatchewan and Churchill river systems, southern part of the Peace river drainage basin in the Rocky

Mountains and several mountainous tracts in the coast district and in the vicinity of Shuswap lake in the Railway Belt in the province of British Columbia. An inspection was also made of a number of sandy tracts of non-agricultural land in the prairie districts of the province of Saskatchewan and recommendations were made that a number of tracts be set aside for reforestation.

The parties were distributed in the four western provinces as follows:—

Manitoba Inspection District	1 party.
Saskatchewan Inspection District	4 parties.
Alberta Inspection District	1 party.
British Columbia Inspection District	2 parties.

The party in Manitoba was in charge of Mr. D. Greig, who covered the country lying north of township 25, between lakes Winnipeg and Manitoba, and bounded on the north by Dauphin river and Sturgeon bay of lake Winnipeg. Altogether, 3,130 square miles were examined by this party. This tract is very flat, with poor drainage, and the greater part of it is covered with swamps and muskegs. In the muskegs there are narrow ridges running north and south covered with jack pine or poplar. About 60 per cent of the muskegs are covered with black spruce and tamarack. The southern and the southwestern portions of the area examined are slightly higher land, covered principally with young poplar and jack pine. Here the soil in general is a silty loam, too light for the growing of heavy crops, but good for mixed farming. When the jack pine occurs, however, the soil is very sandy. On a recommendation made in Mr. Greig's report, a temporary reservation has been made of about eleven townships of sandy land, which were found to be unsuitable for agriculture. A more intensive examination will be made of certain portions of this land in the near future.

In eastern Saskatchewan, Mr. A. B. Connell examined the district known as the Pasquia hills. This survey comprised an area of 3,000 square miles, and covered a tract bounded on the south by the main line of the Canadian Northern railway, on the east by the Pas branch of the same railway, and on the north and west by the Carrot river. The Pasquia hills reach an elevation of approximately 2,000 feet above sea-level, and 1,000 feet above the large marsh which lies around its base on the north and northeast. The whole tract has the appearance of a flat, rough-topped plateau, with a long and gentle southward slope and a sharp and steep northern face. Many creeks of fair size rise on the northern, eastern, and southern slopes of the hills. Many of these streams have eroded deep valleys, and their beds are strewn with boulders.

The characteristic soil of the plateau is boulder clay, which precludes any possibility of profitable settlement at present. The soil of the large stretch of hay marsh and swamp land on the north side of the plateau is fairly good, but this land would, of course, have to be drained to be of agricultural use. A drainage proposition here would have to be on a large scale and comprise the entire plain of the Lower Saskatchewan and Carrot river valleys.

The plateau is covered with white and black spruce balsam, poplar, aspen, and some jack pine, mostly of small dimensions. Numerically, the two poplars are the most important trees of the region. The white and black spruce are, however, the most important from a commercial standpoint. The white spruce seems to be well adapted to the boulder-clay soil and the climate of the region, and this plateau will develop into a spruce forest if fire does not interfere.

In the better situations and on the muskegs, stunted black spruce, with occasional larch intermixed, forms the stand.

As the inspection made clear that the Pasquia hills are absolute forest land, and as the timber thereon will be of great value to the settled prairie country to the west and south, it has been recommended that this area should be set aside as a forest reserve.

Another party under charge of Mr. E. H. Roberts examined the district northwest of Prince Albert in the vicinity of Big river, Birch lake, and Green lake. This tract

Photo by A. B. Connell.

Jack-pine Reproduction on a Burned Muskeg. Sand close beneath.
Tp. 47, Rge. 5, west of 2nd meridian.

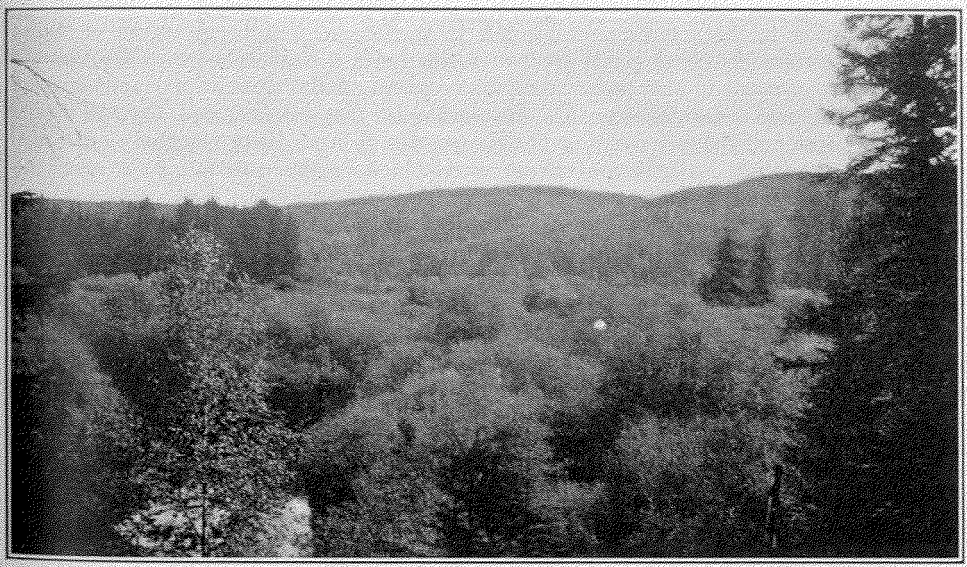


Photo by A. B. Connell.

Poplar Slopes of the Fir Valley in Tp. 48, Rge. 5, west of the 2nd meridian, Saskatchewan. The muskeg type begins at the top of the slope on both sides of the river.

is quite an important watershed covering the head-waters of Big river and other tributaries of the Beaver river which finally reach the Churchill. The elevation of this tract is from 1,500 to 1,900 feet above sea-level. The country is a rolling plain to the east and southeast, while to the west and southwest it is quite hilly. The general slope of the country is to the north and northwest. In the northern and eastern portions of the district examined there are numerous undrained flat areas making hay sloughs and muskegs. Of the 1,800 square miles examined only about three per cent is covered with merchantable timber, consisting principally of spruce, aspen, and jack pine. About forty years ago a very extensive fire burnt over most of the district examined, leaving a few strips of timber here and there, which are now included in timber limits. Reproduction is very good, however, covering about eighty per cent of the area inspected. The reproducing species are spruce, jack pine, and aspen. Muskeg covers about fifteen per cent of the area. The greater part of this muskeg carries no timber of any value, but the edges of the muskegs are fringed with a thick growth of black spruce and tamarack. About two per cent of the country examined is grazing land. This is chiefly found along Witcheken lake and south of Chitek lake.

The soil over the greater part of the area is sandy, specially so in the jack pine belt in the central portion of the district. The inspections made resulted in recommendation for the inclusion of the greater part of the area in a forest reserve.

A third party, under Mr. G. P. Melrose, explored the country lying north of Battleford in Townships 55, 56 and 57, Ranges 16 to 27 west of the third meridian inclusive. This examination covered an area of about 1,800 square miles, of which approximately 1,000 square miles are covered with poplar, spruce, and jack pine. Poplar is by far the most common species. About 250 square miles are muskeg or under water, and about 290 square miles were found to be grassland. The remaining 250 square miles are either brulé or cut-over lands. The tract examined, which consists of a series of low hills, is the watershed between the creeks running north to the Beaver river and south to the Saskatchewan. The soil is, as a rule, sandy and unsuitable for permanent agriculture. It is probable that a more complete survey will be made before a decision in regard to setting apart any of these lands will be reached.

In addition to these three surveys, Mr. L. Stevenson, who is an expert on soils, made examination of several small areas of sandy land in Saskatchewan. Representations have been made to the department that certain sandy areas in the southern or central portions of Saskatchewan are unsuitable for agriculture, and that it would be in the interest of the surrounding prairie country to have them reserved and reforested when necessary. All these areas are surrounded by settlements. As a result of Mr. Stevenson's examinations, recommendations have been made that certain areas, generally covered with a drifting sand where the tree-growth is scattered or altogether absent, should be set apart as forest reserves with a view of being later reforested or afforested for the use of the neighbouring settlers. The proposed forest reserves, seven in number, are situated as follows: One at Manito lake, one in the vicinity of Eagle hills, one just west of Dundurn, one at the Elbow of the South Saskatchewan river, one at Steep creek near Prince Albert, one at Seward east of Swift Current, one just east of Cypress Hills Forest Reserve No. 2.

In Alberta, Mr. J. A. Doucet continued the examination of the northern portion of the Rocky mountains as far as the Peace River block, covering the territory from the divide between the Little Smoky and Simonette rivers, to which point the examination had been carried the previous year, to the British Columbia boundary. This includes the valleys of the Simonette, Smoky, and Wapiti rivers and their tributaries, and comprises an area of 8,000 square miles in the mountains and foot-hills, and an area of 1,500 square miles of prairie and brush land. The examination was made at a cost of $5,310, or an average of 57 cents per square mile.

The western portion of the district is the main portion of the Rocky mountains, consisting of ridges and peaks from 4,000 to 9,000 feet elevation above sea-level with intervening valleys at elevations from 3,500 to 5,500 feet. Easterly as one descends

into the valleys of the Smoky, Porcupine, and Simonette rivers, the elevation decreases to 2,000 to 5,000 feet. All of this territory below 5,000 feet in elevation was at one time or other covered with forests of spruce, lodgepole pine, and poplar, with some tamarack, fir, and white birch, but the fire loss has been enormous. Of the forest area of 8,000 square miles, only 648 square miles, or about 8 per cent, has been found bearing a forest cover of 100 years old or over, that is, of a diameter between 12 and 24 inches, and the forest between 50 and 100 years of age does not cover more than 8.5 per cent more. In the last fifty years more than 65 per cent of the area has beeen swept by fire. In the last thirty years probably more than 16,000,000,000 feet, board measure, of merchantable pine and spruce lumber have been destroyed by fire which, at the current selling price at the mill of $16 per thousand, would make a loss to the industries of the country of $196,000,000, and a direct loss to the Government in dues at the rate of 50 cents per thousand feet, board measure, of $8,000,000. Over a large part of the territory, reproduction is taking place naturally and satisfactorily, but in some places the soil-cover has been removed entirely, and it will be a long time before the forest can be re-established.

On the whole it is estimated that the present stand is 3,776,440,000 feet, board measure, of saw-timber and 10,417,600 cords of wood. Some of the stands in the river-valleys are remarkably good, running as high as 15,000 feet, board measure, to the acre in places, and there is no reason why a forest of immense value should not be developed in this district. The all-important question is the prevention of fire, and the value of the property involved would justify a sufficiently large expenditure to make this as near a certainty as can possibly be done.

This is the main source of timber supply for the Grande Prairie and Sturgeon Lake districts, both splendid farming districts filling up with a good population, which will be largely increased on the advent of railway communication.

A tract of land of an area of about 170 square miles, situated at the junction of the Wapiti and Smoky rivers, was also examined. It is largely sand, with muskegs between the ridges of sand, and has a variable stand of pine, spruce, poplar, and tamarack. It is particularly valuable as a source of building timber for the prairie country in the immediate vicinity, and therefore requires special protection.

Partial examination was also made of a tract of about 1,200 square miles south of the Peace river, which forms a plateau 3,000 to 3,600 feet in elevation, in which the Pouce Coupé and Burnt rivers take their rise. At this elevation the land can hardly be of agricultural value, and as the precipitation in the Peace river valley is light, it is important that watersheds should be carefully looked after. Moreover, on the part examined the soil was found to be sandy and very coarse on the ridges. This plateau was at one time well wooded with heavy spruce, pine, and poplar in the low valleys. The merchantable timber still existing on this tract is estimated at one thousand million feet, board measure. It is proposed to complete the examination of this tract on the earliest possible occasion.

In the Railway Belt of British Columbia two parties were at work under Mr. C. R. Mills and Mr. Bruce Robertson. They examined an area covering approximately 4,650 square miles. The country explored is all mountainous and chiefly of high elevations. Practically all land in the Railway Belt west of Revelstoke has now been examined by the Forestry Branch. Messrs, Robertson and Mills recommended that several tracts which were of high altitude, generally well timbered with Douglas fir, cedar, hemlock, white fir (balsam), and jack pine, and of no agricultural value on account of poor soil and the rough character of the country, should be set apart as forest reserves. No action has as yet been taken to that effect, however.

FIRE RANGING.

The fire patrol outside of the forest reserves covers the large extent of more or less forested land from the southeastern boundary of Manitoba through the northern

part of Manitoba, Saskatchewan and Alberta, an extent of 205,344 square miles. It also covers most of the Railway Belt in the province of British Columbia. The patrol is carried out as fully as the appropriation will permit, but the large extent of territory involved makes the patrol for each fire ranger very large and the educative work done by the ranger is more effective than the actual work of extinguishing fires.

There were twelve fire-ranging districts, each under charge of a chief fire ranger. The districts and number of fire rangers employed were as follows:—

District.	Headquatters.	No. of Rangers.
Southern Manitoba	Winnipeg	8
Northern Manitoba	Norway House	16
The Pas	The Pas	12
Prince Albert East or Hudson Bay Junction	Hudson Bay Junction	12
Prince Albert	Prince Albert	18
Battleford	Emmaville	7
Edmonton	Edmonton	40
McMurray	McMurray	8
Great Slave	Fort Smith	2
Mackenzie	Fort Simpson	—
Revelstoke	Revelstoke	15
Salmon Arm	Salmon Arm	17
Coast	New Westminster	31
	Total	186

The number of fires reported was 511, and the total area burned over was 149,456 acres, of which over one-half was grass-land, so that the proportion of the forested area which was burned over was about nine one-hundredths of 1 per cent. The small extent of the area burned is due to the fact that the season was a favourable one in most districts, but it is evident also that the rangers have been doing more thorough work from the number of fires reported extinguished.

Campers, surveyors, and prospectors were the greatest individual causes of fires, and as these are ever changing and therefore the educative work of the rangers has little opportunity for effect, it is evident that a more intensive patrol will be necessary in dry years. Locomotives were the second greatest individual cause of fires, but with a more thorough organization of the patrol on railways which is being perfected each year, this source of danger should in time be controlled, and this would cover the several other causes of fires that occur along the railways.

Clearing of land by settlers is a third great cause of fire, and it is desirable that some change in the provincial Fire Act of the provinces of Manitoba, Saskatchewan, and Alberta should be made which would give a better control of this cause of fire, such as is given by the permit system for setting out fire under the British Columbia Fire Act.

I would call particular attention to the statement of the inspector of fire ranging that by far the greater proportion of fires started which are extinguished by our rangers result from the surrounding conditions of the woods as regards slash and débris. This emphasizes the fact that one of the most necessary preventive measures in regard to fire is to get rid of the débris and slash from lumbering operations, road-cutting or other work.

The patrol of the Peace river and Mackenzie river can best be carried on at the present time by steamboat, as the routes of travel and, therefore, the places of danger are along these waterways. They are both difficult of travel upstream by canoe, especially with the great distances to be patrolled, and it is advisable, if the timber, so important in these northern districts, is to be protected, that provision should be made for placing a steamboat on each of these rivers as soon as possible.

WOOD BISON.

The patrol for the protection of the herds of wood bison in the vicinity of the Great Slave river has been continued throughout the year, and a fair idea of the number in the herds has been obtained, although in a partially wooded country it is difficult to get any definite estimate of the herds, as they are easily stampeded and cannot be seen for any great distance. It is estimated that the number in the different herds may reach 500, and there is no indication that they are decreasing. The bison that were seen were in good condition, and food and shelter are plentiful, so that they may be expected to increase if protected from their enemies.

It was thought at one time that the Indians were killing off the herd, but no evidence can be found to substantiate the opinion, and the conclusion from several years' observation of the situation is that there is little, if any, trouble from this source. The penalty for killing the bison is severe, and moose and, in winter, caribou are plentiful, so that the temptation to follow the bison, which usually keep well away from the settlement, is not great.

Evidence was found that wolves were following the herds in some cases, but in only one case were there any signs seen of destruction by wolves. This was a case of a young bull who had evidently been separated from the herd. Wolves will not attack a herd, and as the young are usually kept in the middle of the herd and well protected it is not likely that there is great destruction from this source.

In such a large district with poor communications close protection cannot be given, but it seems safe to conclude that the herds are sufficiently protected so that they are increasing rather than decreasing and, if no serious accident occurs, there is no reason to expect that the herds will disappear. The most serious possibility of danger might be a general conflagration in the district, and the patrol of fire rangers, made as effective as the appropriation will permit, is designed to prevent the occurrence of such a catastrophe, as well as to assist otherwise in the protection of the bison herds.

REINDEER.

In accordance with instructions, Mr. E. H. Finlayson, Inspector of Fire Ranging, visited Fort Smith during last summer and looked into matters in connection with the reindeer herd at that place. As reported last year, after the stampede of the herd in the summer of 1911, only twelve of them were gathered together, and afterwards another was lost, which left the number at eleven.

This herd were brought down to Fort Smith in the spring and were kept there with the intention of taking them down to Hardisty island in Great Slave lake, which had been set apart, after inspection, as a suitable place for keeping the reindeer. Unfortunately, however, the department had no steamer of its own below the rapids at Fort Smith and none of the other steamers plying below could be secured to take the deer down. As a consequence, they were held at Fort Smith until the season when the flies became troublesome and on the 9th May this plague became so bad that the deer broke out of the place where they were confined by a fence and swam across the rapids of the Athabaska river. The rapids at this place are among the worst on the river and it was thought absolutely impossible that the deer could swim across. Eight of the deer swam across the river and scattered through the bush on the eastern side of the river. These were, however, all recovered later, and the herders gathered a large quantity of reindeer moss to supply the deer through the winter season.

Owing to the trouble that had been caused by the deer breaking away, they were put in a comparatively small enclosure for the winter with a good supply of reindeer moss. Before very long some of the deer became quite ill, and although the doctor at Fort Smith did all he could for them, seven died, leaving only four. It was decided then that possibly the close confinement was causing the difficulty, and the deer were

allowed to run more openly with the result that the reindeer have continued in good health. It is the intention this spring to take these few remaining deer down to Hardisty island.

The time for which the two herders and the apprentice were hired on arrangement through Dr. W. T. Grenfell expired on the 1st September last, and as the herd was so largely reduced it was not considered necessary to retain all of these men. It was expected when the inspector went down to Fort Smith that this would be the case and he was given authority to make the best arrangements possible in the matter. After consultation with Mr. A. J. Bell, the Dominion Government Agent at Fort Smith, it was decided that it would be well to allow Mr. N. Geer, the chief herder, who had his wife with him, and who was anxious to return to Newfoundland, to do so, and that Mr. Wm. McNeill, the other herder, and Mr. John Broomfield, the apprentice, should be retained. An arrangement was therefore made with them to remain for a year further.

The result of the experiment in placing reindeer in this district is not satisfactory so far, as all that has been demonstrated is the difficulty of handling a herd in that district, though a better knowledge has been obtained of just what the difficulties are.

In the first place, it is quite clear that it is impossible to hold the reindeer in the summer in a place where the bull-dog flies are numerous, as they are in the bush country in the vicinity of Fort Smith. The caribou migrate south to that vicinity during the winter, but they all return to the north of Great Slave lake and the barren grounds in the summer, so that everything combines to lead to the conclusion that the reindeer cannot be held in that district for the summer. Of course the first endeavour was to demonstrate whether a herd could be kept by the ordinary method of herding which is followed in Lapland and Newfoundland without close confinement, as this is the only way in which a herd could be made a success in a general way anywhere. The experience shows that this is not possible the year round under the conditions existing south of Great Slave lake, and there is nothing to be gained by making any further effort in that direction.

As stated, during last winter the experiment was made of holding the herd in rather close confinement, and this has not turned out well, as close confinement and an exclusive diet of reindeer moss does not seem to be wholesome.

As to the future of the herd, it is proposed, as stated, that the reindeer should be taken down to Hardisty island in Great Slave lake during the coming season. This island is in an exposed situation in the lake and is fairly open, and it is expected, therefore, that the fly pest will not be so serious as on the mainland, while the deer are not so likely to leave the island as they are to break away from enclosures on the mainland, even if the flies should become troublesome.

Unless some addition is made to the herd, however, the experiment cannot be considered other than a failure, and three courses are open to be taken in connection with the matter.

1. The experiment might be abandoned altogether. Since so much expense has already been incurred in connection with the herd, and it is demonstrated that during winter they would be of great value for travelling purposes in the district, I think it is desirable the experiment should be carried out to a further extent. The Government of the United States lost heavily on the first shipments of reindeer to Alaska, and much more heavily than the Canadian Government has suffered with this shipment. If the reindeer can be held satisfactorily on Hardisty island in Great Slave lake during the present season it will demonstrate that we have overcome the main and only difficulty so far experienced, and will give very good hope that the keeping of reindeer may be made a success in that district.

2. An effort might be made to obtain some young caribou and cross them with the reindeer. There seems to be no reason why this might not be carried out satisfactorily, and an effort will be made to obtain some of the caribou. The Indians have promised to assist in this, although owing to certain superstitutions in regard to the

caribou it is a question how far they will be prepared to go. It is possible, however, that some of the caribou may be obtained by the reindeer herders after the deer are taken down to Hardisty island.

3. Another shipment of reindeer might be obtained from Dr. Grenfell, and if no success is obtained in capturing the caribou and crossing them with the reindeer I would consider it advisable to do so, as I am sure that the use of the reindeer can be finally made a success in that district. It would not be advisable, however, to consider undertaking another shipment until we have the result of this year's experience with the deer on Hardisty island. As the flies are the worst during early summer, we should have full information in regard to the matter before the season is over.

FOREST PRODUCTS LABORATORIES.

A small appropriation was provided for beginning the work of the Forest Products Laboratories, and arrangements were therefore undertaken for organizing the work.

The location of the laboratories was the first question considered, and at this time McGill University offered to place its timber-testing laboratory at the service of the department and to furnish office accommodation for the staff. It was decided that it would be advisable to accept this offer and to locate the laboratories in Montreal in connection with McGill University for the following reasons:—

(1) That the complete and costly equipment of McGill University for timber-testing would be available without cost, thus saving largely in the expenditure for equipment.

(2) That the advice and assistance of the staff of McGill University would be available for the development of the work.

(3) That Montreal is the main business centre for pulp and paper, the railways and other industries, investigations in connection with which will form some of the most important that will be undertaken.

The arrangement with the authorities of McGill University does not involve any grant to the university, and the only obligation assumed by the department is to permit of the staff of the laboratories delivering occasional courses of lectures and to allow the students doing special investigations at the university the use of the laboratories and the assistance of the staff. On the other hand, the university has undertaken to allow the use of its apparatus to the department and is at present providing accommodation for the laboratories and the staff. It also gives the advice and assistance of the professors in charge of the departments that relate to the work of the laboratories without charge. The university, therefore, is making a most generous contribution to the establishment of the laboratories.

The second consideration was to obtain a superintendent for the laboratories, and, after consultation with the authorities of McGill University and others, the position was offered to Mr. A. G. McIntyre, B.A., B.Sc. Mr. McIntyre graduated in arts from Acadia College, Wolfville, N.S., and in chemical engineering from McGill University. He has given special attention to research work in pulp and paper when at the university, and had some practical experience in such work in connection with pulp-and paper-mills. He was editor of the Canadian Pulp and Paper Magazine and had also organized the Canadian Pulp and Paper Association, of which he was secretary. In order to ensure that the laboratories would be organized on a proper basis and that the plans for the research work would not merely duplicate work already done elsewhere, it was arranged that Mr. McIntyre should visit the Forest Products Laboratory of the Forest Service of the United States at Madison, Wisconsin, and

study the methods followed there and the investigations which had been undertaken. As a result of this study it will be arranged that:

(1) The Canadian laboratories will not duplicate work done by the Forest Products Laboratory of the United States, the results of which are applicable to Canadian conditions.

(2) The methods followed in general by the United States Forest Service will be followed here, and a similar system of record will be established, so that results obtained in Canada may be directly comparable.

(3) The initial mistakes necessarily occurring in the establishment of any new enterprise may be largely avoided by profiting by the experience of the United States.

In this connection I wish to express my appreciation of the courtesy shown at all times by the officials of the Forest Service of the United States and the readiness with which they were prepared to furnish information at any time.

After a careful study of the organization of the Forest Products Laboratory of the United States the following scheme of organization for the Canadian Laboratories was recommended, and, as it has been approved, is now being carried into effect. The divisions of the organization proposed are as follows:—

1. General staff, including clerical work, records, library, and maintenance.

It is of the utmost importance in work of this kind that the records should be complete and kept well up to date. Unless this is the case, the results of work done and the expenditure in connection with it may be wholly lost. The value of experimental work lies largely in its comparability with other experiments or with practical conditions, and comparison can be made only when all the conditions of an experiment are recorded so as to be available in definite form.

A good library, well indexed, dealing with the special subjects taken up in the laboratories, is a necessary part of the equipment. Through the kindness of the authorities of McGill University the library of the university will be available for the staff of the laboratories, but the special nature of the work of the laboratories is not covered fully enough by any general library and must be supplemented by a special library.

Maintenance, which here includes construction, design, and computation, requires special consideration. The equipment, being for the purpose of developing experiments, must be in many cases specially designed by the staff. The computation of results will also require a trained staff and careful and accurate calculations.

2. *Timber Physics.*—This division will investigate the physical properties of woods so as to know the intimate structure, the fibre, the specific gravity. A knowledge of the fundamental characteristics is necessary to all other investigations that may be made as to the usefulness of wood for various purposes, so that the work of this division is primary, and as it involves comparatively little equipment it has been organized at once under charge of Mr. W. B. Campbell, B.Sc.

3. *Timber Tests.*—This covers the testing of the mechanical properties of wood such as strength, bending, elasticity, etc., and is particularly needful in connection with timbers required for structural purposes. The equipment at McGill University makes it possible to begin this work immediately, and shipments of Douglas fir timber from British Columbia and Alberta have been obtained for the purpose of conducting a series of tests of this timber. Tests will be made on small, clear specimens of the timber so as to get as nearly as possible an absolute factor, and will also be made on timbers in the form in which they will be in actual use in construction. This division is in charge of Mr. R. W. Sterns, B.Sc.

4. *Pulp and Paper.*—The pulp and paper industry is one of the largest and most rapidly developing industries of Canada, in spite of the fact that over one-half of our pulpwood product is exported to the United States unmanufactured. It may be confidently expected that Canada will become the greatest paper-manufacturing country in the world with the stores of raw material available. Anything that will tend to eliminate waste or improve the methods of manufacture will assist towards that end. A number of important problems will be taken up and investigated as soon as the necessary equipment can be secured.

The Superintendent of the Forest Products Laboratories has made exhaustive inquiries to determine the best equipment in pulp and paper machinery. The following men of expert knowledge of pulp and paper machinery were consulted by him: Mr. Arthur Hastings, President American Paper and Pulp Association; Mr. John H. Thickens, expert for the Beaver Companies of Buffalo, and director of the Beaver Laboratories, and formerly in charge of the United States Government Experimental Station at Wausau, Wisconsin; Mr. I. H. Weldon, President St. Lawrence Paper Mills, Company, Toronto; Mr. Carl Riordon, President of the Canadian Pulp and Paper Company of Montreal; Mr. J. A. De Cew, Consulting and Mechanical Engineer in pulp and paper, Montreal; Mr. R. O. Sweezy, Manager, Montreal Engineering Company; Mr. Howard F. Weiss, Director Forest Products Laboratory, Madison. Wisconsin; Mr. McGarvey Cline, past Director and Organizer, Forest Products Laboratory, Madison, Wisconsin, now manager of a seven million dollar mill being erected at Jacksonville, Florida. All other possible information was obtained both as to machines in Europe and the United States, and a recommendation which has now been submitted as to the proper machine which should be purchased is the result of the recommendations and suggestions of all these authorities combined and should furnish a machine that will be as fully capable of the work required as it is possible to obtain at the present time.

In charge of this branch of investigations will be Mr. John S. Bates, Chem. E., Ph.D., who has had considerable experience in pulp and paper investigations, having just concluded a special study of the southern pine of the United States in this relation.

While no other divisions of the work will be developed at the present time it is hoped later on to take up other lines of investigation. These would include studies of the fungi and other agencies destructive to wood and of preservatives and methods of preservation. The necessity for reducing waste by prolonging the life of ties, paving blocks and structural timber makes such investigations of great value. The chemical contents of the woods should also be investigated and the methods and results of wood distillation.

Respectfully submitted,

R. H. CAMPBELL,
Director of Forestry.

STATEMENT OF REVENUE, FORESTRY BRANCH, FISCAL YEAR, 1913-14.

Forest Reserve.	Timber Fees and Dues.	Timber Seizures.	Grazing.	Hay.	Land Rental.	Miscellaneous Uses.	Nursery Stock.	Miscellaneous Revenue.	Total.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
Turtle Mountain	146 40	6 00	166 00	119 40	20 00				457 80
Spruce Woods	34 00			31 40					65 40
Riding Mountain	4,572 02	1,205 13		149 70					5,926 85
Duck Mountain	2,443 89	142 40		22 30					2,608 59
Moose Mountain	391 65	17 00	16 25	32 00					456 90
Beaver Hills	29 00			53 00					82 00
Fort à la Corne	151 25	40 00							191 25
Pines	165 85	119 45		23 50					308 80
Nisbet	604 25	101 50		0 70					706 45
Cypress Hills	354 59	56 95		218 80					630 34
Cooking Lake				40 80					40 80
Crowsnest	2,475 58	8 45	38 65	43 00	108 40				2,674 08
Bow River	34 18	34 00		13 25					81 43
Clearwater	2,226 25	558 91			1,475 00	75 00			4,260 91
Brazeau	1,937 11	972 02			33 56				2,942 69
Athabaska				5 00					5 00
B.C. Reserves	39 38			20 55	164 27				224 20
Indian Head Nursery					514 00		1,135 80	58 05	1,707 85
Total	15,605 40	3,261 81	220 90	773 40	2,315 23	75 00	1,135 80	58 05	23,371 34
Refunds									1,062 33
Net Revenue									22,309 01

Timber Permits issued on Forest Reserves, fiscal year 1913-14.

Forest Reserve.	No. of Permits.		Roof Poles.	Fence Rails.	Fence Posts.	Lumber.	Railway Ties.	Mine Timber.	Building Logs.	Fuel Wood.		Amount.
	Free.	Paid.								Green.	Dry.	
						Ft. B. M.		Lin. Ft.	Lin. Ft.	Cords.	Cords.	$ cts.
Turtle Mountain	94	23	14,080	160	3?0	51,200			3,170		5,505	146 40
Spruce Woods	38	11									787	34 00
Riding Mountain	195	329	1,200	500	10,678	1,453,249			7,450	100	4,359	3,632 00
Duck Mountain	227	180	4,920	100	21,060	1,334,405			38,635	155	1,558	1,836 79
Moose Mountain	14	172	11,250	600	4,275				6,480	951	461	391 65
Beaver Hills	116		810	100	9,900	234,625			20,750		1,625	29 00
Fort à la Corne	123	36	2,425	9,800	24,685	123,585			3,200	1,342		151 25
Pines	72	42	855	4,000	1,610				14,360	94	1,963	165 85
Nisbet	25	69	400	1,900	500	9,500			8,000	766	1,598	604 24
Cypress Hills	357	9	79,885	171,540	77,825				510,080	1,814	1,876	140 85
Crowsnest	27	6	8,400	7,175	800	150,000			30,065		418	122 25
Bow River	25	6	1,200	3,400	2,365			6,850	11,750		320	34 18
Clearwater		5				225,000	127,000	17,000	2,500			1,226 25
Brazeau	5	3			100	3,420	40,000	910,000	460,000		55	257 00
British Columbia Reserves	5	6	48						2,542		69	39 38
Totals	1,323	897	125,473	199,275	154,148	3,584,984	167,000	933,850	1,118,982	5,222	20,504	8,811 29

Hay Permits issued for fiscal year 1913-14.

Forest Reserve.	No. of Permits	No. of Tons cut	Revenue
			$ cts.
Turtle Mountain	44	553	119 40
Spruce Woods	17	229	31 40
Riding Mountain	69	1,146	149 70
Duck Mountain	39	123	22 30
Moose Mountain	14	295	32 00
Beaver Hills	23	385	53 00
Pines	9	177½	23 50
Nisbet	1	4½	0 70
Cypress Hills	18	407	218 80
Crowsnest	2	18	43 00
Bow River	8	185	13 25
Cooking Lake	13	343	40 80
Athabaska	4	30	5 00
British Columbia Reserves			20 55
Total	261	3,896	773 40

STATEMENT showing the quantity of Timber Cut and Revenue received therefrom during the Fiscal Year ending March 31, 1914, on Licensed Timber Berths within Dominion Forest Reserves.

MANITOBA.

Forest Reserve	No. of Berths	Area	Quantities Sold			Revenue		
			Lumber	Laths	Other Products	Dues	Rent	Total
		Sq. M.	Ft. B. M	M		$ cts.	$ cts.	$ cts.
Riding Mountain..	5	45	2,138,271	.....	....	1,019 13	227 15	1,246 28
Duck Mountain...	11	100	7,876,926	2,770	.....	4,284 69	499 90	4,784 59
Total	16	145	10,015,197	2,770	.....	5,303 82	727 05	6,030 87

SASKATCHEWAN.

Porcupine and Pasquia	51	1,055	40,479,454	12,945	45,901 ties	22,353 79	5,116 90	27,470 69
Nisbet and Pines..	6	117	.....	....	5,269 cords	1,318 25	173 15	1,491 40
Sturgeon	12	178	20,403,610	3,235	....	7,712 25	891 33	8,603 58
Big River.....	4	283	25,260,690	5,883	336,942 ft, piling 2,134 posts 744 cords	8,795 27	1,416 25	10,211 52
Total.....	73	1,633	86,143,754	22,063	..... .	40,179 56	7,597 63	47,777 19

ALBERTA.

Crowsnest	12	259	3,350,270	....	428,456 ft. mining timber 264 ties 155 posts	1,812 36	1,295 95	3,108 31
Bow River.....	16	374	1,088,350	1,797	46,836 posts	4,747 57	1,860 95	6,608 52
Clearwater.....	4	378	.....	.....	....	....	1,887 80	1,887 80
Brazeau	12	226	....	.....	....	.... ..	1,131 30	1,131 30
Total.....	44	1,237	4,438,620	1,797	.....	6,559 93	6,176 00	12,735 93
BRITISH COLUMBIA	11	134	82,586	.....	.....	41 29	667 85	709 14
Grand total...	144	3,149	100,680,157	26,630	46,165 ties 6,013 cords 336,942 ft. piling 49,125 posts 428,456 ft. mining timber	52,084 60	15,168 53	67,253 13

APPENDIX No. 1.

REPORT OF THE CHIEF OF THE TREE PLANTING DIVISION.

INDIAN HEAD, Sask., March 31, 1914.

R. H. Campbell,
Director of Forestry,
Ottawa, Ont.

SIR,—I have the honour to submit herewith my thirteenth annual report, dating from March 31, 1913.

General conditions affecting tree-growth throughout the west for the past season were on the whole favourable for established plantations, but in the case of new plantings, the spring and early summer months were too dry in most localities. This resulted in a percentage of loss rather larger than the usual average in the case of seedlings, and a very considerable loss in the case of cuttings. In the latter, failures to the extent of 50 per cent were found in several localities where the lack of precipitation during spring was most marked. Rainfall during late summer was rather above the average and resulted in a good growth where plants and cuttings survived the preceding dry weather.

General interest in tree planting is still maintained; especially are farmers now paying more attention to ornamental planting of shrubs and establishing lawns, etc., in connection with the shelter-belts set out under our co-operative system. We have received numerous requests during the past season for plans suggesting the arrangement and laying out of ornamental grounds around farm houses. Although the furnishing of such landscape plans cannot be looked upon as exactly coming within the scope of our work, we have still endeavoured to furnish such plans when time has permitted. This office cannot however, hope to do much work of this nature unless there is added to the staff someone familiar with landscape gardening and horticultural conditions in the west, and also capable of draughting suitable planting-plans. There is no doubt that much general good to the country would be derived if the beautifying of the farm home could be more widely encouraged; but whether that can be looked upon as a legitimate branch of the work of the Tree Planting Division, and developed as such, is a matter worthy of consideration.

Data in connection with the general distribution work of this Division are shown in the tables given hereunder. It will be noted that there is a slight reduction in the number of new applications received this winter. I do not consider, however, that this is any indication of a lack of appreciation of the work of this division, but may be attributed to three causes. The first is a lack of sufficient advertising. The date up to which applications will be received has been set as March 1 in each year. The usual advertisements calling attention to this fact appeared in the farm papers only five or six weeks prior to this date. Then, too, the advertisements are not conspicuous enough to attract general attention. I think that far better results would be obtained if quarter or half-page advertisements could be used for a short time, suitably illustrated and accompanied with well-worded texts calling attention to the advantages of planting, the benefit to the farmers, etc. The small advertisement at present used is more than likely to be overlooked by the average subscriber.

Secondly it is now becoming more generally known that the branch will not furnish trees unless ground has been put in the best state of cultivation, and the tendency is for farmers not to send in applications if they cannot see the way to getting their land sufficiently worked to meet the requirements. In this connection it may be noted

that 10 per cent more of the new applicants last year had their ground ready for planting than was found to be the case with new applicants of the previous season.

The third reason accounting for a reduction in this spring's applications is the general scarcity of money during the past season and at the present time. Several communications have been received stating that lack of funds is the main cause in certain cases for applications being withheld.

On reference to table No. 1 it will be noted that the total number of trees to be shipped out this spring is about 235,000 in excess of last season's figures. This does not include shipments of evergreen stock, which will total about 100,000 more, to be sent to some 375 applicants not included in the figures in table No. 1.

Table No. 1 gives a comparative statement showing the numbers of trees distributed annually since 1910, also the number of applicants on the lists, etc.

TABLE I.—Table of Comparative Data for distribution of Deciduous Stock.

Class.	1910.	1911.	1912.	1913.	1914.
Number of applicants on inspection list	8,318	8,036	7,375	6,987	7,350[1]
Number of applicants receiving trees	3,173	3,285	3,618	3,536	3,585[2]
Number of trees and cuttings distributed (not including conifers)	2,533,600	2,636,100	2,729,135	3,495,375	3,729,765[1]
Average number of trees per applicant	798	721	626	988	1,008[1]
Number of new applications received	3,832	2,656	1,649	1,899	1,559[1]

[1]Compiled March 31, 1914. The figures will be slightly altered when the 1914 lists are completed.
[2]The difference between this figure and the total number of trees allotted on Table III is accounted for by the addition of 113,500 trees which are to be shipped to the nursery station at Saskatoon, Sask.

INSPECTION WORK.

The following inspectors were employed during the past season: Messrs. A. P. Stevenson, Angus Mackintosh, James Cowie, Wm. Macdonald, Geo. Kennedy, Wm. Kynoch, Donald Macdonald and James Craig. The last two were engaged for the first time this summer; both had previously been employed on the nursery at Indian Head, and were thoroughly familiar with the species and methods of cultivation suitable for prairie conditions. Prior to their engagement on the nursery station, both men had spent several years in practical forestry work on large estates in Scotland.

Tables Nos. II. and III. show in detail the districts covered by each inspector, the number of applicants on each man's list, the number of trees allotted, etc.

TABLE II.—Table of Classification for 1914 Distribution.

Class.	A. P. Stevenson.	Angus Mackintosh.	W. Macdonald.	James Cowie.	Geo. Kennedy.	Wm. Kynoch.	James Craig.	Don. Macdonald.	Totals.
Number of applicants on inspection list	498	534	717	1,085	1,019	849	911	1,374	6,987
Number of applicants who had received trees	331	350	475	642	675	515	427	717	4,132
Number of applicants who had not received trees	167	184	242	443	344	334	484	657	2,855
Number of applicants receiving trees in 1914	247	165	444	514	477	423	474	841	3,585
Old applicants receiving trees in 1914	147	61	256	239	245	210	174	522	1,854
New applicants receiving trees in 1914	100	104	188	275	232	213	300	319	1,731
Number of applicants not receiving trees in 1914	251	369	273	571	542	426	437	533	3,402
Old applicants not receiving trees in 1914	67	80	54	168	112	121	184	338	1,124
New applicants not receiving trees in 1914	184	289	219	403	430	305	253	195	2,278
Number of plans drawn up to Feb. 20th	177	143	389	490	359	345	473	733	3,109

NOTE.—There will be a slight alteration of the above figures before the 1914 shipping list is completed on account of cancellations and additions to be received after the date of the compilation of this table Feb. 20, 1914.

TABLE III.—Table showing Distribution of Trees in relation to Districts, 1914.

Inspector.	District.	No. of Men on List.	No. to Receive Trees.	No. of Trees Allotted.	Average No. of Trees per Applicant.
A. P. Stevenson	Central and Southern Manitoba	498	247	191,840	817
A. Mackintosh	Central Saskatchewan, G. T. P., Yorkton Branch and Pheasant Hills Branch, C. P. R. east of Saskatoon	534	165	167,425	1,014
Wm. Macdonald	Southern Saskatchewan West to Assiniboia	717	444	462,700	1,042
G. Kennedy	Northern Manitoba and Saskatchewan	1,019	477	581,625	1,220
J. Cowie	Southern Alberta	1,085	514	522,025	1,015
Wm. Kynoch	West Central Saskatchewan	849	423	395,000	934
J. Craig	Northern Alberta	911	474	481,725	1,016
D. Macdonald	Main Line, C. P. R., in Saskatchewan	1,374	841	813,925	968
*Distribution for 1914: Totals		6,987	3,585	3,616,265	1,008 average.
" " 1913: Totals		7,617	3,519	3,449,952	980 average.

[1]NOTE.—Above figures will be slightly altered on account of supplementary shipments and cancellations, subsequent to date of above table (March 1, 1914).

Following is a summarized report of the conditions in the various inspection districts:—

District covered by A. P. Stevenson.—Plantations visited during 1913 would compare favourably with other years. On account of the extreme dry weather in early spring in the eastern portion of Manitoba the young plantations did not do as well

as those in the western part. The older plantations were all looking fine with the exception of a few into which brome grass had got a foothold. These were in rather poor shape. This pest of trees is much on the increase, especially in the older plantations, and its evil effects are soon noticed. The trees show an unhealthy, decrepit appearance, the leaves fall early and little or no growth is made. The seed blows in among the trees usually from the adjoining fields, but is often introduced in manure that is spread among the trees, and it appears to be a difficult matter to convince planters of the danger of this practice. They mulch to keep down weeds and often introduce the worst of all weeds. One or two hailstorms did some damage among the one-year trees, but this was only locally, and the damage was not much more than in other years from this cause.

District covered by Angus Macintosh.—Manitoba boundary to Saskatoon, Yorkton branch, Canadian Pacific railway, Qu'Appelle valley on the south to the Big Quill lake and Yorkton districts on the north—mileage covered during summer, 3,880 by team and 1,790 by train. The season was favourable to tree-growth, failures being only 7 per cent. The greatest loss was among the willow cuttings. In the new plantations the average growth ran as follows: Maple, 6 to 15 inches, ash, 4 to 9 inches, Russian poplar, 9 to 24 inches, willow, 12 to 24 inches. Evergreens were doing splendidly; 6 per cent would cover all losses. Annual growth ran as follows: Spruce, 3 to 5 inches, jack, lodgepole, and Scotch pines, 4 to 8 inches. Winter-killing was not as conspicuous as in past seasons. The old plantations, as a rule, have made a good growth and have been properly cared for.

District covered by William Macdonald.—Southern Saskatchewan, south of the main line of the Canadian Pacific railway from the Manitoba boundary, west to Assiniboia and Moosejaw. Among the 1913 plantations, maple and ash showed 2 per cent failures. The cuttings were not as good as in the season of 1912. Losses ranged from 50 to 30 per cent, due to the dry weather in the spring and early summer. Considerable winter-killing of maple and willow occurred from range 20, west of the second meridian, to range 2, west of the third meridian. Small branches and tips were affected, but the new growth was good, and the trees recovered from the above-mentioned injury. Some neglected plantations were seen along the Arcola-Moose Mountain section of the Canadian Pacific railway; these were due to the large number of farms in this section which have changed hands during the past year. The snowfall for the winter of 1912-13 was slight, and the spring of 1913 dry—conditions not favourable for tree-growth. Considerable hail-damage was found in the Willow Bunch country. Evergreens were doing very well, with 5 per cent loss on the average. They came through the winter with slight or no injury. Spruce is more in favour than pine, on account of its dense, compact appearance.

District covered by George Kennedy.—Saskatchewan, north of the main line of the Canadian Pacific railway except Yorkton and Pheasant Hills branches and part of Northern Manitoba. The 1913 plantations were made under favourable conditions, but dry weather followed, giving an average of 25 per cent failures with cuttings. The 1912 plantations were extra good and healthy, showing large annual growth, with 25 per cent failures. The older plantations, as a rule, require no further cultivation, and are making good headway. Drought was not as injurious in this district as in other parts of the west. There was little or no winter-killing. The largest and best plantations were found in the district west of Saskatoon. All species distributed are adaptable to this district. Maple shows the largest annual growth when young. Evergreens make excellent growth; the failures would average 5 per cent. The instructions supplied by the Forestry branch have been followed.

District covered by James Cowie.—Southern Alberta, including the main line of the Canadian Pacific railway from Dunmore Junction to Cochrane. The 1913 planta-

tions showed 5 to 10 per cent loss in seedlings, and 35 per cent loss in cuttings, very little rain having fallen during the spring and early summer. The failures were much less in irrigated districts. Among the 1912 plantations the best showing was made by ash, Russian poplar, and caragana. Winter-killing of maple, cottonwood, and willow was conspicuous; these species have not made successful headway. The winter killing was most evident along the foot-hills country and in dry belts. In the Monarch district a species of blister beetle had done considerable damage to the young wood and leaves of the caragana, and in several other districts the willows had been attacked by a caterpillar. In the fall the plantations seemed to have ripened their new wood and were in a healthy, hardy condition to withstand the winter. Evergreens on the whole have been very successful, showing 3 to 5 per cent of loss. All species planted are apparently suitable to Alberta conditions.

District covered by William Kynoch.—Central Saskatchewan west of Saskatoon: The 1913 plantations were rather backward in starting growth. The spring was cool and dry, and the average loss among cuttings was 15 per cent. The 1912 plantations averaged 10 per cent failures. Freezing back was noticed in the cottonwood, maples, and willow. The older plantations were healthy and well established. On every variety of soil, encountered in the district, thoroughly successful plantations were seen, and in practically every case where the instructions of the branch as to the planting and subsequent treatment were carried out satisfactory and encouraging results followed.

District covered by James Craig: Northern Alberta.—The 1913 plantations as a whole made a good start, the greatest loss being among cuttings. The loss among the maple and ash was 5 per cent, among cuttings 25 per cent. The older plantations are well established. Few plantations in this district were planted prior to 1911. There were a few instances where maple and willow were frozen back, and a few plantations suffered from hail-storms. The evergreens were doing very well. The varieties which have been supplied are suitable to soil and climatic conditions. As a rule, proper cultivation and attention have been given to plantations.

District covered by Donald Macdonald: Main line Canadian Pacific railway in Saskatchewan.—The 1913 plantations have made good growth, showing 5 per cent loss in maple and ash, and 25 to 30 per cent in cuttings. Among the 1912 plantations some winter-killing was found in districts south of Moosejaw, but was not so conspicuous farther west. There was a good annual growth in 1913. The older plantations close to the main line give evidence of successful tree-planting on the prairies. Some damage was done in the south country through hail-storms. On the whole, plantations were well cared for and farmers showed a great deal of interest in tree-planting.

OFFICE WORK.

The work of preparing planting plans and compiling the distribution lists and the inspectors' lists for the coming summer is taken up in the office during the winter months. This work is carried on under the immediate supervision of Mr. S. S. Sadler, with the assistance of five of the inspectors.

The following tabulated statement of plans prepared and correspondence handled shows a small increase for 1913 over the previous season:—

	April 1, 1912, to March 31, 1913.	April 1, 1913, to March 31, 1914.
No. planting plans prepared	3,000	3,109
No. pieces mail received	14,161	14,387
No. pieces mail sent out	21,466 (inc 3,000 plans "franked").	21,122 (inc. 3,109 plans "franked").[1]
No. new files added	2,943	2,598

[1]This does not include bulletins, these being sent out from the office at Ottawa.

EXHIBITS.

An exhibit was prepared for the Dominion Fair held at Brandon during early August. This exhibit was prepared by Mr. Sadler, and consisted of an inside collection of native woods, tree-seeds, photographs, etc., and also an outside demonstration plot, part of which is planted permanently to certain varieties of the hardy conifers and a few ornamental shrubs, the other part being laid out to illustrate a small nursery plot such as would meet the requirements of an individual farmer. On this plot are small seeed-beds of the best conifers, showing seedlings one and two years old, and also transplants of three and four years old. There were also nursery rows showing propagation of maple and ash from seed, as well as poplar and willow from cuttings.

NURSERY WORK.

Results on the nursery during the past summer have been very satisfactory. Although the spring was somewhat dry, no bad effects were apparent in the germination of seed or growth of stock. The late summer was rather exceptionally wet, and this resulted in more than the average amount of lost time, and considerable difficulty in keeping down weeds. All stock matured well. Owing to an exceptionally early freeze-up we were prevented from digging some 5 acres of maple seedlings and a large plot of tamarack. The maples will have to be carried over for another season. The tamarack, however, will be lifted in the spring, as they would be too large to handle if left for another season's growth.

Areas devoted to the different varieties of stock were as follows:—

	Acres.
Broadleaf—	
Maple seedlings, 1 year old	28½
Ash seedlings, 1 year old	25
Ash seedlings, 2 years old	20
Caragana seedlings, 1 year old	5
Willow-cutting stock	5
Russian poplar-cutting stock	2
Conifers—	
Transplants	9
Seed-beds	¾
Total	95¼
Seed sown in fall of 1913—	
Maple	10¼
Ash	21
Caragana	5½
Total	36¾

The following stock is available for distribution this spring (1914):—

Deciduous Stock—		
Maple (1-year seedlings)	1,445,000	
Ash (2-year seedlings)	1,240,950	
Caragana (seedlings)	233,425	
Russian poplar (cuttings)	203,000	
Willow (cuttings)	690,225	
Tamarack (4-year transplants)	38,690	
Siberian larch (4-year transplants)	8,800	
		3,860,090
Evergreen (not actually dug, but a close estimate)—		
Scotch pine (4-year transplants)	17,556	
Jack pine (4-year transplants)	15,982	
Lodgepole pine (4-year transplants)	48,775	
White spruce (5-year transplants)	37,955	
Colorado spruce (6-and 8-year transplants)	1,963	
Norway spruce (5-year transplants)	5,688	
Bull pine (4-year transplants)	3,457	
Flexilis pine (5-year transplants)	294	
Concolor fir (5-year transplants)	1,261	
		132.931
Grand total		3,993,021

This total is about 100,000 less than that available last season, but had we been able to lift the 5 acres of maple referred to above it would have increased the present total by some 400,000.

A considerable proportion of the above stock will be needed this spring for planting on the new nursery station at Sutherland, Sask.

COLLECTION OF SEED.

The past season was a poor one for seed collection. No seed of ash and maple could be secured in quantity in Saskatchewan. Search for maple and ash seed was made in many districts in Manitoba, but Brandon seemed to be the only place where large supplies could be collected.

The following seeds were collected:—

	Weight in Pounds.
227 bags maple seed at Brandon	3,446
9 " " near Indian Head	198
10 " ash seed " "	200

Cones were also collected as follows:—

36 bushels jackpine.
47 " lodgepole pine.

CONIFERS.

Seed-beds.—Three thousand six hundred square feet of new seed-beds were sown, principally of white spruce and Scotch, lodgepole and jackpines. Including two and there-year-old seedlings there were altogether 10,000 square feet of seed-bed of all ages. The stands of seedlings throughout are uniformly good, and the stock shows good growth.

Transplants.—The following seedlings were moved to the transplant plots:—

Scotch pine	77,924
Lodgepole pine	49,872
Jack pine	54,524
White spruce	240,797
Black spruce	3.504
Douglas fir	3,175
Magnus pine	500
Juniperus sabina	200
Total	430,496

Altogether, 9 acres were devoted to transplants of all ages up to 5 years.

EVERGREEN DISTRIBUTION.

Seventy-four thousand four and five-year transplants were dug in the spring of 1913 and the greater part of these were shipped out. A small number was used in the plantations at the Nursery Station and for lining out to be grown on with a view to having some larger stock to plant on the Saskatoon nursery in 1914. Forty-two shipments were made to Manitoba, 188 to Saskatchewan and 40 to Alberta,—a total of 270 lots made up of from 100 to 500 plants each.

Reports regarding the success of these evergreens are particularly encouraging, not more than 6 or 8 per cent of the trees having been lost. In some cases the planters report no deaths at all, and in others only one or two out of 500. Only one or two odd reports were received showing a much larger loss, and undoubtedly in such cases failures may be attributed to bad handling or planting on unfit soil. The pines will not stand planting on soil that has the least trace of alkali. Spruce is not so easily affected. Unfortunately, the unsuitability of the soil may not be apparent until some months after planting, when the needles of the pines commence to turn a greenish yellow or light-yellow colour. If this is noticed in time the plants may be saved by moving them to soil free from alkali.

The distribution of evergreens was commenced in 1912. The trees sent out stood the winter well, and favourable reports have been received as to their second season's growth. Undoubtedly the hardy coniferous evergreens when once established, are better suited in every way to prairie conditions than are the ordinary deciduous varieties, the only drawback being that the expense in connection with their propagation makes it practically impossible to turn them out in anything like the large numbers of the deciduous stock that are handled.

PERMANENT PLANTATIONS.

The permanent plantations, now aggregating nearly 100 acres, showed excellent growth during the past season. The plantations of Scotch pine set out in 1906 are a particularly valuable demonstration as to the possibilities of this variety for shelter-belts on the prairies. The tamarack, too, continues to make splendid growth. The first plantation of this variety set out in 1903 on backsetting now stands 20 feet high. In connection with some ornamental planting it was necessary last fall to cut out a dozen or more of these tamaracks which were encroaching too much on some white spruce. Several of these trees cut up into quite serviceable 7-foot posts, running from 2½ to 3½ inches in diameter at the tops.

The possibility of growing fuel has been practically demonstrated in connection with plantation No. X, a three-quarter-acre plot of Russian poplar. This plot was set out in the spring of 1906 on backsetting, broken in the spring of 1905, and extra well worked. The stock used was one-year rooted cuttings of *Populus certinensis* and *Populus Petrovski* in about equal proportion, spaced 4 feet apart each way. The growth of this plantation was rapid from the very start. Cultivation was continued during 1906 and 1907, but no work was needed after that as the trees then covered the ground, making further cultivation unnecessary.

In 1909 and 1910 some heavy pruning was done to get stock for cuttings which we were short of in those seasons. This seemed to be rather injurious to the trees, as in 1911 and 1912 the usual canker made its appearance. I think that the cutting of the limbs induced this canker to develop earlier than it otherwise might have done by providing wounds where spores could readily enter the tissues, for although the Russian poplar always shows this disease sooner or later, it does not as a rule develop until the tree is at least ten years old.

Last summer this canker seemed so general in the plantation (in many cases weakening the trees to such an extent that the main trunk would break off at the

diseased point), that it was decided to cut half of the plot. The other half was left in order to see just how much injury the canker would cause later on, and the cut-over portion was allowed to sprout again and form a second growth which may or may not show evidences of the disease.

The results of the cut portion show without any possibility of question the feasibility of the prairie farmer growing his own fuel. From three-eighths of an acre were cut and piled 6¾ cords of very fair fuel, the sticks averaging from 6 to 8 inches in diameter. This, on an acreage basis, means a yield of 18 cords per acre. Poplar cordwood sells locally at from $4.50 to $8 per cord delivered, the price depending upon quality. The wood cut in this plantation is at least equal to the poorest quality sold, and would therefore show a gross acreage yield of $81 after eight seasons' growth.

The figures in connection with the labour cost of establishing this plantation, and, later, cutting and cording, calculated on an acreage basis, are as follows:—

1906, planting and cultivating, $15.20 at 5 per cent, 7 years	= $21.35
1907, cultivating, $9.05 at 5 per cent, 6 years	= 12.13
Fall 1913, cutting and cording,	= 46.93
Total	$80.41

In this particular case then the yield of this plantation would show a return of slightly more than 5 per cent on the actual labour expended. As against rent of land, cost of stock, etc., can be placed the value of the plantation in the meantime as a shelter and as an ornamental feature: also the value of cuttings taken off during this period at various times to extend the plantations. In this case several thousands of cuttings were taken off in 1909 and 1910,—about 30,000 in 1909, and 20,000 in 1910. These are worth at least $1 per thousand, being quoted commercially at from $2 to $4. This would mean $50 which should properly be credited to three-quarters of an acre (the actual size of the entire plantation).

To give an idea of the growth in this plantation, the following measurements taken in the fall of 1912 are submitted:—

Average height 21 feet 2 inches, maximum height, 25 feet 11 inches.
Average new growth, 2 feet 1 inch, maximum new growth 2 feet 7 inches.

Considering these figures as applied to an average farm plantation we believe that the establishing of an acre of trees would not necessarily add a single dollar of actual cash paid out in wages, as the planting and cultivating would be done at convenient times with the ordinary labour of the farm. Figures submitted above for cutting and cording are very high; first, because great care was taken to cut the wood the exact length and cord it accurately so that there might be no mistake as to the actual yield; and second, because the cost of clearing up and carting off all brush and tops is included.

I do not, on the strength of this result, recommend the Russian poplar as the variety to be used in every case for fuel production. Neither does the fact that this particular lot was cut after eight seasons mean that this is the most profitable time to cut, though in this particular instance it may have been. Had the plantation been in a good thrifty condition and not affected by canker there would have been no cutting till the trees had attained larger size. The figures, however, show the possibilities in connection with the growing of fuel in a very short time.

There are at the nursery station several other plantations of other varieties, such as maple, cottonwood, birch, tamarack and willow, all of which indicate that a good return from fuel may be expected in a comparatively short time.

I am, however, personally of the opinion that the Russian poplar under average conditions will give quicker results in the shortest time for the least expenditure.

New Plantations.—The following new plantations were set out in the spring of 1913:—

Norway poplar and Manitoba maple in equal mixture, 2¼ acres.
Russian poplar and Manitoba maple in equal mixture, 6¾ acres.
Red or Russian laurel willow and maple in equal mixture, 3 acres.

The Norway poplar is a variety of comparatively recent introduction. It is evidently a horticultural variety of the common cottonwood (*Populus deltoides*). It, however, grows very rapidly, resembling very much the Carolina poplar in habit and leaf. We have only had this variety a few years, having got our first stock of cuttings four years ago. The growth has been so far extraordinarily vigorous, and though there are signs of slight winter-killing, this variety appears hardier than the Carolina poplar. The growth, however, is so rapid that this variety may prove quite valuable as a fuel-producer in districts where it will not winter-kill too severely.

Of the red or Russian willow mentioned I do not know the exact botanical designation. Cuttings were obtained from John Caldwell, of Virden, Manitoba, about six years ago. This willow is sold by him as the red willow. This is quite distinct from the golden willow, acute-leafed willow, or common laurel willow. The growth is extremely vigorous, much more so than the other varieties mentioned, and the tree seems quite hardy.

The cottonwood (*Populus deltoides*) has shown itself quite unsuited to planting in pure stands on the soil here. The soil on the nursery might be classed as a medium light clay loam with clay subsoil. The soil on the Experimental Farm is a heavy clay, and here the cottonwood seems to thrive very much better. However, even on the heavier soils I think it would always be advisable to plant cottonwood in equal mixture with Manitoba maple. A 3-acre plantation of cottonwood set out in 1908 had to be rooted out last season, as a very large proportion of the trees failed to live, and those that did survive did not appear to be in a thrifty condition. In some seasons the cottonwood is badly affected by a leaf rust, which evidently weakens the tree to a very marked extent. Apparently this rust is more prevalent on the lighter soils, or so it would appear from our observations. There is on the nursery a very thrifty plantation of cottonwood and maple set out in 1906, mixed in equal proportions, while immediately adjoining, and planted on the same day under exactly similar conditions, is another plot of pure cottonwood in a most unthrifty condition. In the former case there is a fine ground-cover and no possibility of any weeds or grass coming up under the trees, while the belt itself is a dense wind-break. In the second plot there is now a heavy growth of grass and weeds, and although about 50 yards wide, the belt is practically useless as a shelter from the wind.

ORNAMENTAL GROUNDS.

The lawns, shrubs, and border plantings surrounding the buildings made a fine appearance during the growing season. A small addition to the ornamental planting was constructed last spring in connection with the new boarding-house recently erected.

GENERAL FARM WORK.

The usual grain and hay crops were grown to supply feed for the horses. An additional 33 acres of new land was broken and backset on the southern quarter and about 35 acres of summer-fallow ploughed and kept in cultivation. There are still about 80 acres unbroken, but this is so rough, scrubby, and cut up with bluffs and sloughs that clearing and breaking will be a slow and comparatively expensive work.

We have now approximately 400 acres under cultivation, made up about as follows:—

	Acres.
Permanent plantation and shelter-belts	100
For propagation of nursery stock	117
Crop land, hay, summer-fallow and pasture	100
Ornamental grounds, variety plots, roads and waste land in coulee and dam	83
	400

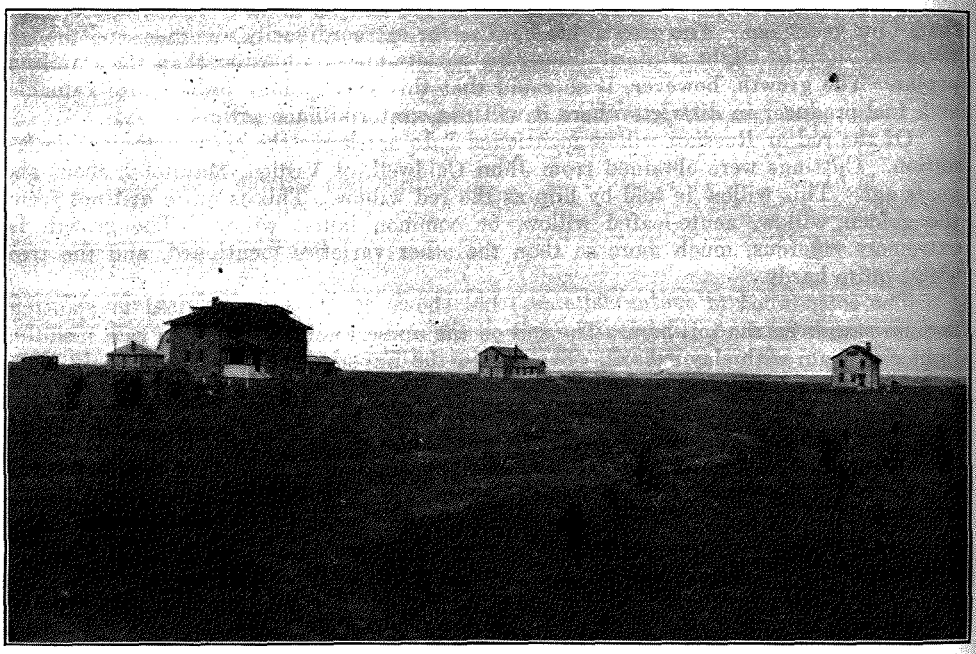


Photo by N. M. Ross.

View from Intersection of Main Drive and Approach to Residence looking Northeast, at the Forest Nursery Station at Sutherland, Saskatchewan.

SUTHERLAND NURSERY.

Work was commenced on the land at Sutherland to put it into shape as soon as possible for the production of nursery stock. This nursery contains 320 acres, which at time of purchase in the spring of 1912 was all in stubble. As no buildings could be erected that season it was decided to have the land summer-fallowed by contract. Unfortunately, this was not done until very late in the season, and as a consequence the land got in a very dirty condition, being very badly overgrown with couch grass and wild roses, beside the usual annual seeds. The couch grass, however, was the worst feature, and the late summer-fallowing was not at all effective in getting rid of it.

In the spring of 1913 the necessary horses and equipment were purchased, and, as no buildings had yet been erected, the teams and men had to be housed in the village of Sutherland, some three-quarters of a mile from the south boundary of the nursery.

The work has so far been carried on under the direct supervision of Mr. W. B. Guiton as Acting Superintendent. Some 14 acres of ash seed were sown on what

appeared to be the cleanest portion of the land in the spring and about 5 acres of cutting stock of Russian poplar and willow were also planted. The dry spring and the rapid growth of the couch grass resulted in practical failure of these first attempts, and later in the season it was thought advisable to thoroughly plough the land to eradicate the grass and give up any hope of growing stock under such adverse conditions.

Some 22 acres were seeded down to grass for hay in 1913, and 22 acres sown to oats for feed; about 10 acres adjoining the stables were also sown to permanent pasture.

During the summer all the remaining ground on the south quarter was thoroughly summer-fallowed and constantly worked, so I trust that all grass and roses will have been eradicated.

The main drives and cross-roads were marked out and roughly graded.

In the fall, about 20 acres more of ash seed was put in. The construction of the buildings was commenced by the Department of Public Works, but much delay was occasioned owing to no tenders being received, so that later it was decided to go ahead with the work by day labour. The buildings erected comprise: a brick residence for the Superintendent, 41 feet by 40 feet; a frame house for the men, 26 feet by 28 feet; a stable, 32 feet by 76 feet; a packing shed, 50 feet by 24 feet, with workshop 24 feet by 16 feet attached; an implement shed, 54 feet by 24 feet; pumping plant, 32 feet by 24 feet, containing pump, engine, and two compression tanks of a capacity of 1,000 gallons each, and the water and sewerage system.

The frame house mentioned will later be used as a foreman's house as soon as a larger boarding-house for the men can be erected. The equipment is very complete throughout, the buildings being conveniently arranged both as to their interiors and to their relation to one another. The work on these buildings has only just been completed.

The north quarter of the nursery was rented for cropping, as it would have been impossible for this branch to handle the land without doubling its equipment of horses and implements; besides as there was no accommodation for labour on the place itself the latter course would have been a very expensive undertaking.

This spring (1914) it is hoped to complete all the permanent planting in the way of shelter-belts and ornamental planting. The stock necessary for this purpose will be shipped from the Indian Head Nursery Station. In connection with the ornamental planting, detail plans have been prepared for all the different varieties of shrubs and specimen trees. There will be a considerable amount of work to accomplish in the way of levelling, grading, and cleaning up around the buildings preparatory to seeding down lawns, etc.

Blocks of willow and Russian poplar will be set out to supply future cutting stock. Land will be further worked up for seed sowing in the fall of 1914, and spring of 1915 so that in the spring of 1916 we should be able to put out between two and three million cuttings and seedlings from this station.

Respectfully submitted,

NORMAN M. ROSS.

Chief of the Tree-planting Division.

APPENDIX No. 2.

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR MANITOBA.

WINNIPEG, May 16, 1914.

R. H. CAMPBELL, Esq.,
Director of Forestry,
Ottawa.

SIR,—I have the honour to report on the Manitoba Inspection district for the year 1913-14 as follows:—

BOUNDARIES.

No changes are suggested in the boundaries of any of the reserves in this district, other than on the Spruce Woods, where an addition to the reserve might well be made by taking in those parts of the south half and northwest quarters of sections 1, 2, and 3 in township 10, range 15, west of the first meridian, being south of the Canadian Northern Railway line, and which, while of practically no value for agricultural purposes, would be of use for grazing if included in the pasture now being enclosed. If these were obtained it would obviate the necessity of building a fence along the north side of the pasture, as the present railway fence could be used.

An alteration was made in the Duck Mountain reserve by adding that portion of townships 29 and 30 in range 28 west of the principal meridian, which is east of the Shell river, excepting section 1 and the east half of section 2 in township 29, range 28, west of the first meridian.

MARKING OF BOUNDARIES.

Where not already clearly marked, all boundaries should be cut out, blazed, and posted, even if it is not found possible or advantageous to construct fire-lines along them. Some splendid work along these lines was done on the Riding Mountain reserve during the year, and it is expected that a considerable portion of this work will be accomplished on all the reserves in this district during the present year.

PERSONNEL.

There has been a marked improvement in the general work of the staff and, with the exception of some three or four rangers, all have worked well and shown interest in their duties, but one suspension having been called for; the ranger in this case was exchanged to another reserve, where it is hoped he will render better service.

FIRES.

There have been practically no fires in the district during the year. Weather conditions in the spring were most favourable, and, though grave cause for alarm existed in the fall, owing to the excessive rank growth of vegetation and the absence of rain, which caused nearly all of the sloughs and streams either to become completely dry or be greatly reduced in volume, we were fortunate in having no serious outbreaks. Close and constant supervision was urged on all officers.

The fires that occurred are as follows:—

1. *Spruce Woods.*—Covering one and a half sections, supposed to have been set by a Canadian Pacific engine; cost, $11; ran over 160 acres of young growth (poplar); occurred in April. 2. Covering seven sections, thought to be incendiary, but guilty party not known; cost, $40; ran over two sections of young poplar; occurred in April.

Riding Mountain.—1. Covered some four sections; no damage to timber, other than quarter section young growth; balance, dead spruce and poplar; supposed to have been set by Indians. Cost to extinguish, $44. 2. A small grass fire, no damage; put out by ranger; no charges; cause not known. 3. Small grass fire as above.

Turtle Mountain.—1. Covered one-half acre grass; set by some one not known; put out by ranger; no extra help; no damage; occurred in May. 2. Covered one-quarter acre grass, set by some person not known; put out by ranger; no extra help; no damage done; occurred in May.

Duck Mountain.—1. Covering 560 acres; supposed to have been set by trappers in April; some 60 acres timber destroyed; put out by ranger; no extra cost. 2. Covering some 1,300 acres; supposed to have been set by trappers; destroyed some forty 15-to-20-year-old spruce; cost to extinguish, $22.50; occurred in May. 3. Small fire discovered and at once put out by a temporary ranger, no damage done; occurred in October. 4. Covering some 400 acres; thought to have been caused by trappers; burned about 150 acres young growth; cost to extinguish, $7.50, occurred in November. 5. Covered 200 acres; set by settlers; no damage done; only scrub burned; cost to extinguish, $10.70; occurred in November.

IMPROVEMENTS.

The improvements on the different reserves have been carried out to the best possible advantage and good value received for all outlay. They have consisted of buildings (such as ranger houses and cabins, stables, store-houses and look-out towers), roads, trails, bridges, telephone lines, fire-guards, boundary lines, fencing, pastures and the opening of summer resorts, particulars of which are furnished in the reports of the several supervisors.

GRAZING.

As yet grazing has been established only on the Turtle Mountain reserve, where some 29,000 acres, including numerous lakes, have been enclosed with a woven-wire fence. The use of these lands by settlers in the surrounding country is increasing yearly, and it is expected that a considerably greater number of stock will be pastured during the coming season than formerly.

It is the intention to divide this pasture so as to prevent stock from approaching too close to the international boundary line, as in the past some trouble was caused by stock getting out and trespassing on the farms of settlers over the line.

This is an ideal pasture, and is of marked benefit to the settlement.

A similar proposition is under way on the Spruce Woods reserve, south of Carberry, where some 8,500 acres will be enclosed, the material being now on the ground and some of the posts set. This tract is also a good grazing area, though not quite as advantageous as Turtle Mountain owing to the absence of natural water supply. This lack, however, will be overcome by the use of pumps operated either by wind mill or a gasoline engine. The settlers in the vicinity are looking forward to the opening of this pasture, and it is expected that ere long it will be fully stocked. The rates charged on these enclosed pastures are $1 per head for the season, a charge which appeals to the public. A herder is kept on the Turtle Mountain during the grazing, which practice will be carried out on the Spruce Woods reserve, and the duties demand a close supervision of all stock taken in.

Open grazing has been instituted on the Riding Mountain reserve this season, and it is expected that many settlers will take advantage of the good grazing land which is available on both this and the Duck Mountain reserve, several applications having been received. On these last two reserves the tracts where it is proposed to graze are ideal for the purpose, being well watered and carrying heavy crops of grass and pea-vine. Stock should do well and the project prove of great value to the country tributary, as for some time past, owing to the private lands being so largely enclosed and brought under crops, settlers have not been in a position to provide summer feed for any considerable amount of stock, the result being a marked depreciation in the stock industry.

USES OF LANDS.

It is to be hoped that the public will make use of the reserves in every way possible by taking advantage of the summer resorts, one of which, at Arbor island on lake Max in the Turtle Mountain reserve, some 16 miles south of Boissevain, has been in operation for some years; here a number of cottages are occupied throughout the season and more are to be erected this season.

A number of lots have recently been surveyed on the main land on the shore of lake Max, close to the supervisor's headquarters, where parties who do not care to locate on the island will erect cottages. A dock has been built for the convenience of the people at this point, and the resort is largely used by the residents of the neighbouring towns and the farmers.

A summer resort has been laid out at Madge (or Island) lake in the Duck Mountain reserve, some sixteen miles northeast from Kamsack, Sask., an ideal spot, where it is expected a number of cottages will be built as soon as the plan is in the hands of the supervisor so that lots may be selected. A road is under construction from the edge of the reserve to the resort, and it is said the municipal authorities will improve the portion out of the reserve so that automobiles as well as horse-drawn vehicles may travel without difficulty. This should prove a most attractive resort and will without doubt be appreciated by the public. Many inquiries have for some time been made as to when lots will be available.

Another summer resort is to be established on the south shore of Clear lake in the Riding mountains, some 35 miles north of Minnedosa, where there is a beautiful sheet of water some seven by three miles. A most desirable spot has been selected, and this will attract the residents of Minnedosa, Neepawa, and other towns adjacent. A good road has been built to the lake, and all classes of vehicles can travel it with ease. Some further improvements will be made to this before the lots are placed on the market and it is to be hoped that every effort will be made to hasten this survey and the preparation of the plans.

As yet no further demands have been made for such resorts, but in event of this occurring steps should be taken to open them up as a means of securing the good-will and interest of the public in the policy of conserving the reserves generally.

TRESPASS.

Trespassing has been confined to cutting timber without permit or in excess, and but one instance where large quantities are involved has occurred. This is now being investigated, so that exact figures are not to hand, but it is thought that these will reach some 400,000 feet board measure. The general public are appreciating the fact that regulations are enacted for their benefit and consequently are paying more attention to them from year to year.

There are some seven settlers located in that tract, enclosed by the Shell river, which was added to the Duck Mountain reserve. Instructions have been issued to the supervisor to inspect and report on their improvements with a view to arranging for their removal.

From time to time squatters attempt to gain a foothold in the reserves, but these parties are at once notified to move out as soon as their presence is discovered.

SURVEYS.

A survey was made of the southerly lines of the Spruce Woods reserve last summer, carried out by the forest assistant at that time attached to the reserve, and the boundaries marked out. Such further surveys as may be required can, I think, be done by the staff of the several reserves, and would be mainly in the way of establishing the location of timber areas, though some work along these lines may be required in cases where roads, trails and telephone lines are required.

I must draw attention to the need of a survey to be made at the earliest possible date of the summer resort at Clear lake in the Riding mountains and Madge (or Island) lake in the Duck Mountains.

FISH.

It is proposed to stock Clear lake and Madge (or Island) lake, in the Riding and Duck Mountains respectively, with pickerel, which are good game and edible fish. When in Ottawa I called on Professor Prince, and learned from him that the best plan was to take mature fish from some convenient point just before spawning, and have arranged to secure these at Winnipegosis, the most accessible place where they can be secured, and the Canadian Northern Railway Company kindly promised to furnish transportation over their lines free of charge. This will be taken up as soon as the fish run up the Mossy River, and nets can be set, the services of a competent fisherman having already been secured.

Should this venture prove successful, I would recommend that some other suitable lakes be stocked, as at present they contain only jack or pike, suckers and small perch. Steps should be taken to eradicate, or at least reduce, the number of suckers, which are of no value and are most destructive to the propagation of other and better fish.

Lake Max in the Turtle mountains might well be stocked, as I learn there are not as many or as large fish caught there now as in former years. Suckers and jack are the only varieties found there; I have been told there were some fry of black bass introduced some years ago, but I have never heard of any being taken.

GAME.

The game is under the management of the provincial authorities, and considerable criticism is indulged in, owing to the entire prohibition of shooting in either the Turtle Mountain or the Spruce Woods reserves. From my own point of view I think that small game might well be killed during the open Manitoba season on all the reserves, but the authorities have ruled otherwise.

Prairie chickens were very numerous last season in the Turtle mountains, and it is claimed by the settlers living adjacent that considerable damage was done to their crops; and from my own personal knowledge I can say that these birds, when disturbed on the fields, at once sought safety in the reserve.

I do not think there is any danger of the supply being seriously reduced, provided the regulations are enforced in the close season.

As far as duck and geese are concerned, they are simply preserved on this side of the line for the benefit of our American neighbours who, I understand, shoot them indiscriminately as soon as they cross the border—this especially south of the Turtle Mountain reserve.

As to big game, the number of elk is seriously reduced in the Riding Mountain reserve, which is practically their last home and refuge in Manitoba. Should much

further reduction be made in their numbers, I fear speedy extermination will be the sure result, and a close season for some few years would be most beneficial. There are elk to be found in other localities not on our reserves, and a few frequent the Duck Mountains. Moose are numerous in the Riding and Duck Mountain reserves, and when in the Spruce Woods recently I found evidences of there being a few in this locality. Jumping deer are found in all of the reserves, and are not killed to any great extent, as hunters, being limited to one deer of any variety in a season, kill the moose or elk in preference.

Beaver are getting quite numerous in the Riding and Duck mountains, where many new dams are to be found, and a colony has established itself on the Spruce Woods reserve. These, however, are closely protected all through the province, and have been for a number of years.

Black and brown bears are found in both the Riding and Duck mountains, a number being taken each year, but I have not heard of any being seen in either the Turtle Mountain or Spruce Woods reserves.

EQUIPMENT.

The several reserves are now fairly well equipped, three of them being supplied with horses, the Duck Mountain being the only one not yet furnished, as the supervisor considers it more advisable, so far, to hire when required. The oxen which were in use on the Riding and Duck Mountain reserves, though proving useful at the time, were found unsatisfactory on account of slowness and the difficulty in hiring men to work them, and, in consequence, they were sold.

EDUCATION AND PUBLICITY.

Efforts are being made to interest the public in the protection of the reserves, and to impress them with the value they will be in the future. Most of the officers are doing all they can along these lines, and it is gratifying to know that a much better feeling exists among the settlers as to the reserves than in the past, this doubtless owing to the interest taken by the officers, and the work accomplished, as well as the benefits derived from grazing, timber, and summer resorts.

Respectfully submitted,

F. K. HERCHMER,

Inspector of Forest Reserves for Manitoba.

APPENDIX No. 3.

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR SASKATCHEWAN.

PRINCE ALBERT, SASK., May 18, 1914.

R. H. CAMPBELL, Esq.,
Director of Forestry,
Ottawa.

SIR,—I beg to submit the following report on the Saskatchewan Inspection District for the fiscal year 1913-14.

ORGANIZATION.

The Saskatchewan Inspection District was started April 10, 1913, by the opening of an inspection office at Prince Albert, Sask. At the time the organization of the district was undertaken, it comprised five forest reserves with an area of 1,248·19 square miles. Additions were made by Act of Parliament on June 21, 1913, and in May, 1914. Table No. 1 shows the names of the forest reserves and their areas in 1912, 1913 and 1914.

TABLE No. 1.—Areas of Forest Reserves in Saskatchewan Inspectorate.

Name.	Area, 1912.	Area, 1913.	Area, 1914.
	Sq. Miles.	Sq. Miles.	Sq. Miles.
Beaver Hills	99·00	99·00	99·00
Moose Mountain	156·00	156·00	156·00
Nisbet	14·94	149·49	149.49
Pines	152·75	166·15	166·15
Porcupine No. 2	360 00	564.75	3,246·75
Porcupine No. 1 (Manitoba)	312·00	777·50	777·50
Fort à la Corne	0·00	513·00	513·00
Big River	0·00	0·00	1,342.00
Dundurn	0·00	0·00	63·25
Elbow	0·00	0·00	119·00
Keppel	0·00	0·00	86·25
Manito	0·00	0·00	179·65
Pasquia	0·00	0·00	2,615·00
Sturgeon	0·00	0·00	729·00
Seward	0·00	0·00	30·75
Steep Creek	0·00	0·00	7·00
Total	1,094·69	2,425·89	10,279·79

The Dundurn, Elbow, Keppel, Manito and Seward reserves are located on the prairie, and have practically no tree-growth at the present time. The soil is wholly sandy and unsuitable for agricultural purposes. These small prairie areas were set aside with the idea that reforestation would be started as soon as conditions per-

mitted. A careful examination of these reserves will be made during the coming summer for the purpose of ascertaining the best method to use in restocking. The remainder of the reserves are more or less timbered, and will gradually restock by natural methods (except certain areas on the Beaver Hills, Pines, and Nisbet reserves) provided adequate fire-protection can be secured.

BOUNDARIES.

The boundaries of the present reserves are well located, except in a few instances. The east boundary of The Pines, certain portions of Nisbet, and Fort à la Corne, and that part of the Porcupine from Hudson Bay Junction to Bowsman, south of the Canadian Northern Railway tracks, should be carefully examined, and all non-agricultural lands included in the reserve which at present separate the reserve from agricultural or railway lands. The boundaries of forest reserves in this district should be so located that all land suitable for agriculture should be excluded, but the reserve should include all non-agricultural land, so that there will be no land between the reserve and agricultural areas over which there is no supervision. Any areas of this nature are a source of trouble both to the settlers and reserve officials, as well as a source of danger to the reserve. Where there is no supervision, the areas along the boundary of the reserve are always fire-traps, and lead to trespass on reserve lands.

Practically all of the sandy, mountainous, and other non-agricultural areas of any size, south of township 54 have been examined, and that part suitable only for growing timber has been set aside as Dominion Forest Reserve lands. Only a small proportion of the land north of township 54 is suitable for agricultural purposes, and it should be examined as soon as possible. The Forestry Branch has three reconnaissance parties in the north country this season. It is the aim of the branch to examine the land before settlement commences, so that areas suitable only for forest reserves will have an organization on the ground, at least for fire-protection, when settlement begins. The timber on the areas north of the present settlement needs constant care, as homesteaders are rapidly occupying all lands in the north suitable for agriculture or stock. The timber in the north will be valuable, as well as a necessity to the homesteaders, and forest reserves, with a field force sufficient for fire-protection, should be set aside as soon as possible so that the forest administration will grow gradually up with the settlement.

As soon as the boundary of a forest reserve has been determined with any degree of permanency, it should be plainly marked. In a settled country where the danger from fire is great and there are a large number of grazing and timber permits, the boundary should be cut clean, at least 25 feet in width, should have at least three ploughed furrows on each side, and be burned between the furrows. This will give the forest officers a chance to get around the boundary, prevent trespass—except that of a wilful nature—and it will stop any ordinary fire from crossing into the reserve. Where there is heavy timber and less danger from fire, a line 12 or 16 feet in width with two ploughed furrows on each side and the intermediate space burned will be sufficient until the timber is valuable enough to warrant a better line. In the unsettled areas where there are very few permits issued, and where a fire is as liable to start within the line as on the outside, a blazed boundary, well posted with boundary notices, will be sufficient for the present time, as the money needed for a better line could be expended more advantageously on other improvements, such as a good system of trails, lookout stations, equipment, etc. A distinct boundary of some sort is an absolute necessity for the proper administration of the reserve, as well as for the benefit of the public.

PERSONNEL.

The Saskatchewan Inspection District comprises the province of Saskatchewan, and all the work of the Forestry branch is handled from the inspection office, except

the Tree Planting Division and a small portion of the Duck Mountain and Cypress Hills reserves, which are under the supervision of the Manitoba and Alberta Inspection Offices, respectively. A part of the Porcupine reserve and of The Pas Fire-ranging District are in Manitoba, but the work is supervised from the Saskatchewan Inspection Office.

The work of the Saskatchewan Inspection Office is divided into three main divisions: (1) Forest reserves; (2) railway fire inspection; (3) fire ranging.

The fire ranging is divided into three districts: (1) Battleford; (2) Prince Albert, and (3) The Pas, with a chief ranger for each district. The chief rangers are permanent employees, but the rangers are employed only for the fire season.

The following outline gives the different branches of the service in the Saskatchewan Inspection District, the class and number of employees in each branch:—

Saskatchewan Inspection Office—
- 1 district inspector of forest reserves.
- 1 assistant inspector of forest reserves.
- 1 accountant.
- 1 stenographer.

A—Forest Reserves—

Beaver Hills—
- 1 ranger in charge.
- 1 labourer.

Fort à la Corne—
- 1 ranger in charge.
- 1 ranger.

Moose Mountain—
- 1 ranger in charge.
- 1 ranger.
- 1 labourer.

Nisbet—
- 1 ranger in charge.

Pines—
- 1 ranger in charge.
- 1 ranger.
- 1 temporary ranger (6 months).

Porcupine—
- 1 ranger in charge.
- 11 rangers (for 6 months).

B—Railway Fire Inspection—
- 1 divisional fire inspector.
- 3 railway fire guardians.

C—Fire Ranging.

Battleford District—
- 1 chief ranger.
- 9 rangers.

Prince Albert District—
- 1 chief ranger.
- 18 rangers.

The Pas District—
- 1 chief ranger.
- 16 rangers.

The fire-protection work on the forest reserves, created in May, 1914. is handled by the fire ranging branch of the service, but the forest reserve administration will be gradually established during the present season. The Pasquia reserve is under the jurisdiction of the ranger in charge of the Porcupine reserve, and the eleven rangers mentioned as being on the Porcupine reserve are also protecting the Pasquia reserve.

The prairie reserves will be simply a fire-protection and grazing proposition until such time as reforestation is started.

The forest reserves staff will require a few additions on the old reserves, and a new organization for all the new reserves. The Porcupine and Pasquia reserves will be administered as one reserve until conditions are more favourable for handling as separate units. The eleven fire rangers are all temporary men, and are not included in the forest reserve staff. The increase in staff urgently needed is shown by following outlines:—

Saskatchewan Inspection—
1 stenographer.

Fort à la Corne—
1 ranger.

Nisbet—
1 ranger.

Porcupine—
1 supervisor.
1 forest assistant.
6 rangers.
6 temporary rangers for 6 months.

Big River—
1 supervisor.
1 forest assistant.
3 rangers.

Manito—
1 ranger.

Keppel—
1 ranger.

Dundurn—
1 ranger.

Elbow—
1 ranger.

Sturgeon—
1 supervisor.
3 rangers.

The Seward, Steep Creek, and Stench Lake reserves comprise only a few sections each and will be administered by the nearest ranger.

The main responsibility for the results of the outside work of the branch lies with the rangers. The duties of a ranger are many and varied, such as office work, supervision of the timber, grazing, and fire protection; construction of cabins, houses, trails, telephones, bridges, and other classes of improvements, as well as the enforcement of the Reserve Regulations, fire, and game laws. Each ranger has a definite district and is responsible for the proper management of all the work within his district. The districts are usually some distance from settlement, and vary in size from 50,000 to 200,000 acres, according to location, danger from fire, and quantity of permit work. Districts of this size require a large amount of travel. In a grazing country, this travel should be done on horseback, and on most of the reserves this is the only mode of travel that will give results. On some of the northern reserves it is necessary to use a canoe or go on foot. A wagon cannot be used to advantage in any reserve work except to bring provisions and equipment to headquarters. It is also often necessary for rangers to be away from headquarters for days at a time, which necessitates a large amount of camp life. A man qualified to fill the position of forest ranger should be able-bodied, honest, have at least a common school education, and some executive ability. He should also be familiar with all branches of the field work such as grazing,

woods-work, camp life and ordinary compass surveying, and be able to ride a horse. In connection with the above qualifications, he should be sober, energetic, and interested in his work.

FIRES.

The Pines, Moose Mountain and Beaver Hills were the only reserves directly under the supervision of this office during the fire season of 1913. The remainder of the reserves were patrolled by the fire-ranging staff. The season was very wet, and the danger from fire was at a minimum during the entire danger season.

Table No. 2 gives the number of fires, classes, expenditure, etc.

TABLE No. 2.—Fires on Saskatchewan Forest Reserves during 1913.

Class.	No.	Expenditure.	Damage.	Causes.	Season.
1.....	3	$110	$500	Settlers.....	May.
2.....	13	50	330	" 5	4 May.
				Railway.....8	4 June.
					5 Oct.

The causes of fires in this district are: settlers, railways, carelessness, campers, incendiarism and lightning, enumerated in order of importance.

In the northern and mountainous section of the provinces where the settlements are new, fires are very numerous, due to the fact that the settler cares nothing for the damage done by a fire, so long as it burns over his quarter-section. He usually starts the fire when there is a high wind and everything is very dry, without any pretense at fire guarding or otherwise confining the fire. If the settler would take ordinary precautions in burning, 75 per cent of the fires and loss therefrom would be eliminated. It is a very simple matter in this country to either plough a furrow and back-fire, or simply back-fire when conditions are favourable around the area to be burned, and then start the fire against the wind. This method will give a far better burn than starting the fire with the wind, and there is practically no danger of its getting away if a small amount of precaution is used. The result more than counterbalances the extra time it takes to make the guard.

In the spruce belt from Green lake to Hudson Bay Junction, approximately four hundred million feet of merchantable timber has been destroyed by forest fires in the past six or eight years. There was far more than this amount destroyed, as the more northern and western areas are not included, on account of the lack of definite information and the distance of timber from market; but reports show that there has been a large quantity destroyed in the north and west during the past few years. The four hundred million feet include only areas that are accessible to market, and using a minimum estimate of $15 per thousand feet, board measure, for the lumber on the cars at the mill, it means a loss of six million dollars to the people in northern Saskatchewan and to the country at large. Nearly all of the money expended for labour, provisions, etc., is spent in the locality where the timber is manufactured, and practically all classes of trade in the vicinity of the timber belt are more or less affected by the destruction of each foot of merchantable timber.

There is also another factor that should be considered by the lumber-users of Saskatchewan. The province is situated about half way between the Atlantic and Pacific timber belts. The timber areas to the southeast and southwest are not close nor large, and most of the timber is south of the international line. Considering the timbered area of Saskatchewan, there is only a small quantity of merchantable timber, but it is located nearly in the centre and acts as a regulator on the price of lumber throughout

the province. So long as the timber in the province is protected and the cut maintained, the lumber consumers will be able to purchase lumber at a reasonable figure, but when the timber in the province is exhausted, prices will rapidly increase, as the outside dealers will have no competition. The prices must also increase as the cutting advances into the unsettled areas to the north, or the lumbering industry in the province will gradually decline.

It is to the interest of each and every lumber consumer and manufacturer in the province that the small quantity of merchantable timber, together with all young growth not on agricultural soil, or on agricultural soil that will not be taken up for some years, be protected from fire. The only way that the timber can be protected is by securing a good class of fire-rangers. Approximately 90 per cent of the loss from forest fires in the past few years has been due to the poor class of rangers. The rangers are not universally in the above class, but in certain localities it is almost impossible to get a good, reliable man appointed as ranger. The rangers who are doing their duty deserve a large amount of credit, for it is very discouraging to a good man to have another ranger, perhaps in an adjoining district, doing nothing and drawing the same salary. It is to the interest of every citizen in the province to demand that a fire-ranger be a man capable of fulfilling his duties, and that he be dismissed for gross neglect of duty.

IMPROVEMENTS.

At the beginning of the fiscal year, 1913, the improvements in this district consisted of two ranger-houses, two small stables and about thirteen miles of neglected boundary line. During the year the following improvements have been made on the various reserves:—

Beaver Hills.—Thirty-eight miles boundary line, 28 feet wide; 13 miles of old line disked three times; one house; one stable; one wagon shed; one well; 1½ mile road.

Fort à la Corne.—One ranger-house, completed; one ranger-house nearly completed; two stables nearly completed; one well, 4 miles road 10 feet wide.

Moose Mountain.—Twelve miles boundary line 12 feet wide; 8 miles road 25 feet wide; one ranger-house; one bridge; 14 miles telephone line (material only purchased); one stable (material purchased).

Nisbet.—Thirty-four miles boundary line, 25 feet wide; 2 miles road allowance cleaned up, 66 feet wide; one ranger-house; one stable; one wagon shed; one 80-foot lookout tower; 140 acres brush piled and burned by the branch; one ranger-cabin (material purchased).

Pines.—Twenty-seven miles boundary line 25 feet wide; three corduroy bridges; one 80-foot steel look-out tower; one 30-foot wooden tower; one ranger-house; two stables; one wagon-shed; one tool-house; one kitchen added to head-quarters range-house (shingles purchased for house and the inside ceiled up); one pasture fence, quarter-section at head-quarters; 200 posts for pasture at Roddick; 7 miles road 10 feet wide; 75 acres brush cleaned up by branch; 5 miles of telephone (material purchased); 113 tamarack telephone poles cut and placed at headquarters; one nursery; seventeen seed-beds; some 12 acres broadcasted; 1 acre seed spots.

Porcupine.—One ranger-cabin; one stable; one cabin nearly completed; one stable (material purchased); 10 miles trail 6 feet wide; 4 miles road 10 feet wide.

The dimensions of the buildings are approximately as follows: Houses, 24 feet by 24 feet, six rooms; cabin, 18 feet by 24 feet, three rooms; stable, 18 feet by 24 feet, with loft; wagon-shed, 16 feet by 24 feet; tool-house, 12 feet by 16 feet.

The boundary lines were cut 25 feet in width on reserve land and adjoining the road allowance. All wood was saved and piled in the centre of the line, and the brush was burned on most of the tract as cutting proceeded. All stumps were cut close to the ground so that three furrows can be ploughed on each side of the line, and the intermediate area burned.

It will be necessary to expend a small sum on improvements on the old reserves this season, but as there are no improvements of any kind on the new reserves, it will be necessary at least to construct cabins for the permanent rangers before the season closes.

SILVICULTURE.

The following tree species indigenous to this district have a commercial value: White spruce, tamarack, jack pine, birch, white poplar, black poplar, black spruce-ash, and willow. The black spruce seldom grows to log size, but trees that will make a log are cut and sold the same as white spruce. Black spruce can be used as pulp, but there are no pulp-mills in this district, consequently very little black spruce is cut. White spruce, tamarack, and jack pine are the chief lumber trees, and are used to a great extent for ties. Jack pine and the poplars are largely used for cordwood, but only a small quantity of lumber is sawn from these species. Birch is used by farmers for general repair work, such as double-trees, etc., and for cordwood. Tamarack, ash, and willow are used for fence posts.

There is a large quantity of poplar throughout northern Saskatchewan that has very little commercial value at the present time, principally on account of prejudice. Poplar makes good lumber if properly seasoned, and makes cross-ties as good as, if not better than, those of white spruce. The sectionmen all agree that it lasts as long and holds the spikes better than green spruce. They secured the information from actual tests and under the most unfavourable conditions, as only the smaller poplar were cut and put on the track green and without peeling. If the poplar was even peeled and seasoned for a few months, the results would be far more favourable. I would suggest that the Forestry Branch take up the question of the utilization of the immense quantity of poplar now going to waste in all sections of the north country. I feel that treated poplar ties would give more satisfactory results, at the same cost, than any of the untreated native species now in use, and experiments should be made along these lines by the department. There is also a large amount of waste in white spruce, black spruce, and poplar that could be utilized for pulp and other purposes, and experiments should be undertaken for the purpose of determining a commercial method for the utilization of this waste.

There has been no attempt in the past to cut along silvicultural lines, but, on the contrary, all cutting is done in the most wasteful manner as regards the welfare of the forest. A few companies are utilizing the trees, cut well into the tops and cut fairly low stumps, but as a general rule the stumps are high, even to 3 or 4 feet, and the diameter of the tops left in the woods runs as high as 14 inches. Usually one and sometimes two logs are left in the tops. This is especially true in hewn-tie operations. All companies and individuals make no attempt to dispose of the brush, cut below the diameter limit, do not utilize the tops, leave merchantable timber in skidways, and pay no attention to the destruction of young growth. The operators pay very little attention to the limit-line and cut all timber in sight. The above manner of cutting leaves the woods in the worst possible condition for a future crop, and the Government loses a large amount of revenue, owing to the large amount of timber wasted. The blame for the wasteful cutting does not rest entirely on the operators, as a large percentage of them would be willing to cut along conservative lines and make proper brush-disposal, provided they were so instructed by the department under whose jurisdiction the cutting took place, and provided each operator in the district would be required to follow the same method. It is simply lack of proper

Photo by G. A. Gutches.

Permittee Burning Slash, on Nisbet Forest Reserve.

Photo by G. A. Gutches.

Brush Piled. Permittee Starting to Burn it, Nisbet Forest Reserve, Saskatchewan.

supervision and enforcement of the regulations on the part of the Government that permits such wasteful cutting. The proper handling of this work lies with the field men, and when men are appointed to look after this work who do not know what should be done, and who do not visit many of the operations, the Government cannot expect to get results. The increase in revenue would more than pay for an efficient force of men to handle the cutting operations on a conservative basis.

The cutting on forest reserves in this district under the jurisdiction of the Forestry Branch was given close supervision last season, and good results were secured on all the reserves except Moose Mountain. The poor result on this reserve was due to the inefficiency of the ranger in charge, but he resigned, and better results are expected on this reserve next season.

Taking the reserves as a whole, the results were as follows:—

Brush piled for burning on 2,340 acres.
Brush piled and burned on 315 acres.

The disposal of the brush was something new, and many protests were made at the beginning of the season, but after it had been working for a few weeks the operators began to see the benefits, and by the end of the season there were practically no complaints. The operators were also required to cut only dead, down, and infected wood under cordwood permits, and only mature timber for lumber, piling, etc. The majority of the cuttings took place on the Nisbet reserve, and the good results obtained were due to the diligence of the ranger in charge. The cost of the work was not excessive, as shown by the data secured on the Nisbet reserve, which is a fair average for the work in the district. On this reserve instructions were issued about the first of October to all rangers of forest reserves in this district that the brush was to be piled on all timber operations within the reserves.

The work was inspected early in February, and it was found that permittees were not making suitable piles for burning, and new instructions were issued to all rangers on the reserves that the brush from all cuttings was to be piled and burned, and results show that it is easier and cheaper to pile and burn the brush in connection with the cutting than it is to make piles suitable for burning and then burn them at a later date.

This branch also undertook to dispose of the brush on old and new cuttings on the reserves, and the following figures show the results:—

Area 1.—This was a fair stand of jack pine, a cordwood operation. The cutting was done last year and the brush left scattered according to the old method. The brush and all refuse on an area of 20 acres of this old cut was piled and burned. The men were paid at the rate of 25 cents per hour. The average cut was twenty-two cords per acre. Total cut, 440 cords. Total cost, $20.50. Cost per acre, $1·025. Cost per cord, $0·047.

Area 2.—This area was covered by a fair stand of jack pine, and was also a cordwood operation. The timber was cut this winter, and the brush was piled and burned as soon as cut. On an area of 18 acres the average cut was twenty cords per acre. Total cut, 360 cords. The men were paid at the rate of 25 cents per hour. Total cost, $19.75. Cost per acre, $1·097. Cost per cord, $0·054.

Area 3.—This area was covered by a fair stand of jack pine, and was also a cordwood operation. Approximately 50 per cent of the area was cut over last year and the remainder was cut this season. All brush was piled and burned. The men were paid at the rate of 25 cents per hour. The area comprised 210 acres, with an average cut of 20 cords per acre. Total, 4,200 cords. Total cost, $208. Cost per acre, $0·99. Cost per cord, $0·049.

Average cost for the above areas per acre	$1·00
" " " " " " cord	0·049

The brush was disposed of in the above areas under practically the most difficult conditions, as the brush was as heavy as any in this locality, and I feel that the above figures are a fair average for the cost of the work in this district.

The areas cut over under permit on the Nisbet reserve have been well cleaned up and the brush and refuse have been piled and burned by permittees on 58 acres, and piled on 1,350 acres.

The permittees at first felt that brush-piling would be a hardship, but after they had tried it for a short time they found it was far easier to get at the wood than under the old system, and this was especially true on areas where low stumps were cut. In former cuttings, the stumps were cut from 2 to 4 feet in height, and it was very difficult to get to the piles with sleighs without getting hung up on stumps. After a little experience, the permittees found that the brush-disposal and low-cut stumps did not entail any extra cost on the wood delivered, as any extra expense caused by cutting low stumps, piling and burning brush was saved by making the wood more accessible for hauling.

Photo by G. A. Gutches.

Old Slashing on Nisbet Forest Reserve cleaned up by Forestry Branch in Spring.

The cutting operations take place during the winter months in this district, and there is no danger from burning. Burning is not permitted during the fire season.

Cost-data were also obtained for an area, cut over for ties, where the tops were lopped. This was a heavy stand of spruce; all the trees were cut and the ties removed before the parties were notified that the tops were to be lopped, making the cost of the operation a maximum for this district. I visited the area when the operation was about half completed, and the tops were completely lopped, even to the smallest twigs. Approximately 300 acres were cut over, and 16,178 ties were removed. The top-lopping cost $161.75, or approximately 1 cent per tie, or 53⁹⁄₁₀ cents per acre. The cost per acre is not very satisfactory, as the entire 300 acres were not cut over as the timber was in various-sized bunches on the area, and consequently the cost per acre would be much increased if the figures had been determined from the actual area. These ties were much above the railway standard in so far as size is concerned, and the operator estimates that the timber removed would have sawed 521,000 feet, board measure, and the top-lopping on this estimate would have cost 31 cents per thousand feet board measure.

The operator reports in part as follows:—

> "I am of the opinion that, had I had information of the intention of the department enforcing the top-lopping last fall before starting in the work, I could have arranged with the tie-makers to do this lopping and could have had it done for less money per tie. I am also confident that the cost per M would have been less for sawlogs than for ties, as generally the tops will run out smaller."

The regulations covering the cutting of all timber on Dominion lands require that the brush be disposed of in proper manner, and if the work is not done it is due to neglect on the part of field officers, except in a few cases of trespass where it is impossible to locate the offender.

PLANTING.

There are approximately 500 square miles of open, sandy land within the reserves that need restocking by artificial methods. Ninety per cent of this area is included within the prairie reserves; and, considering the fact that these reserves are located in the midst of a settled country where there is practically no timber, the restocking of these areas should take place as soon as possible. It may seem foolish to talk of planting in a new country like Saskatchewan, but what will be the opinion twenty-five or fifty years hence? On the prairie to-day the farmers and towns people are travelling miles for a load of wood, and in the cities cordwood is selling as high as $8 per cord. A quantity of timber of any kind on the small prairie reserves would be of immense value to the surrounding country and the province at large. Even to-day, there is practically no saw-timber of any kind on the forest reserves south of the Saskatchewan river, and all the merchantable spruce north of the river is within timber limits, and will soon be cut off. There is very little natural reproduction of spruce on account of fire and other causes, and if many of the cut-over areas are to be restocked with spruce, it will have to be done artificially.

The artificial restocking of any of the reserve areas would be a waste of money until an experienced field force and an efficient fire-protection system is secured, but these can be easily acquired provided the department is given a free hand in the matter.

In forest-planting operations in this district, only species native to the region should be used extensively. Exotics should be experimented with, but not planted on a large scale until proved to be satisfactory. The most valuable native trees are the white spruce, tamarack, jack pine, and green ash. The latter is especially valuable for post material on the prairie.

Before starting any reforestation work, the branch expects to make a careful survey of the areas to be planted, for the purpose of outlining the planting plans and location and size of nursery needed. The nursery is an important factor and it should be under the supervision of an experienced man. I would advise one large nursery under a competent man in preference to small nurseries on each reserve with inexperienced men.

GRAZING.

The grazing regulations did not go into effect on the reserves until the beginning of the present year, consequently no permits were issued last season. Many applications have been received this spring, and the grazing will become an important factor of the forest reserve administration in the near future. Most of the stockmen have been more or less restricted on account of the grazing areas being taken up by homesteaders, but now that permanent range can be secured in the reserves, all classes of stock-raisers feel that the number of cattle in the district will be increased. Although settlers have first chance for grazing privileges on the reserves, they will use only a small portion of the range areas, and there will be room for all applicants.

Several of the small reserves are located in settled country where the herd law is in force. On such reserves it will be necessary to allow fencing, but such fencing should be restricted to the boundary of the reserve, or simply to small breeding pastures along the boundary. This will leave the reserve open to general grazing, or at the most only drift-fences will be needed.

Over-grazing should not be allowed, but regulated grazing would be a benefit on practically all of the reserves, until planting or young growth starts naturally, as grazing will reduce the fire-danger by removing the large quantities of grass which at present dies and becomes the worst sort of fire-trap. The cattle will also clean out a great deal of the brush and open up the country. It will also be to the interest of the stock-owners to prevent fire.

The regulations of the department for grazing on Forest Reserves place the stock industry in this section on a permanent basis, and I feel that as soon as the stockmen become familiar with the regulations, the range on the reserves will be well stocked.

GAME.

An Act of the Provincial Parliament creates game preserves out of all the Dominion Forest Reserves within the province, and the Dominion Forest Reserve Act confirms the provincial Act. This places the responsibility for the protection of the game upon the Dominion as well as on the province. The forest reserve rangers have protected the game on the reserves as far as possible, but the province has taken no active interest in protection in the past, though plans for co-operation on forest reserves are now being worked out between the Dominion and the province. There is no use in setting aside game preserves unless the respective Governments intend to enforce the regulations.

Game preserves with adequate protection are urgently needed, as much game is being slaughtered out of season, and in some instances elk and moose are being killed, the carcases poisoned and used for wolf bait. Unless better protection is given the big game will rapidly decrease.

POLICY.

In the organization of the work on forest reserves the aim has been to secure, first, an efficient personnel. This has been a difficult task, as the work is new and there are few suitable men in the locality who are familiar with the work or can grasp the fundamental ideas of conservative forestry work. The men are rapidly improving, and have done well, but conditions would be greatly improved if a ranger school was established or a forestry course provided in the west, so that the local people would become more generally interested in the work.

The second object has been to secure comfortable quarters for the men. The head-quarters have been located as near the centre of the various districts as possible, so that the rangers would be centrally located. Lookout points, pasturage, water, and a small area of tillable land were considered, but one or more of the desirable points were usually lacking in the final selection of head-quarters, as the central location, lookout points, and water were the chief factors.

The third aim has been to require all rangers to familiarize themselves with their districts so that in cases of emergency they would know where to go and what to do. A ranger is of little use unless he knows his district and travels over it as often as conditions require.

The fourth requirement kept in mind has been to furnish the rangers with sufficient equipment and tools so that the reserve work can be done in proper shape. A ranger must have sufficient equipment to get results, as he is usually located where it is difficult to borrow in case of need, and a man with a good outfit has no excuse for not keeping his district in good shape.

The fifth aim kept in view has been to dispose of the brush in proper manner, and to cut, as far as possible, along silvicultural lines. It has been the aim in all cutting to get rid of all merchantable dead, down, and infected material. All brush should be piled and burned, as there is so much refuse on the ground throughout the wooded areas, that it is absolutely necessary to have a few clean areas, even though some young trees are destroyed in the process.

The work on the reserves has progressed very favourably during the year, and credit is due the rangers for all results obtained.

Respectfully submitted,

G. A. GUTCHES,
Inspector of Forest Reserves for Saskatchewan.

APPENDIX No. 4.

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR ALBERTA.

CALGARY, ALTA., March 31, 1914.

R. H. CAMPBELL, Esq.,
Director of Forestry,
Ottawa, Ont.

SIR,—I have the honour to submit herewith my second annual report as District Inspector of Dominion Forest Reserves for the province of Alberta.

BOUNDARIES.

The boundary work in the Alberta district during the year ending March 31, 1914, was comprised largely under three heads as follows:—

1. Creation of new reserves as a result of previous explorations.
2. Examination of lands proposed for inclusion in the forest reserve.
3. Survey and marking of boundaries of existing reserves.

As a result of previous examinations made by the Forestry Branch, one new reserve was created in the Alberta district during the past year, and three additions were made to existing reserves. I mentioned in my annual report for 1912 that certain additions were proposed to the Crowsnest, Clearwater, Brazeau, and Athabaska forests. These additions were all made by Act of Parliament, assented to on June 6, 1913, and comprise three separate areas lying (1) in the Porcupine hills in southern Alberta, (2) in the Rocky Mountain foothills between the North Saskatchewan and the Athabaska river, and (3) in the foothills between the Athabaska river and the 15th Base Line. The total area of these additions is, approximately, 2,683 square miles, or, in round numbers, 1,720,000 acres.

The new reserve created is known as the Lesser Slave Lake forest reserve and was established by Act of Parliament assented to on June 6, 1913. It comprises two separate areas, one located in the Swan hills immediately south of Lesser Slave lake, and the other in the Martin mountains north of the east end of Lesser Slave lake. These blocks are separated from each other by Lesser Slave lake and its outlet into the Athabaska river, and total, approximately, 5,023 square miles, or 3,215,000 acres.

The additions made to the Rocky Mountains forest reserve had all previously been under administration in connection with those divisions of the reserve of which

they form a part, so that there was no material change in the organization as a result of these extensions. On the Lesser Slave Lake forest reserve no work has as yet been undertaken, as the reserve was created too late in the year to undertake an organization last season and there was no apparent necessity for administration during the winter. Plans have, however, been made for placing this reserve under formal administration during the season of 1914.

The examination of lands which it is proposed to include in forest reserves divides itself into two parts. The first is the preliminary inspection preceding the temporary withdrawal of the land for a more detailed reconnaissance. Work of this sort is handled mostly by the inspector in so far as it is done under the direction of the Alberta District Office, and last year involved a cursory inspection of about two townships adjacent to the east boundary of the Clearwater forest on the south side of the Saskatchewan river. On the recommendation of the inspector these lands were temporarily withdrawn from entry and these, together with about twenty-five townships withheld from entry in the vicinity of the east boundary of the Brazeau, will be examined in detail during the summer of 1914.

Detailed examinations under the direction of the Alberta District Office were made only in the coal-lands reserves in the Crowsnest region of British Columbia. This coal-lands reserve consists of two blocks, one of 45,000 acres and the other of 5,000 acres located east of Fernie on the head-waters of Michel creek and the Flathead river. The examination of this land was made under instructions prepared by the inspector in August, 1913, the crew consisting of Forest Assistant McVickar with Forest Student J. M. Sloan as assistant. This examination involved a mapping of the entire area, showing types, and a report upon all phases of the problem, such as the climate, the timber, local industries, settlement, improvements, grazing, etc. This report, with map, was prepared by Mr. McVickar and submitted under date of September 10, and recommends the creation of both blocks of coal land into forest reserves and their attachment to the Crowsnest forest for the purpose of administration.

As was suggested in my annual report for 1912, there was urgent necessity of delineating and marking on the ground a considerable portion of the east boundary of the Rocky Mountains forest reserve. The most urgent work of this sort lay south of the main line of the Canadian Pacific railway, extending from there to the international boundary and comprised a total of 230 miles of boundary line. The purpose of this survey was twofold. The first was to mark on the ground by means of blazed or cleared lines and by posts and boundary notices the actual location of the forest reserve boundary, so that trespass through ignorance of the location of the reserve might be avoided. The second was to show on the map the types of land and cover, distinguishing particularly grazing lands from timber lands immediately adjacent to the boundary both inside the reserve and outside. In order to accomplish these purposes, detailed instructions were prepared in the inspector's office under date of April 17, in which the method of survey was explained and an outline prepared for a report on the examination, together with instructions covering the mapping. Two crews were organized, one under the supervisor of the Bow River and the other under the supervisor of the Crowsnest forest. Several changes in personnel occurred in these crews during the season, but the work as far as planned for 1913 was practically completed. The final report on the work on the Bow River was prepared by Forest Assistant McVickar, who was last in charge of the field work on that reserve. The final report on the Crowsnest was prepared by Forest Assistants Alexander and Clark. The work on the Bow River extended over approximately 85 miles of boundary line, while that on the Crowsnest extended over approximately 150 miles of boundary line. Both maps and reports were prepared in sufficient time to be of very material assistance in the handling of the grazing business during the present year.

The boundary marking consisted of blazing or cutting out the boundary line and establishing permanent wooden posts suitably inscribed and witnessed at half-mile

intervals along the line. At these same intervals, and also at the points where all trails and roads enter the Reserve, boundary posters and fire warnings were placed for the information of the public.

There still remains urgent necessity for continuing this work so as to cover all of the boundary in the Porcupine hills addition to the Crowsnest, which involves the survey of about 150 miles of boundary line, and the marking of the boundary line in the north division of the Bow River forest, which involves about 100 miles of line. This work will be done under the same instructions and in the same manner as was the work last season and will be covered during the summer of 1914.

As a result of field examinations made by the inspector during the past year, it was thought desirable to make a change in the interior boundary between the Brazeau and Clearwater forests, so as to include in the Clearwater all of the drainage of the South Brazeau river. The most important reason for making this change was that this portion of the Brazeau had become very much more readily accessible from the south than from the north owing to the completion of the Canadian Northern railway to the town of Nordegg. It was therefore much easier to carry on improvement and protection work from Nordegg than it was from the nearest railway point to the north, and, as the business of the reserve naturally follows the lines of most ready communication, that portion of the Brazeau which lies in the South Brazeau drainage is, as a result of railway construction, being approached via Nordegg from Rocky Mountain House instead of via Pacific pass from Mile 37. It was therefore much more desirable to change the boundary line so as to include this valley in the Clearwater forest than to retain the old boundary line in opposition to the trend of local development.

The work for the next field season in the Alberta district which is of most pressing importance is the continuance of the boundary-marking on the Crowsnest and Bow River reserves as above stated and the examination of lands adjacent to the Brazeau and Clearwater reserves which have been temporarily withdrawn from entry so that it may be decided whether or not they should be included within permanent forest reserves. Plans for this work have already been completed so that the projects will be undertaken during the season of 1914. It is also very desirable to extend the boundary delineation work to the Cypress Hills reserve, and this will be done during the summer season if the work on the Rocky Mountains progresses as present plans would indicate.

PERSONNEL.

The staff in the inspector's office during the past year consisted of the same employees as in the year previous; that is, the inspector, an accountant, and one stenographer. On the forest reserves and in the district office there was employed, in addition to the inspector, a total of 275 employees. The grades and total salaries paid these employees are shown in the following table:—

TABLE 1.—Employees on Rocky Mountains Forest Reserve.

Grade.	Number.	Salary.
		$ cts.
Supervisors	5	6,347 27
Forest assistants	7	5,062 91
Surveyors	2	713 71
Clerks	5	4,369 40
Rangers	59	42,464 37
Surveyor's assistants	11	3,266 60
Temporary laborers	186	16,675 85
Total	275	78,900 11

It will be noted that during the year there were considerably fewer changes in the permanent employees than during the year previous. All of the supervisors employed, with the exception of one, remained in the district the entire year. The supervisor of the Bow River forest, Mr. F. C. Edgar, resigned from the service in August, and was not replaced during the year, his work being taken over by the district inspector. Of the forest assistants employed, one was employed only temporarily during the summer, one resigned in November, and one was promoted to a supervisory position and is included under the list of supervisors as well as among the forests assistants. There were no changes in the clerical staff during the year except that Mr. G. C. Blyth, forest clerk on the Brazeau forest, resigned during the last month and his place had not been filled at the end of the fiscal year.

In connection with the forest rangers, of whom fifty-nine were employed during the season, it should be noted that the greatest number employed at any one time was forty-nine. Of the total number employed, thirty-nine were employed for a period of less than nine months, and twenty for a period of nine months or more, of whom fifteen were employed for the entire year. The temporary labourers were employed exclusively on trail and other construction, this total not including any men employed on fire-fighting. Most of the temporary labourers were employed for a period of less than three months.

Although there were not as many changes in the permanent staff during the past year as took place the year previous, it was unfortunately necessary to carry on the work as originally planned with a wholly inadequate force. Many of the original plans for the administration having been crystallized into the form of regulations, it was essential that the administration be continued along practically the same lines as was originally planned, although the force available for this work was very inadequate. This applied particularly to the technical staff, which was seriously depleted as a result of the organization of the forest service of the province of British Columbia, which employed a considerable number of the men who were originally assigned to this district.

The practice of forestry under conditions very similar to those existing in the Dominion Forest reserve is not by any means unknown on this continent. It is true that there has been no extensive practice in conditions of timber growth exactly comparable with all conditions involved in the Dominion forests, but so close are the relationships between the types and species existing within the Dominion forests and those existing within other forest reserves and timbered lands upon which forestry is being practiced, that no difficulty need be experienced by a trained forester in applying the results of experience in corresponding regions to the forests of the Dominion reserves. This applies not only to silvicultural problems, but also to problems of protection, utilization, and the administration of grazing. But, while the technical aspects of the situation present comparatively few difficulties, yet the really fundamental problem which must be solved before any real progress can be made is that of the organization of a trained and efficient personnel. I pointed out in my last annual report what were the necessary qualifications for a forest ranger, and urged at that time the necessity for establishing some organization by means of which rangers could be instructed in their duties and trained to that degree of efficiency which is essential for the continuance of the work. This need has become very pressing, and the situation is daily becoming more acute as the demands upon the forest reserve continue to grow and the field force is confronted with the necessity of either meeting these demands and handling the reserve timber according to forestry principles, or else abandoning any attempt at the practice of forestry or the employment of conservative methods of utilization. As was pointed out in my annual report for 1912, it is impossible to expect that we can secure men having the requisite qualifications unless we can offer inducements which will attract to our organization and hold in it men who are willing to devote a great deal of time and effort to securing a training along the lines which are necessary for the proper administration of the reserves. Such men we cannot hope to secure unless appointment is placed upon a basis of efficiency and

tenure of office, and promotion is determined by merit alone. In other words, we must practically create a new type of employment, that of minor forest employee or forest ranger, and the fact that, as pointed out in my previous report, it will probably be necessary for us to provide our own means of instruction is not by any means an unprecedented course either for the Government or for private enterprises. To show that this course is not without precedent in the Dominion Government it is only necessary to cite the report of the Militia Department for the fiscal year ending March, 1911, which shows that a total of more than $87,000 was expended during that year by this one department for schools of instruction. Assuming that the rate of increase in the expenditure for instruction in this department has been on the same basis as the increase in the total appropriation for the department, the expenditure next year would be approximately $250,000. If so vast a sum as this can be expended annually for the purpose of training to greater efficiency a force whose purpose it might not be impossible to demonstrate to be largely destructive in character, how much greater would be the justification for the expenditure of a comparatively insignificant sum of $8,000 or $10,000 that would suffice for the establishing of a service school for the training of a forest ranger staff which is a force that is not only essentially constructive in character but whose constructive efforts are confined not alone to the needs of the present but also take into full consideration the needs of future generations. Next to placing the administrative staff upon a basis of permanency, there is no more important step that could be taken in the Forestry branch than the creation of an organized scheme of training and instruction for the forest ranger staff.

There are in the Dominion adequate facilities for the training of men for the more highly technical positions. Two universities offer complete courses in forestry, while there is a special forest school maintained by the province of Quebec, and one is promised by the province of British Columbia in connection with its provincial university. There are absolutely no facilities whatever in the Dominion for the training of men for the lower grades of employment in the forestry service although such men outnumber the officers in the higher grades more than twenty to one. Naturally it can scarcely be expected that facilities for obtaining such training will be provided until there is a recognized demand for men having these qualifications, or at least reasonable grounds for assuming that there will be such a demand. This is in strict contrast with conditions in the United States, where almost every Western State university has its forest school for forest rangers, and several very large schools of this character are also maintained in connection with the more important universities in the East. It should not be expected that men whose field of work will lie in the forestry service of the Dominion Government or of the various Provincial Governments should be compelled to secure their forestry training in foreign schools as has been done in a few cases in the past. On the other hand, as none of the western provinces except British Columbia have any timber lands under their administration it will no doubt be out of the question to look for the establishment of ranger schools in connection with the provincial universities. At the same time it is highly desirable that this training be provided, if possible, in the general region in which the men's field of work lies, so that for work on the Dominion Forest reserves it would seem necessary for the Government to arrange for this course of training within its own establishment.

FIRE PROTECTION.

The fire situation during the past season was again remarkably favourable. Although it is a general impression that less rain fell during 1913 than 1912, nevertheless the precipitation in 1913 was very generally distributed at frequent intervals throughout the season, so that there was never any time during which the fire danger became at all acute. On the other hand, during 1912 rain was so frequent and so long-continued at certain periods that it not only removed the fire danger, but caused much loss owing to the impossibility of carrying on any kind of constructive work.

This condition was not apparent during 1913, although the fire danger was on the whole little, if any, greater during that year than during the year previous. The general situation as regards fire within the reserves is shown in the following tables which give the number of fires that occurred on each reserve, the causes, the cost of control and damage caused by these fires:—

TABLE 2.—Number of all Fires Reported by Classes on Each Reserve.

Forest.	Large.	Small.	Total.
Crowsnest	.....	2	2
Bow River	.....	1	1
Clearwater	5	1	6
Brazeau	2	8	10
Athabaska	1	1	2
Cooking Lake	.....	.....	.....
Cypress Hills	.....	.....	.....
Total	8	13	21

TABLE 3.—Fires reported by each Forest, showing Month of Occurrence.

Forest.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Feb.	Total.
Crowsnest	.....	.....	.....	.....	1	1	.....	.....	.....	.....	2
Bow River	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Clearwater	.....	1	.....	.....	.....	.....	2	1	1	.....	6
Brazeau	3	2	1	.....	3	.....	.....	.....	.....	1	10
Athabaska	1	.....	.....	.....	1	.....	.....	.....	.....	.....	2
Total	4	3	1	1	5	1	2	1	1	1	21

TABLE 4.—Causes of all Fires reported.

Forest.	Ry. Construction.	Locomotives.	Clearing.	Lightning.	Match dropping.	Sawmill Waste burning.	Unknown.	Total.
Crowsnest	.....	1	.....	1	.....	.....	.....	2
Bow River	.....	.....	.....	.....	.....	.....	1	1
Clearwater	5	.....	.....	.....	.....	.....	1	6
Brazeau	.....	6	1	1	.....	1	1	10
Athabaska	.....	.....	.....	.....	1	.....	1	2
Total	5	7	1	2	1	1	4	21
Percent of Total	23·9	33·3	4·7	9·5	4·7	4·7	19·1	100

TABLE 5.—Damage caused by Fire on each Forest.

Forest.	Area of Reserved Land.	Damage to Timber or Reproduction on Reserved Land.			
		Timber Destroyed or Damaged.		Value[1] of Reproduction Destroyed.	Total.
		[1]Ft. B.M.	Value.		
			$ cts.	$	$
Clearwater	1,300	.....	.....	4,650	4,650
Brazeau	3,000	75,000	150	5,250	5,400
Athabaska	3,800	Not Known.		.....	.....
Total	8,100	75,000	150 00	9,900	10,050

[1]Value figured at flat rate of $5 per acre.

TABLE 6.—Expenditure for Fire-fighting by Forests, exclusive of Ranger Labour.

Forest.	Temporary Labour.	Supplies Transportation.	Total Cost.	Value of Voluntary Assistance.
	$ cts.	$ cts.	$ cts.	$ cts.
Clearwater	415 90	41 66	457 56	301 60
Brazeau	538 86	392 09	930 95	.....
Total	954 76	433 75	1,388 51	301 60

It will be noted, on comparison with the previous year, that there were only about two-thirds as many fires placed under control by the forest rangers during 1913 as was the case during 1912. It will also be noted that the number of fires occurring inside the reserve during these years is practically the same, there being only one more in 1912 than in 1913. The difference in number of fires occurs entirely in fires fought outside the reserve, which is accounted for by the fact that during 1912 all fires that occurred along railways adjacent to the forest reserve boundary were handled by the forest reserve force, while during 1913 these fires were handled by the railway fire patrol employed by the railway companies. Also during 1912 there was more or less construction work on railways adjacent to the forest reserve boundary which gave rise to fires, most of which had progressed so that the work was largely within the reserves during 1913.

A comparison of the results for the two years, however, does not lead to altogether optimistic conclusions. It will be noted, for instance, that while there was one less fire during 1913 than during 1912, the number of large fires inside the reserve was 60 per cent greater than the year previous and that the area burnt over is ten times as large, with the cost of control increased from $58.95 to $1,388.54, and the damage from $1,221 to $10,050.

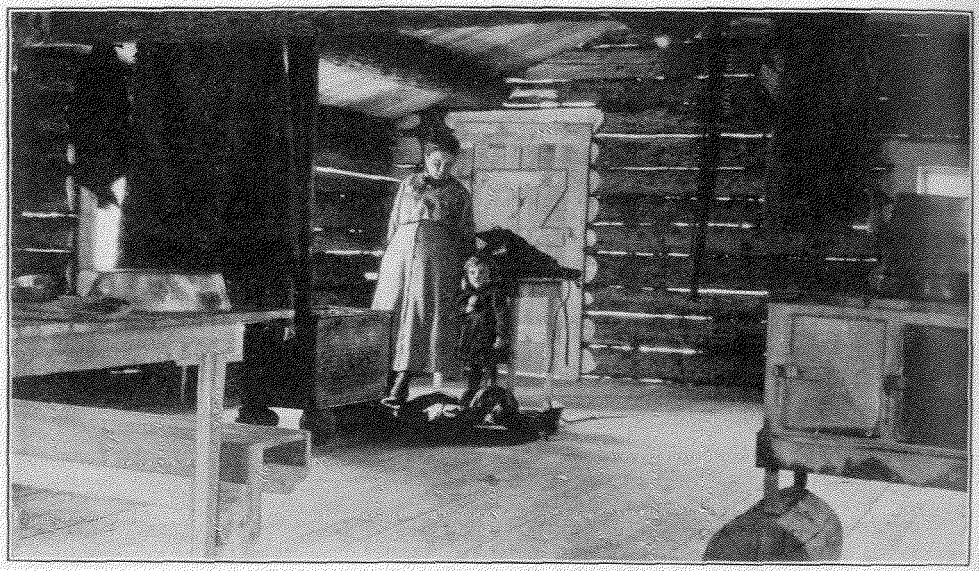


Photo by W. N. Millar.

Interior Wilson Ranger Station Cabin, Clearwater Forest, Alberta.

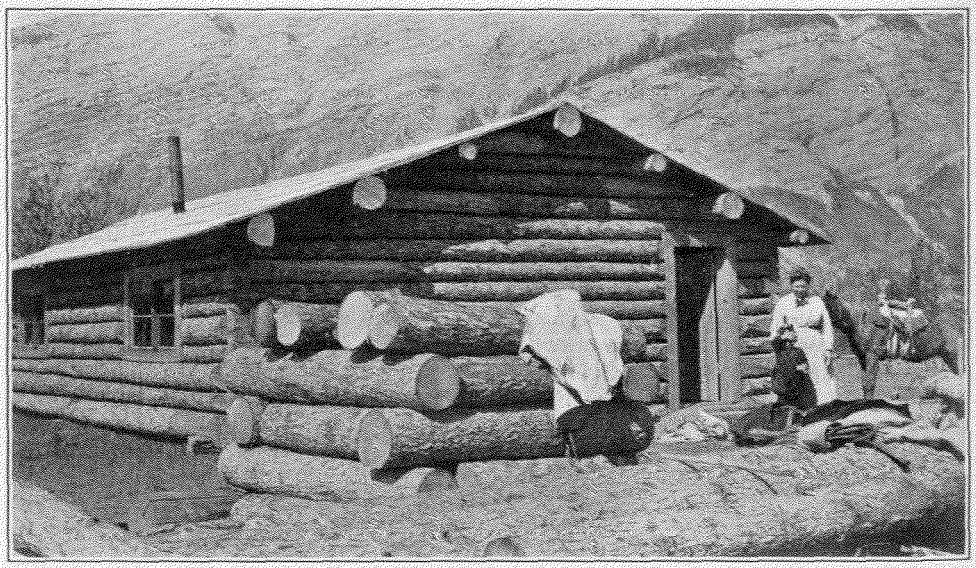


Photo by W. N. Millar.

Wilson Ranger Station Cabin.

It takes but a brief examination into the history of the various large fires which occurred to fix very conclusively the responsibility for this condition. The bulk of the damage, and by far the greater part of the cost, occurred on the Athabaska and the Brazeau forest, and resulted from two fires. The only other very large fire which occurred was on the Clearwater forest in the mouth of December, when no fire danger was anticipated and conditions were thought to be such that the danger for the year was over. The two fires on the Brazeau and Athabaska, one of which covered about 2,500 acres and the other of which is set at 3,800 acres, but may be much larger, resulted solely from the incompetence of the rangers in whose district the fires occurred. In both cases, although the fires were sighted almost immediately after being set, the rangers were unable to get to the fires, although in one case the distance of the fire from the ranger's headquarters was only 8 miles, through comparatively open foothill timber.

I stated in my last annual report that it was impossible from the consideration of one season's work—particularly a season as favourable as was 1912—to arrive at any conclusions as regards the efficiency of the force. I indicated in the body of my report, however, that unless fundamental conditions as regards employment were radically changed it could scarcely be anticipated that any improvement in the protection can be secured. On the contrary, with the opening up of the reserve by railways and other means of communication, and the establishment of coal-mining towns and other settlements within its boundaries, it was to be fully anticipated that the number of fires occurring inside the reserve would constantly increase and without a corresponding increase in the efficiency of the protection the final result can not help but be disastrous. The basis of efficient fire-protection is an efficient personnel far more than an elaborate equipment of permanent improvements or carefully-worked-out plans. It is true that good men are not the only requirements, but that under modern conditions of fire protection the best results are secured by an efficient staff, assisted in every possible way by mechanical aids and permanent improvements and by careful organization, but to show that improvements alone are not sufficient it is only necessary for me to point out that in the case of the large fire which occurred on the Brazeau Forest reserve we not only had a newly constructed trail and headquarters for the ranger in the district, but also had the ranger headquarters connected with the supervisor by means of a Forestry Branch telephone, and that the fire was discovered from a lookout within a few hours after it was set. In fact, we had practically all of the necessary ingredients of first-class modern fire protection except an efficient ranger and this fire attained the size it did and caused so much damage simply because we had a ranger who was not able to find his way around the woods.

PERMANENT IMPROVEMENTS.

Although the amount expended on improvements during the past fiscal year constitutes only 3 per cent more of the total allotment than during the preceding year, the results obtained have been very much superior to those the year previous. This has been due to better organization of the work, to the establishment of standard specifications for the trail work and to better supervision of all work done. A considerable part of the work reported last season was found on inspection to be of rather low grade and not to come up to the specifications which it was reported to follow. This condition does not obtain for the work constructed last year, practically all of which conforms very closely to the specifications established for the improvement work on the reserves.

It is unnecessary to go into details of the necessity for the construction of permanent improvements, as I dealt with this matter at some length in my last annual report, and a very little consideration of the subject and of the conditions within the Dominion Forest reserves will convince any one of the impossibility of administering or protecting these reserves until they are equipped with trails and other improvements that make them readily accessible for our rangers. In so large a country as the Rocky

Mountains forest reserve the mileage of trails required to make it accessible is, of course, very great, and a number of years will be required for the construction of all the needed improvements. The work has, however, progressed very satisfactorily during the past two years, considering the handicaps of lack of preparation and inadequate knowledge of the country which we have faced, and it is to be hoped that as the organization for the extension of improvement work is each year made more perfect, the funds for carrying out this work will be available so that the improvement equipment may be completed at as early a date as possible. It will, of course, be realized that the construction of permanent improvements on the forest reserves is a matter of temporary importance only as there is a limit beyond which it is not necessary to go, and as soon as this limit is reached the only charge for improvements will be the cost of maintenance, which will be larger or smaller according to the character of the original construction. It has been the aim of the administration in this district to make the original construction first-class in every respect so that subsequent maintenance charges may be reduced to the minimum. In order to accomplish this it has been found desirable to establish uniform specifications for trail construction throughout the district. This is greatly facilitated by the fact that natural conditions affecting the construction of trails and similar improvements do not vary greatly anywhere in the Rocky Mountains forest reserve.

I suggested in my last annual report the requirements for two classes of trails known as "standard" and "secondary." Shortly after submitting this report I prepared a circular letter in which the subject of trail construction was discussed in detail, and standard specifications for three classes of trails were laid down. These trails are known as "primary," "secondary," and "auxiliary." The primary and secondary trails correspond very closely with the standard and secondary trails as explained in my last annual report. The auxiliary trails are described as follows: "Auxiliary trails may consist only of a blazed line where there is no down timber or heavy brush. The purpose of these trails should be to indicate those passes, valleys, or other natural routes of travel which it is possible to take horses through. No clearing other than that which is absolutely necessary to get packs through will be required, nor should any grading be done unless it is essential in getting around an exceedingly steep side-hill. The grade on auxiliary trails should not exceed forty per cent. Where a trail with a grade of less than forty per cent cannot be secured without grading, then a tread about twelve inches wide should be cut to secure the proper slope. No bridges or corduroy need be built on auxiliary trails except across bog-holes that would be likely to mire horses at unfavourable seasons of the year. Wherever corduroy or bridges are constructed, however, they should be built according to specifications for secondary trails, since nothing is ever gained in constructing temporary corduroy or bridges."

The work of telephone construction has not advanced much over the previous year. One line 26 miles in length was built during last year, at an average cost of $46.82 per mile. This line is very satisfactory, and, if we could do similar work throughout the reserve and be as successful in the maintenance of the line as has been the case with the telephone on the Brazeau, we could do much more effective work both from an administrative and protective point of view. Certain personnel difficulties, however, particularly in those reserves which are most in need of telephone communication, have made it impossible, to date, to undertake extensive work of this character.

Further study of the situation on the reserves as regards rangers' cabins reveals the fact that three rather uniform types of log cabins might be adopted as standard on the reserves without being subject to any very great variation to meet special requirements. This fact was indicated in my last annual report, but has been elaborated during the past year, and plans and specifications for three standard types of log buildings have practically been completed and will be shortly distributed to the field officers and established as standard buildings for reserve work. In those districts where rangers are employed all year round, log buildings of from five to seven rooms,

with log barns, will be used except where it is readily possible to secure lumber for construction purposes. It has been found, however, that the construction of frame buildings is not feasible except in a very few easily accessible localities, and the greater number of the large ranger stations which will hereafter be constructed will have to be built of logs.

In those localities where men are not stationed all year round, but are stationed for more than half the year, and where it may be anticipated that the growth of business and the increase of settlement near the reserve will shortly require year-long establishments, we are building houses 18 by 24 feet (inside dimensions), using them now for dwelling purposes, but having in view their future utilization for barns whenever it becomes necessary to provide a more elaborate equipment for year-long use. It will be noted from the tables of improvements accompanying this report that during the past year one Class A, three Class B, and twelve Class C buildings have been constructed. The Class A buildings are the large ranger-stations, Class B intermediate type, and the Class C. the small 12-by-14-foot or 14-by-16-foot cabins which are built only for tool-caches and temporary stopping-places. It will be noted, in addition, that three Class A cabins, fourteen Class B cabins, and one Class C cabin which were unfinished at the beginning of the year have been carried to completion during the present year. Several cabin projects which were reported last year as having been completed were found to require additional work, so that about $2,000 altogether was required to carry to completion eighteen buildings that were left unfinished last year. In addition to this, a little over $800 was required to fit out five buildings purchased during the year, which required some repairs in order to make them available for immediate use.

In the tables attached hereto the average costs have a much more distinct value than similar averages would have had last year. The reason for this is that the work during the past year has been on a more systematically organized basis, and, as most of the trails and buildings are built according to uniform standards, it is much easier to compare them and secure average costs that have a real value than was the case during the previous year. In considering averages, however, from year to year, certain points in regard to the improvements constructed must be kept in mind. For instance, during the past year the average road cost has been only $52.01 per mile. This cannot be assumed to be a figure that will hold good throughout the reserve, as a very large part of the road construction was included in one project on the Clearwater forest which involved a large amount of open country where the cost of construction was very slight and the average cost was, therefore, very low.

The cost of primary trails is shown to have averaged $48.71 per mile. This, I believe, may be taken to be a very fair average figure for primary trail construction throughout the reserves, as such trails were, during the past year, distributed in all types of country and timber in all of the reserves except the Crowsnest, and may be assumed to represent a fairly average figure for the cost of these improvements.

The secondary trail cost appears at $39.74 per mile. This is considerably higher than trails of this character should average, but the high cost is explained by the fact that on the Crowsnest Forest and on several trails in other reserves, trail work which corresponds to primary specifications except for minor points has been classified as secondary work. The cost of converting such trails into primary trails will be comparatively small, so that the final result will be a primary trail with the cost but little more than the average figure for such trails. The intention of these various projects was to construct them as primary trails, but there seems to have been some misunderstanding of instructions which resulted in a type of construction that is much more elaborate than necessary for secondary trails but does not quite comply with primary standards. Another factor which accounts for the high average cost of secondary trails is the fact that quite a number of these trails during the past year have been constructed in heavy timber and windfall, where the cost of construction is considerably greater than the average that may be reasonably anticipated for trails of this

character throughout the reserve. I would point out that during the previous year the average cost of secondary trail construction was only about $15 per mile, which represents more nearly an average figure for the entire district than the results of the present year do.

The average cost on all classes of buildings as shown in the table of completed projects during the past year is aproximately what may be anticipated as the cost of such buildings throughout the district. Better organization and more experience in construction will undoubtedly cause some reduction in these averages, but I do not think that a greater reduction than 10 per cent below the average for the past year can be anticipated.

Photo by R. M. Brown.

Coleman Ranger Station, Bow River Forest, Alberta.

The purchase of buildings during the past year has enabled us to secure five new houses at a very reasonable cost. Most of these buildings were engineer's or contractor's camps in the vicinity of the new railway lines, which were very well constructed and happened to be located at the places where we needed buildings, and were secured much below their actual value owing to the fact that the cost of removal would in most cases have been prohibitive. In order to adapt these buildings to our requirements, it was necessary in all cases to make some repairs and alterations, but the final result is that we have secured three buildings that correspond practically to Class A specifications, and two that correspond to Class B specifications at an average cost, including alterations, of $561.05 per building, which is about $200 less than the average cost of newly constructed buildings of both types during the past year. The purchase of such buildings, however, has about ceased to be possible, as there are no more roads under construction in the forest reserve at the present time.

The four tables given below show the total work carried out in the district during the past year. These tables show not only the work that was done, but also the condition of the project at the end of the year. As was previously pointed out, a number of projects reported as completed last year were found to require some additional work during the present year. These are shown under Table 10. The greater part of the work was, of course, done by the permanent force.

TABLE 7.—Summary of Complete Projects.

Project.	Length.	No.	Average Cost.	Cost, Rangers' Salary.	Cost, exclusive Rangers' Salary.	Total.
	Miles.		$ cts.	$ cts.	$ cts.	$ cts.
Roads	40·25	.....	52 01	291 52	1,801 81	2,093 33
Primary Trails	287·00	.....	48 71	2,532 19	11,447 25	13,979 44
Secondary Trails	142·5	.....	39 74	1,130 87	4,532 84	5,663 71
Auxiliary Trails	128·00	.....	6 30	781 38	25 00	806 38
Corrals	.....	1	25 00	.....	25 00	25 00
Cabins, Class A	.....	1	1,131 09	31 09	1,100 00	1,131 09
Cabins, Class B	.....	14	359 12	745 89	690 60	1,436 49
Cabins, Class C	.....	12	188 49	755 69	1,241 89	1,997 58
Barns	.....	4	156 04	312 51	311 66	624 17
Bridges	.....	4	84 23	122 27	214 63	336 90
Fences	.....	10	79 08	334 10	456 74	790 84
Fire-guards (Timber)	1·00	.....	148 40	148 40	.....	148 40
Fire-guards (Ploughed)	671·00	.....	1 00	.....	670 95	670 95
Buildings (Purchased)	.....	5	394 00	.....	1,970 00	1,970 00
Telephones	26·00	.....	46 82	239 46	977 81	1,217 27
Total	.....	.....	.....	7,425 37	25,466 18	32,923 55

TABLE 8.—Summary of Incomplete Projects.

Project.	Length.	No.	Average Cost.	Cost, Rangers' Salary.	Cost, exclusive Rangers' Salary.	Total.
	Miles.		$ cts.	$ cts.	$ cts.	$ cts.
Roads	13	.....	91 21	113 89	1,071 86	1,185 75
Primary Trails	22	.....	39 76	329 40	545 20	874 60
Cabins, Class A	.....	3	818 72	908 70	1,547 47	2,456 17
Cabins, Class B	.....	3	157 25	231 77	240 00	471 77
Cabins, Class C	.....	8	86 23	226 23	463 64	689 87
Barns	.....	1	222 17	32 50	189 67	222 17
Bridges	.....	.....	.....	54 30	230 00	284 30
Fences	.....	4	70 78	46 67	236 45	283 12
Total	.....	.....	.....	1,943 46	4,524 29	6,467 75

TABLE 9.—Maintenance and Alteration of Completed Projects.

Project.	No.	Cost, Rangers' Salary.	Cost, exclusive Rangers' Salary.	Total.
		$ cts.	$ cts.	$ cts.
Roads	.....	16 70	159 90	176 60
Secondary Trails	.....	231 84	121 25	353 09
Telephones	.....	91 60	35 25	126 85
Houses, purchased	5	167 05	473 88	835 23
Total	.....	507 19	790 28	1,491 77

TABLE 10.—Completion of Projects unfinished previous year.

Project.	No.	Average Cost.	Cost, Rangers' Salary.	Cost, exclusive Rangers' Salary.	Total.
		$ cts.	$ cts.	$ cts.	$ cts.
Cabins, Class A	3	379 81	603 50	535 94	1,139 44
Cabins, Class B	14	62 32	737 07	135 33	872 40
Cabins, Class C	1	3 40	3 40	.....	3 40
Barns	2	22 76	45 52	.....	45 52
Total	.....	.....	1,389 49	671 27	2,060 76

Photo by W. N. Millar.

Props and Lagging on the Brazeau Colleries Timber Sale, on the Brazeau Forest.

SILVICULTURE.

The most striking development in the timber-sale business during the past year was the very large demand for mining timbers on the Brazeau Forest reserve. The completion of railway lines into the Brazeau forest, and the opening up of new mines, has given rise to a demand for mining timbers which will undoubtedly continue and very likely increase to a considerable extent. This is also true of the northern portion of the Clearwater forest to which a railway was completed and in which mines are already in operation. The building up of a market for mining timbers within the Rocky Mountains forest reserve will be highly advantageous, not only to the mining interests and the general interests of the community, but also to the silvicultural interests of the forest reserve itself. The great advantage of having coal mines as a market for forest products lies in the close utilization which is secured in cutting timber for such purposes, and in the possibility of disposing of classes of timber which are not ordinarily suitable for manufacture into lumber. This close utiliza-

tion naturally makes possible the application of many technical forestry operations which cannot be considered where the market is more stringent in its requirements as to size and quality.

The development of mining interests within the reserve, and the consequent demand upon the reserve for mine timbers, has given rise to a necessity for taking definite action in regard to limiting the use of forest reserve timber to those purposes for which it is best adapted, as was suggested in my last annual report. In certain portions of the Brazeau Forest reserve, and a relatively small portion of the Clearwater reserve also, it seems very desirable to designate portions of the reserve timber which will be put on the market only for use by mining operators. In designating these areas consideration must, of course, be given to legitimate demands for timber for local requirements other than mining, but, as a general rule, it will be found that the amount of timber adjacent to operating coal mines in this portion of the reserve is so limited that it cannot reasonably be expected that the available supply will suffice both for the needs of the coal mines and for saw-milling and export purposes. Under these circumstances, I feel that the coal mines, because of their close proximity to the timber, their absolute dependence upon timber for continuance of operations, and the superior utilization which they are prepared to make, should have the first opportunity to secure the timber that they need in their own vicinity. This should be accomplished by designating certain tracts of sufficient size within which competition on sales is limited to coal-mine operators alone. The preliminary work of locating these areas has already been done, and detailed recommendations will be prepared and forwarded during the next season.

The subject of brush disposal on timber sale areas has been referred to at various times, and all of the sales that have been made under the Forest Reserve regulations in this district have provisions providing for the disposal of the brush either by burning or in accordance with such other methods as might be specified by the forest officer in charge. It must, of course, be realized that while the methods of disposing of brush are not so very numerous, yet there are quite a number of small variations in these methods needed to make them applicable to local conditions, and that unless the best method with the proper variation is arrived at in each particular case the cost is likely to be excessive or the disposal unsatisfactory. The best way in which to arrive at a final decision in regard to the most satisfactory method of brush-disposal to be followed in any individual case is to carry out a series of experiments to ascertain what is the cheapest and most satisfactory procedure under the various conditions which exist within the reserve. A start has been made on a line of experiments of this sort, although, owing to lack of assistants, especially experienced assistants, the work has not been undertaken upon as clear-cut and scientific a basis as is desirable for the securing of reliable statistics and results within the shortest reasonable time. We have now in operation, however, timber sales in practically all of the more important types and situations which occur in the mountains, so that there is an opportunity afforded for carrying out experiments in brush-disposal which can be made conclusive and fully comprehensive, provided the work is organized upon the proper basis and handled with an adequate staff. This would involve the employment of an assistant in the inspector's office to take charge of silvicultural work alone, as the administrative work of the inspector is entirely too great to permit him to devote to silvicultural work the time both in the field and in the office that would be necessary to make this work a success.

Another line of work taken up during the past year and conducted with much success was the preparation of volume tables for the important species on the East Slope. The only tables available were those prepared by Mr. Dwight, and included within Bulletin No. 33. These tables, of course, were not based upon any large number of trees, and were taken in only one type, which happened to be perhaps the best type of timber on the reserve, and a type of which not very much remains in the hands of the Government. There was urgent necessity for volume tables applicable to the more

unfavourable sites, and especially to the stands which occur in the northern portion of the reserve and at rather considerable elevations. In order to provide these tables, a small crew under the charge of Forest Assistant McVickar was kept employed practically throughout the winter making measurements and plotting results, so that we now have figures upon which we can base volume tables for practically all conditions from the Saskatchewan river south, and for most of the conditions encountered between the Saskatchewan and the Athabaska. There are still one or two tables needed in the Brazeau and Athabaska Forest reserves for which adequate data are not yet available, and which should be secured during the next season. We also secured figures upon which to reconstruct, if necessary, the tables prepared by Mr. Dwight and published in Bulletin No. 33. The work of computing the results of the measurements is not yet completed, but I attach hereto volume tables for lodgepole pine and Engelmann spruce, prepared as a result of measurements taken on the Highwood river, and based upon diameter and total height in 10-foot height classes in one table and diameter and merchantable height in 16-foot log lengths in the other table. Three tables will be prepared for both spruce and pine showing board-foot contents on the basis of total height and diameter, merchantable hight in log lengths and diameter, and cubical contents on diameter, merchantable length. These tables will be applicable in three different regions of the forest reserve. Work of this character should, of course, be under the direction of the assistant in the inspector's office above suggested.

The timber-permit business in the district, although it is rather large as regards totals, is yet distributed over so extensive an area that it is not possible to give to it the same close attention as in other districts. It is impossible in the Alberta district, with forest reserves of three or four million acres in extent, for the forest supervisor to have the intimate personal acquaintance with the timber-permit business on his reserve that can be readily secured in much smaller and more concentrated reserves such as those in Manitoba and Saskatchewan. A system of administration, therefore, which gives good results in small compact reserves of a few hundred thousand acres does not give equally satisfactory results on reserves the size of those in the Alberta district. There is evident necessity for some form of report by forest rangers on the timber permits handled under their supervision, so that inspection by the supervisor may not involve a knowledge of each separate permit, but may be confined simply to an inspection of a small portion of the work upon which the rest can be judged as shown by the rangers' reports. This procedure is particularly necessary in the Rocky Mountains, although it would perhaps not be so important on the Cypress Hills, provided there were a supervisor for that reserve who would live on the reserve and keep in direct touch with all lines of work, of which the most important is the timber-permit business.

In connection with the administration of fire protection on the timber berths within the forest reserve and the prevention of trespass on these berths or on lands adjacent to the berths, a great deal of difficulty has been experienced, owing to the fact that the lines in many cases, through lapse of time, or through fire, or other causes, have become obliterated. It has become urgently necessary in a number of cases, that these boundary lines be delineated, and for this purpose plans have been made for an examination of the more urgent cases by a qualified surveyor in co-operation with the district ranger, so that the lines which need retracement and re-establishment may be accurately determined. The resurvey of these lines would seem to be properly chargeable to the berth-owners and in order to maintain the lines in proper condition berth-owners should be required to re-blaze them and clear them out at least once every ten years. The work of examining these lines will be completed during the next season and the plans for this work contemplate the establishment of these lines only in the most urgent cases and the recommendation that the berth-owners be required to re-establish the lines wherever it appears that such re-establishment has become necessary. It would seem fully justifiable to assess a maximum rate of damages against timber-berth owners who, through neglect to mark up their lines, trespass on the forest reserve, as it is impossible in many cases to determine the location of these boundaries except by a transit survey, which none of our forest rangers are qualified to make.

A line of work which is of very considerable importance for the proper organization of the silvicultural work on the reserve is the preparation of a type map of the entire reserve, particularly those portions which are adjacent to areas where timber is in demand either under sale or permit. Such a map is also essential for the proper organization for fire protection as it will be obvious that without accurate knowledge of the location of valuable bodies of timber a proper distribution of the fire-protective force and line-up of fire-protective improvements is scarcely feasible. I will refer to this at greater length under the subject of Surveys, as a start has already been made on this work and much preliminary work has been done during the past season.

GRAZING.

The work of organizing the administration of grazing in the forest reserve in conformity with the Forest Reserve regulations governing this subject had progressed very satisfactorily at the end of the present year. The intentions of the Forestry Branch in regard to the administration of grazing within the reserve had been rather extensively advertised, and has been a matter of discussion between forest reserve officers and stock-owners in the vicinity of the reserve for the past two years, so that a fair proportion of the persons affected were already familiar with the system and prepared to conform to its requirements, although it is a rather new proposition and something which has never before been attempted in grazing administration in the Dominion. Nevertheless, it was found that the scheme appealed very strongly to the great majority of the stock-owners near the forest reserve, once it was adequately and carefully explained to them. Practically all of the land which has been utilized for grazing purposes and has a value for this purpose in the forest reserve south of township 19 has been applied for under the Forest Reserve regulations, and for the most part conflicting applications have been adjusted, and the range apportioned in accordance with the principles underlying the Forest Reserve regulations.

The fundamental principles underlying these regulations might be briefly stated as follows:—

1. The conservative use of the entire available range each year with restrictions that will not involve damage to the forest crop.

2. The distribution of this range among a large number of small nearby resident farmers and ranchers, under restrictions which will not compel any one privileged to use the range to run less stock than is commensurate with the maintenance of a home in accordance with recognized Canadian standards.

3. The encouragement of mixed farming by devoting the forest reserve range to summer use and carrying the stock thus ranged during the summer on the by-products of the farm lands outside the reserve boundary.

The desirability of the fundamental principles is almost universally recognized. The only difficulties which have arisen have been in connection with a misunderstanding of the administrative procedure by which the business would be handled so as to accomplish these objects. Almost without exception where the details of this procedure have been explained opposition to the scheme has disappeared. It is highly desirable—in fact, essential—for the continued operation of a system of grazing administration such as this established by the Forest Reserve regulations that there be some one officer, preferably an assistant to the inspector, charged exclusively with the supervision and inspection of the grazing and administrative work. There will be ranged under this system under permit south of the main line of the Canadian Pacific Railway somewhere betwen 15,000 and 20,000 head of horses and cattle, and perhaps 10,000 head of sheep. North of the Canadian Pacific Railway there will also be several thousand head of horses and cattle scattered over a large area of country as far up as Saskatchewan river. The total number of permittees will probably be in

excess of 200, although exact figures are not available. All of these permits must be renewed during the following year, and all are subject to such readjustments as is provided for by the regulations. The amount of detail involved in the administration of such a large number of permits over such an extensive area is very great, and it is impossible that the inspector can continue to handle this work in addition to the numerous other lines of administration with which he is charged.

The scheme of grazing administration is decidedly co-operative in character and it will be found that a great deal more can be accomplished through the action of co-operative associations in the various grazing districts than through direct action with the numerous individuals concerned. This was recognized in the drafting of the regulations which make provision for consultation between Forest Reserve officers and recognized live-stock associations. Several such associations have been consulted, and one has been formed solely for the purpose of securing the benefits conferred by this

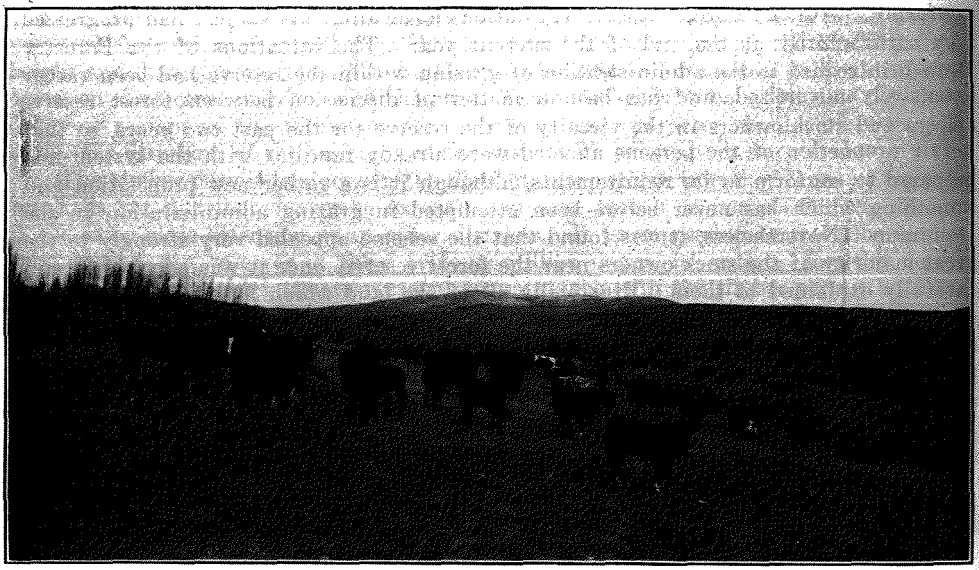


Photo by F. McVickar.

Horses and Cattle on Bow River Forest.

regulation. A great deal more might be accomplished along this line if there were an officer charged specifically with the administration of the grazing business who could give his time exclusively to grazing work and furnish the advice and assistance which is always found to be necessary in the organization of such associations.

The problem of providing range for sheep within the forest reserve, about which there has been more or less agitation and which was referred to in my last annual report, seems to be well on the way to a satisfactory solution. Two areas of ranges in the Crowsnest forest have been considered for this purpose. The one range occupies a large part of the northern half of the forest lying in the valley of the Livingstone river and its branches west of the Livingstone range. This range was, after conference with the Southern Alberta Wool Growers Association, reserved for sheep-grazing purposes, and tentative applications for about 10,000 head were submitted by members of this association, subject to the results of a personal examination of the range which they undertook to make, and also depending upon the securing of a sheep driveway from the Livingstone Gap to the Crowsnest branch of the Canadian Pacific railway. This range will be available for use about three months of the year, and the plans of the sheep-owners who have applied for the privilege of running sheep in the

district contemplate using it only for dry stock after shearing early in June. A very material impetus could be given to this business were it possible to secure from the railways special rate from Lethbridge to the summer range and back again such as is given by the American roads for similar service in Montana.

The second area of range which was more extensively in demand is that lying in the mountains east of the Waterton lakes. It was, unfortunately, not possible to meet all the wishes of the wool-growers in connection with this range, as much of it was previously occupied by cattle that could not be displaced without working a hardship upon those persons who were dependent upon this range for their stock. It was, however, claimed that there was additional range in the vicinity that could be used only for sheep and which had not been taken into consideration by the Forestry Branch. For the purpose of settling this question arrangements were made for a special examination of the range in this vicinity by a Forestry Branch officer in co-operation with sheep owners who are familiar with the district, and if it is found, as is claimed, that range valuable only for sheep occurs in this portion of the forest it may be possible to arrange for its utilization by the sheep interests.

SUPPLIES AND EQUIPMENT.

In my last annual report I suggested that a very material improvement in procedure and administration could be secured if the supplies for the department both for field and office use were standardized. Very little progress has been made in this direction during the past year, and I would again repeat my recommendation that the matter be taken up and standard lists of supplies be prepared as a result of a special investigation of the entire subject to be conducted by the head office and approved by the inspectors' conference. The use of standard lists of supplies would not only very greatly facilitate the preparation of requisitions and avoid much unnecessary correspondence, but would also insure a uniformity of equipment throughout the service and undoubtedly save a large sum of money. At the present time, for various reasons, more or less unsatisfactory equipment has accumulated because of the personal whims of officers who under the present procedure feel free to indulge their own individual ideas as to what kind of equipment is necessary, rather than conform to the requirements which the combined experience of the branch has found to be most desirable. Although this is not a matter of first importance, nevertheless it is a problem that could readily be solved and I am convinced that the results would amply justify the trouble and expenditure that might be necessary in the preparation of such standard lists.

SURVEYS.

The survey of the boundary, the necessity for which was pointed out in my last annual report, has already been described in a previous section of this report. Two other lines of surveys were indicated in my report as being necessary on the Rocky Mountains Forest reserve. These were the establishment of permanent traverse lines along the main rivers, particularly in the northern part of the reserve, and the location of administrative sites by definite surveys.

The work of establishing permanent traverses was undertaken by two parties under the charge of Mr. B. C. Pierce, an experienced surveyor, and Mr. T. H. G. Clunn, D.L.S., who was assigned to the branch from the Surveyor-General's office. Two parties were organized under the charge of these men, and the work was carried out in accordance with instructions prepared by the inspector under date of May 15, and June 7. These instructions provided for the running of accurate traverse lines by means of the transit along which permanent monuments were established at about half-mile intervals. These traverses are tied to the public land survey and in all cases close on a point on this survey. The monuments are numbered consecutively and elevations were carried along by trigonometric methods, so that the elevation of

each monument is known. In addition to the primary traverse, secondary traverse lines were run up most of the important side-streams by means of compass or traverse board. These secondary lines are tied to the primary traverse and serve to enlarge the scope of country mapped in from the primary line. The purpose of this work was not only to afford a reasonably accurate map of those large areas of the reserve which had not heretofore been mapped, but also to afford permanent monuments from which subsequent surveys of any kind whatever can be started and properly located on the map. Such surveys include the survey of administrative sites, of areas of land occupied under permit, of timber-sale applications and of permanent improvements, the location of which cannot otherwise be ascertained.

The work was started on the McLeod river by the northern crew under Mr. Pierce and on the Red Deer under Mr. Clunn, and the crews worked toward each other throughout the summer. The northern crew completed its work as far south as the South Brazeau river and the southern crew completed work north to the Clearwater river. The interval between the two crews, comprising the drainage of the Little Brazeau, the North Saskatchewan and the Sheep river, can readily be handled during the next season, largely by one crew, so that by the end of the season of 1914 this work will be practically completed as far as the reserve south of the Athabaska river is concerned.

In the southern portion of the Crowsnest forest the co-operation of the Topographic Surveys Branch was secured for the purpose of preparing a photo-topographic map of the reserve. The crew, operating under instructions from this branch, worked in the north half of the Crowsnest forest throughout the season and now have the map of this portion well along towards completion. It is understood that this work will be continued in the south half of the reserve during the next season and it would be very desirable to have the same work carried out for the south half of the Bow River forest as soon as the Crowsnest is completed.

The new addition to the Crowsnest forest lying in the Porcupine hills is very inadequately mapped, but it would seem possible, after consideration of the conditions in this portion of the reserve, to handle the mapping most economically in connection with a grazing reconnaissance of this portion of the reserve. I have already referred to this in connection with the subject of grazing.

The third line of surveys, the location of administrative sites, was well forwarded by most of the supervisors last year, so that a fair part of this work has now been completed, but there still remains a considerable number of sites to be surveyed, especially on the Bow river and the Brazeau forests. Little work of this kind can be undertaken on the Athabaska, for the reason that there are no permanent monuments to which surveys can be referred, and there is, therefore, almost no chance to determine with even reasonable accuracy the location of any body of land except at an unjustifiable expense. The following table shows the number of adminstrative sites surveyed and approved on the different reserves during the past season:—

TABLE 11.—Administrative Sites Surveyed and Approved.

Forest—	Number of Sites.
Bow River	5
Brazeau	1
Crowsnest	3
Clearwater	11
Total	20

So little was known of the topography of the mountain divisions of the Brazeau and Athabaska forest, and so conflicting was the information furnished by the persons who claimed to be acquainted with this country, that it was thought desirable last year to have this section explored and secure a sketch map and report upon the conditions in this portion of the reserve upon which further action could be based. The total

Photo by W. N. Millar.

Sheep-heads at Camp, Brazeau Forest, Alberta.

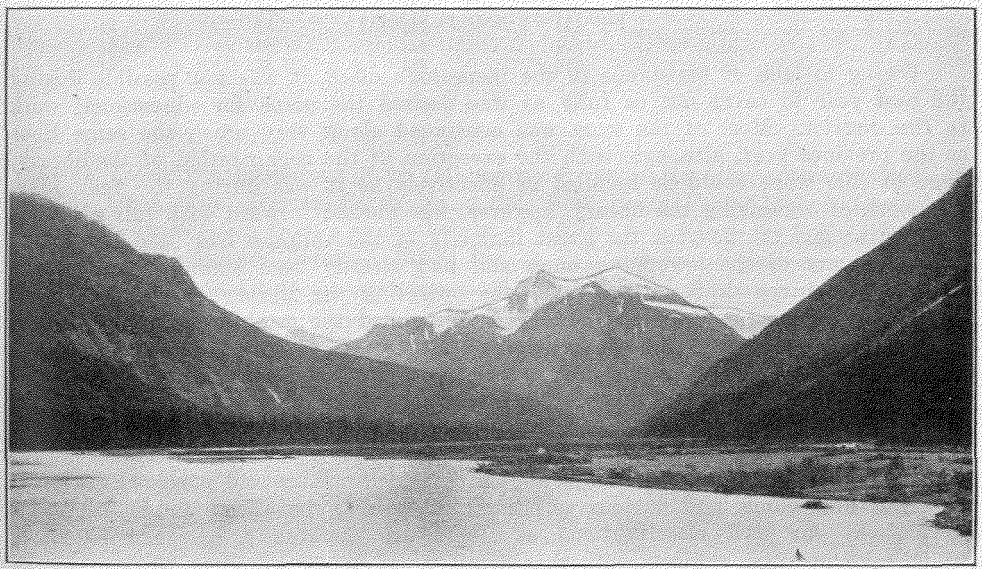


Photo by C. H. Morse.

Forks of the Chaba, Brazeau Forest, Alberta.

area is something over three million acres, so that it was important that some plans for its protection and administration based upon adequate knowledge of conditions be made. To accomplish this work, Mr. C. H. Morse was employed and furnished with an outfit and one assistant, spent the entire summer exploring the mountain portion of the two reserves from the head-waters of the Athabaska to the head-waters of the Smoky. As a result of this work. Mr. Morse submitted corrected maps showing the courses of the streams and the location of ranges, passes and other natural features of importance. He also prepared plans for improvements and fire protection for the reserve, and made sketch maps of the timber resources, mapping in types in a broad way as was rendered necessary by the character of the exploration. This is the only portion of the reserve where exploration work of this kind is necessary, but it would be extremely useful to have a map of the entire reserve showing the timber types in accordance with the Forest Atlas legend so that more definite plans could be made in regard to both fire protection and the administration of the timber. At the present time there is no information of any kind available which shows the location of the merchantable timber or the location of areas requiring special protection inside the reserve. It would be out of the question and unnecessary under present conditions to undertake a detailed reconnaissance, but it would not be especially difficult to make a map of the timber resources of the entire reserve, using as a base the traverses and other survey work that is being done, and sketching in types in a general way from traverses along the main rivers and other elevated peaks. An experienced man on this work could probably cover the entire forest reserve south of the Athabaska river in two working seasons. In connection with this work the photographs taken in the preparation of the photo-topographic map of the Crowsnest would probably be of very material assistance. Such a map is indispensable for the systematic handling of the timber resources of the reserve, and considering its comparatively small cost it is a work that should certainly be undertaken as soon as a competent man can be secured and the permanent traverse lines upon which the map will have to be based are established.

EDUCATION AND PUBLICITY.

Owing to lack of assistance in the inspector's office, it was not possible during the past year to carry out as fully as was desired the plans for educational work in the district. Most of the work was continued along very much the same lines as the previous year, although, with the exception of the organization of the library, none of this work could be handled as effectively as it was during the year 1912. The work of organizing the library, however, was pushed forward with fair rapidity, and by the end of the year the great majority of the volumes had been listed and ordered, many of them were on hand and had already been bound and classified and a preliminary draft of the plans for operating the library had already been prepared. As the plans for the library contemplated the establishment of a circulating system and also the utilization of the library as a school of instruction for the Forestry Branch officers through the preparation of reading lists, etc., it is necessary that the library be much more intensively classified and indexed than would be the case were it to be used only for reference purposes. For the forestry literature in the library the classification prepared by the faculty of the Yale Forest School has been adopted. For other subjects such as stock-raising and grazing, engineering, fish and game and various auxiliary subjects it has been found necessary to prepare our own classifications as there are apparently none in existence which take up these subjects with that detail which was believed to be desirable in a library of the character established in this district. The work has now progressed so that it seems certain that the organization will be completed by the end of the field season of 1914.

The demand for popular lectures on forestry subjects which was referred to in my last annual report still continues and offers an opportunity for educational work

which should certainly not be neglected. It was unfortunately not possible, owing to the inadequate staff in the district, to undertake any work of this character during the past season. Such work, however, is, I believe, of much importance, as by this means the aims and purposes of the forest administration can be most directly placed before the public and many misconceptions and much opposition due wholly to ignorance can thereby be dispelled.

Respectfully submitted,

W. N. MILLAR,

District Inspector of Forest Reserves for Alberta.

VOLUME TABLE FOR LODGEPOLE PINE (HIGHWOOD RIVER).—Based on measurements of 437 trees from Timber Berth No. 1,429, Bow River Forest, taken December, 1913. Trees taken from a stump-height of 1·5 feet to a 6-inch top. No allowance made for rot or abnormal defects. Board feet by Scribner Log Rule.

Diameter at Breast-Height.	Total Height.			Basis Number of Trees.	Average Diameter at Breast-Height.
	50 Ft.	60 Ft.	70 Ft.		
Inches.	Ft. B.M.	Ft. B.M.	Ft. B.M.		Inches.
9	40	47	54	15	9·2
10	50	60	70	59	10·1
11	60	73	86	84	11·0
12	72	86	100	100	12·0
13	84	104	122	73	12·9
14	96	122	144	62	14·0
15	110	141	172	36	15·0
16	124	168	212	8	16·0
Basis.....	104	236	97	437	

VOLUME TABLE FOR LODGEPOLE PINE (HIGHWOOD RIVER).—Based on measurements of 441 trees from Timber Berth No. 1,429, Bow River Forest, taken December, 1913. Trees taken from a stump-height of 1·5 feet to a 6-inch top. No allowance for rot or abnormal defects. Board feet by Scribner Log Rule.

Diameter at Breast-Height.	Number of 16·3-Foot Logs.				Basis, No. of Trees.	Average Diameter at Breast-Height.
	2	2·5	3	3·5		
Inches.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.		Inches.
9	42	50	58	66	9	9·1
10	51	62	72	83	57	10·1
11	60	74	86	100	80	11·0
12	70	87	102	119	102	12·0
13	80	100	120	140	73	12·9
14	91	115	139	161	63	13·9
15	103	132	160	188	37	14·9
16	116	150	185	220	20	16·1
Basis....	101	203	116	21	441	

VOLUME TABLE FOR ENGELMANN SPRUCE (HIGHWOOD RIVER).—Based on measurements of 553 trees from Timber Berth No. 1,429, Bow River Forest, taken December, 1913. Trees taken from a stump-height of 1·5 feet to a 6-inch top. No allowance for rot or abnormal defect. Board feet by Scribner Log Rule.

D.B.H.	Number of 16·3-Foot Logs.							Basis, No. of Trees.	Average Diameter Breast-Height.
	2	2·5	3	3·5	4	4·5	5		
Inches.	Ft.B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.	Ft. B.M.		Inches.
9	45	58	71	89	110	.....	.....	5	9·3
10	52	67	82	102	126	163	.....	15	10·9
11	58	75	93	116	142	179	.....	42	11·0
12	65	85	105	130	159	196	230	43	12·0
13	73	95	115	145	175	214	252	60	13·0
14	81	105	129	161	193	234	276	61	14·1
15	90	116	143	177	214	255	302	55	15·1
16	100	128	157	196	236	278	331	61	16·1
17	110	141	174	216	258	304	362	49	17·1
18	121	155	192	236	285	333	397	49	18·0
19	133	170	212	259	314	367	435	39	19·0
20	145	186	232	283	347	406	477	33	20·0
21	159	203	254	309	382	450	527	13	21·0
22	172	220	277	336	420	500	581	11	22·0
23	186	238	300	362	460	547	638	8	23·2
24	200	256	324	390	500	597	700	4	24·0
25	.....	.....	.....	.....	.....	650	765	1	25·0
26	.....	.....	.....	.....	.....	708	835	1	26·0
27	.....	.....	.....	.....	.....	765	905	1	27·4
28	.....	.....	.....	.....	.....	828	977	.....	.....
29	.....	.....	.....	.....	.....	890	1,050	2	29·0
30	.....	.....	.....	.....	.....	950	1,113	.....	.....
Basis...	60	102	162	130	65	25	9	553	

APPENDIX No. 5.

REPORT OF THE DISTRICT INSPECTOR OF FOREST RESERVES FOR BRITISH COLUMBIA.

KAMLOOPS, B.C., May 2, 1914.

R. H. CAMPBELL, Esq.,
Director of Forestry,
Ottawa.

SIR,—I have the honour to submit hereunder my second annual report as District Inspector of Dominion Forest Reserves for British Columbia.

LIMITS OF DISTRICT.

The British Columbia Inspection District was enlarged this year to include inspection work of the fire ranging in the Coast district. Now, therefore, the fire protection work of the entire Railway Belt is under the general supervision of this office.

Four classes of work were carried out by the Forestry Branch this year, viz:—

1. Forest reserve administration.
2. Surveys.
3. Fire-ranging on Dominion lands.
4. Co-operation with the Board of Railway Commissioners in railway patrol.

These activities will be reported on separately.

FOREST RESERVE ADMINISTRATION.

By an amendment to the Dominion Forest Reserves and Parks Act, assented to June 6, 1913, some 1,100,000 acres were added to the forest reserve areas in the Railway Belt of British Columbia by extending the boundaries of existing reserves and creating new ones as per the following table:—

Reserve.	Original Area, 1911.	Additions.	Totals.
	Acres.	Acres.	Acres.
Long Lake	121,600	47,494	169,094
Monte Hills	67,840	49,120	116,960
Martin Mt.	11,360	10,400	21,760
Niskonlith	80,000	123,840	203,840
Tranquille	95,360	90,624	185,984
Flat Creek	131,200	86,560	217,760
Larch Hills	16,000	.....	16,000
Nicola	.....	323,680	323,680
Fly Hills	.....	143,200	143,200
Arrowstone	.....	163,200	163,200
Mount Ida	.....	28,960	28,960
	522,840	1,067,598	1,590,438

These additions comprise now practically the entire body of forest land within the Dry Belt, and, if administered rationally, should be of material benefit to the neighbouring population, as well as ensuring a permanent and continuous flow of water for irrigation purposes.

Forest Reserves.—Within the last year considerable criticism has arisen as to the advisability of the increase in forest-reserve area, based principally upon the opinion which is unfortunately prevalent among a good many people that large areas of agricultural land are included within these reserves.

I am convinced that this opinion is wrong. It is based on the complaints of a few settlers, which, originally directed against a few quarter-sections, have grown, through repetition and through misunderstandings fostered by ignorant or prejudiced persons, to include all reserves.

All lands within forest reserves challenged by settlers as agricultural amount to less than 1 per cent of the area of reserves in this district. Practically all of these areas challenged are at very high elevations, where frost occurs every month of the year, and are desired only for possibilities of hay production, which is admitted to be all they are good for.

It must be recognized that the opinion as to what constitutes agricultural land has changed greatly within the last few years. At the same time, however, there are many signs which go to show that the limit has about been reached.

It is the opinion of a great many thinking men in this district that no settler should be allowed to enter on lands which will not support him and his family in a decent way. It is considered to be the duty of the Government to take upon itself the guardianship of the future of these people, instead of encouraging them to waste years

of their life in unprofitable pursuits. This can best be done by excluding poor lands from settlement.

By "poor lands" I mean areas such as I mentioned before, which are at high elevations, generally over 4,000 feet, where frost occurs every month of the year, and on which only hay can be raised, and that successfully only in limited quantities in small sloughs and meadows.

There has been in many cases a succession of entries and abandonments of lands of this class. Encouragement of settlement on such areas is surely a mistaken policy, which must inevitably retard the permanent prosperity of the country through the bad name given to the whole district by dissatisfied settlers who have moved elsewhere. Placing lands of this class in forest reserves will exclude this unprofitable settlement, and at the same time leave the way open for the fullest use of any resources they may contain. In this way the value of bona fide agricultural lands in the vicinity is increased without any injustice to anybody, and in the long run the country is benefited thereby.

There is the possibility, however, that lands which are bona fide agricultural lands may have in some cases been included in forest reserves.

It should be the policy of the forest administration to have such lands excluded, and thrown open for entry as soon as possible. Inspections will be made at as early a date as possible this summer of all areas about which complaint is made.

Such areas are, however, in my opinion very small and scattered. When it is considered that the lines of these reserves were run several years ago, when there was no hunger for agricultural lands, and when the possibilities of agriculture were presumed to be much lower than now, I think the Forestry Branch have reason to be proud of the scientific and conservative way in which these boundaries were delineated.

Personnel.—The administration of the forest reserves was placed under the direction of a forest supervisor during 1913. Under this officer there were two forest assistants and five forest rangers.

The average area per ranger was increased by the additions to the forest reserves. It amounted this year to over 183,000 acres per man. No appointments were made on the new reserves, the fire protection being handled by the regular fire rangers on Dominion lands as in former years.

The necessity of having the appointment of forest rangers based on their suitability for the position was emphasized during the year. Several rangers were put in charge of the construction of head-quarters, trails, etc., at the beginning of the season, but with one exception they had to be taken off this work, as they failed to show the requisite ability for handling work of this kind.

Improvements.—The splendid fire season rendered possible the construction of many improvements during the year, as practically the whole staff was available for this work.

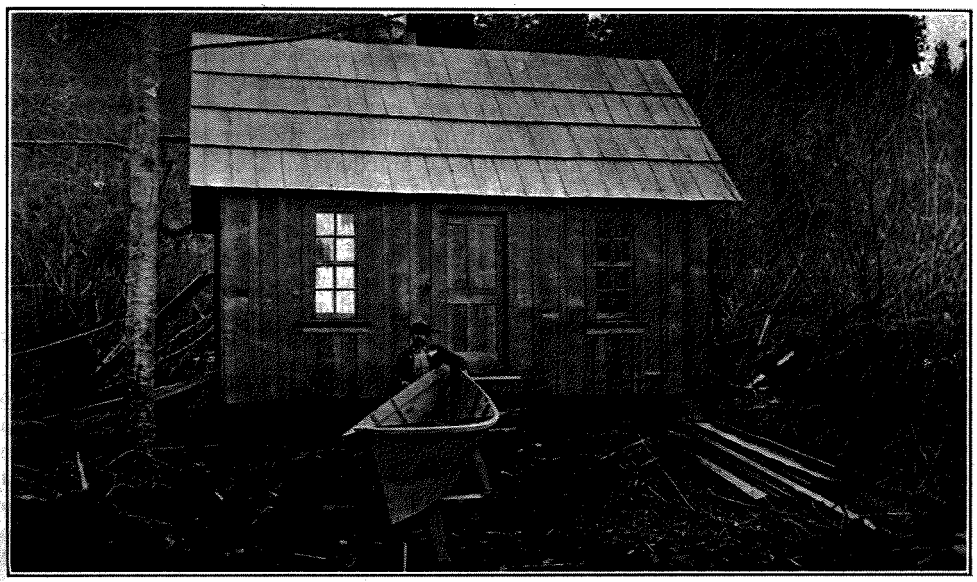
A preliminary examination of the reserves showed that they were for the most part inaccessible and consequently very little known. In planning the improvements for the different units, a site for the head-quarters was first selected, and from this the trails for which the most pressing needs were felt were located. A main ranger station was planned for each of the five old reserves, and considerable work was done on all. Four good stables were built and four houses begun; a considerable amount of fencing and land-clearing was also done. The houses are of logs, with lumber roofs and partitions, and contain from six to seven rooms. Two were inhabited during the past winter and were found most satisfactory. The responsibility for the work on these houses was originally placed on the rangers, but as this scheme did not work out very satisfactorily it was found necessary to have one of the technical staff almost constantly on the ground during construction.

In addition to the houses at the administrative headquarters of the reserve, two shelter-cabins and a tool-cache were built.

For the purpose of opening up the reserves for patrol and administration, over 6 miles of wagon road and 48 miles of trail were built. About 45 miles of disused trail were opened up, and three lookouts made accessible to the patrolmen. In addition, about a mile of fencing was done for the purpose of inclosing pastures and corrals.

In planning the trail system for the forest reserves in this province, the splendid topographical maps prepared in 1898 and 1899 by G. M. Dawson were of considerable assistance. While, of course, these maps were not accurate in the smallest detail, they gave the general trend of the country and showed where we could best hope to succeed in locating a trail.

The actual selection of the routes was made in nearly every case by one of the forest assistants, either alone or in company with someone who was considered familiar with the country. After carefully examining all the possible locations, a final line was decided upon and blazed. The trail-locator then met the foreman of the trail gang, and, if possible, took him over the whole length of the trail, explaining the way



Ranger's Cabin and Boat Built at Lillooet Lake, British Columbia.

in which different problems should be met. Where possible, the supervisor also went over the route before construction was begun. The trails were all cleared 6 feet wide, and all stumps, boulders, etc., removed from a strip about 18 inches in width down the centre of the right of way. On all hillsides where in the judgment of the foreman it was deemed necessary, a grade was made, the rule being to keep short grades down to 15 per cent and, in cases where a long climb was necessary, to below 10 per cent.

Only two roads of very great importance were begun, and of these one was located with the co-operation of the provincial roads superintendent, and the other by the supervisor and a forest assistant.

All the trail and road work was done under the supervision of temporary men of experience, and the results obtained were most satisfactory.

Summer Resorts.—The summer resort at Trout lake in the Long Lake forest reserve was improved by the construction of a road parallelling the lake just behind the lots. This makes all lots readily accessible to town by motor. Several fine summer-houses were constructed on lots during 1913, and the whole project is well on the way to becoming a very successful summer resort.

Camping at Trout lake has been restricted to certain localities under permit. In this connection, twenty camping lots were surveyed by forest officers for the use of persons desiring a private place all summer. In addition to this, a general camping area was laid out.

Fires.—The past summer in British Columbia was an unusually wet one. With the exception of a short period in the early spring, and another similar period shortly before the snow came, the timber never got an opportunity of getting dried out enough to cause worry over the fire situation. On forest reserves during the season there were only four fires, two of which occurred in the early spring. In all about 30 acres were burned over. Fire fighting on the forest reserves cost $121.97, and the total damage to the forest was negligible. These favourable weather conditions were most fortunate, as they enable the newly appointed men to get acquainted with their districts, learn the points of greatest danger, and plan means of approach to each.

The principal sources of danger in this country are campers and lightning. The former are rather confined in their operations, but the latter is likely to strike anywhere.

By close supervision of the camping places, posting notices, clearing away inflammable débris and appealing to the reason of the campers, it is hoped that this source of danger will soon be practically eliminated.

The lightning danger will always be with us and the only way of coping with it is by keeping well placed and vigilant lookouts, and having a sufficiently intensive trail-system to allow of reaching fires easily.

Disbursements.—During the past year disbursements amounting to $35,127.24 were handled from this office. Owing to the absence of clerical assistance, combined with the introduction of an entirely new system of account-keeping, some difficulty was at first experienced in making proper returns to head office. A clerk whose entire time is devoted to the accounts was added to the staff during the summer. In future there should be no difficulty in keeping records and accounts correct and up-to-date. The system of accounting which has been in use during the past year has been found very satisfactory and has simplified to a great extent the problem of keeping accurate account of costs. In connection with the latter much information of value for purposes of comparison has already been obtained and efforts will be made to summarize this and make it as useful as possible in working out plans for the reduction of expense.

Silviculture.—During the past field season the technically trained members of the staff endeavoured to obtain what information they could in connection with the silvicultural conditions upon the reserves, although no special efforts in this direction were made. During the winter, however, the reconnaissance survey carried out under Messrs. Wallensteen and Parlow in the Long Lake and Tranquille reserves obtained a great deal of information. In general, it may be said that the whole of the Dry Belt region between the altitudes of 3,500 and 5,500 feet is covered with lodgepole pine forest which has all been repeatedly swept by fire, and is, as a result, of many different ages. The burns are from five to one hundred and twenty-five years old, and from a few acres to somewhat over half a township in area. In a few cases areas were examined, which had been burned over repeatedly with the result that reproduction had been greatly reduced. One tract in particular is now entirely devoid of any trace of reproduction, and in the absence of seed trees there is very little hope of a stand being re-established for many years to come. This state of affairs is very significant and indicates the great importance of adequate protection in a country which, as in the present case, is so absolutely dependent on forest cover for regulation of its water-supply.

The lodgepole pine here seems rarely to reach merchantable size and most of it would never even do for ties. The small size of the timber seems to be primarily due to site conditions, although the density of the stand on poor soils may be another factor. It is probable that rational thinning would stimulate growth.

The appearance of great quantities of spruce reproduction under the lodgepole would indicate that here, as in the United States, the lodgepole type is temporary, and that if fire could be kept out a valuable spruce forest would replace it.

The Douglas fir and yellow pine are the only other trees of importance in the region. Both appear in open and park-like stands below 3,500 feet. The fir is, as a rule, limby and crooked, although the pine is of fairly good quality.

There is at present in the Dry Belt no demand whatever for timber on the forest reserves, and it is unlikely that timber-sale business on them will develop for some years to come.

Trespass.—Very little difficulty has so far been experienced with timber trespass upon the forest reserves in British Columbia. The principal reason for this is that in most places there are considerable areas of timber-covered Dominion lands which are much closer to the settled districts than are the forest reserve boundaries. It is due to this fact that while a thriving trade is carried on each winter in cordwood and lumber sawn by portable mills there is practically no demand for forest reserve timber and consequently little incentive to steal.

The permit business during the past year was practically negligible, on account of the reasons mentioned in the remarks on trespass.

Survey.—After the close of the improvement work a considerable portion of the reserves staff became available for investigatory work and a survey party was organized to work under Mr. Wallensteen in the Long Lake and Tranquille forest reserves. The general instructions of the party were to locate the boundaries of all important timber types, to map all areas which would be suitable for cattle and sheep grazing, to survey existing trails, and to make recommendations regarding the fire-plan for the reserves. The party consisted of a chief, three assistants, and a cook. The intention was to have two working units of two men each. The results were quite satisfactory, the information sought was obtained, and practically the whole of the two reserves covered.

During the period of operations the whole region was covered with a heavy mantle of snow, but this, although it made moving camp difficult at times, was in other ways of considerable assistance, as areas which in summer are practically inaccessible on account of the windfall, were reached with ease on skis. The party moved from time to time by means of a Yukon sled and a toboggan pulled by hand. All the members were equipped with snowshoes and skis. The former were necessary when pulling on the toboggan or climbing mountains, but the latter were found much more satisfactory wherever the upgrades were not heavy. Considerable personal skill is needed in handling skis, but almost any healthy man can use them to advantage after two or three weeks practice.

A detailed report of the work is in process of preparation by Mr. Wallensteen. This will include accurate maps of the topography of the regions covered, and will give the location of all improvements, both existent and projected. It is hoped to continue this work until a thorough knowledge of all the reserves has been obtained.

The winter survey seems to be a very suitable way of utilizing the services of permanent employees during the winter. In this way not only is there obtained adequate return in labour at an otherwise slack season, but the work itself is of great benefit in educating the ranger staff in forestry work of numerous kinds.

Fish and Game.—The areas in which the forest reserves in British Columbia are situated are famous for the fish and game which is found within their limits. Trout lake (Fish lake) in the Long Lake forest reserve is one of the most noted fishing resorts in British Columbia. The game is all under the control of the Provincial Government and up to the present the Forestry Branch here has made no effort to take any part in the administration of the game laws. Here, as in the Rocky mountains there are those who consider that the forest reserve should be closed for hunting, but I believe that such an action is quite unnecessary and would only serve to increase the troubles of the forest officers and to decrease their popularity. The

inhabitants as a whole respect the game laws and the provincial officers do their best to keep the number of offenders as small as possible.

The fishing within the forest reserves is handled by the Dominion authorities, and it has lately been apparent that some regulation of the use of the lakes is necessary. Owing to the elevation of the lakes in forest reserves and the consequent lateness of the break-up, spawning does not begin in the streams which feed these lakes until the middle of May or the beginning of June. If fishing is allowed in these creeks while spawning is in progress, tremendous quantities of fish can be shovelled out of the streams with ease, and the available stock for lakes will soon be exhausted. To prevent the possibility of this it has been deemed wise to continue the close season within the reserves until June 16, and this year fishing will not be allowed until that date.

Having made this restriction, and one pertaining to the per diem catch, it will be necessary for the Forestry Branch to enforce them. Little difficulty is to be expected in this regard, however, as the fishing is confined to a very limited area.

Supplies and Equipment.—The remarks made on this subject by the District Inspector for Alberta in Appendix 3 of your report for 1912-13 are applicable to this district during the past year. The principal difficulty in requisitioning supplies from Ottawa has been the lack of a check-list to enable us to state clearly just exactly what we needed.

The property-card record system by articles has proved satisfactory.

It should be possible, however, in addition, to work out a cross-reference system whereby the total accountability of any subordinate forest officer who is charged with property from this office can be obtained without the necessity of going through the cards.

The establishment of a system of this kind is being gone into at the present time by this office.

Education and Publicity.—No organized campaign of publicity has been made in connection with the forest reserves administration in British Columbia, but the members of the staff have been instructed at all times to explain to people the aims of the Forestry Branch and the means which it is adopting to secure the ends in view. It has been found that some misconceptions prevailed which resulted in a feeling of antagonism in some instances. It has been the practice of all forest officers to correct erroneous impressions wherever they are found and thus gradually the view-point towards the reserve policy is being changed from indifference or antipathy to interest and support.

Grazing.—During the past year I have paid considerable attention to the questions arising out of grazing of live stock on the forest reserves in this district. The amendment to the Forest Reserves and Parks Act of June, 1913, increased the forest reserve area by about 200 per cent, to a total of some 1,600,000 acres. At the present time practically all the non-agricultural land in the Dry Belt is in the forest reserves. Of this country I have estimated that approximately 660,000 acres are available for cattle and horse range. In addition to this there are over 250,000 acres of lodgepole pine timber-grass country in which horses and cattle will not graze but which may be suitable in considerable part at least, for sheep range. There are also some 80,000 acres of highland range situated above timber-line at an elevation of from 6,000 to 7,500 feet, which contain a very luxuriant growth of grass, vetches, pea vine, etc. This will make good horse or cattle range, but requires herding, on account of flies and lack of salt, so that for some time to came, it can be utilized for sheep only.

Estimates have been prepared showing the approximate carrying capacity of forest range in this district. This has been compiled on the basis of allowing 40 acres as sufficient to provide feed for four months for each head of cattle or horses and 13 acres for each head of sheep. The table shows a minimum carrying capacity of 16,462 head of horses or cattle and 26,625 head of sheep.

Most of the forest range in this district is available for summer use only. In most places grazing should not be allowed much before June 1, in order to allow the young grass to obtain a start and the range to dry off, so that damage by trampling will be avoided. By early October the cattle come out of the forests of themselves so that approximately four months can be considered an average grazing season.

Stock-growing at the present time is practically confined to horses and cattle; this has been a long established industry in this district. Misuse by overstocking of accessible range in the past, and the steady influx of settlers, who secured the best areas and the watering places on leased lands, caused a decrease in the number of stock some few years ago. Within the last year or two, however, the continued high price of beef has given a new impetus to the industry. More remote forest ranges are being opened up, and the number of stock in the country is increasing again. Besides this increase of stock by the ranchers we have another one, which year by year is increasing in importance, making itself manifest, namely, the gathering together of small herds by the numerous homesteaders and small settlers.

Stock held in this way will in the future by far outnumber that held by the present large owners. Indications, indeed, point to the fact that eventually all the industry will be devolved into these small holdings.

This state of affairs, namely, the necessity for using forest range, and the advent of the small owner into the question, makes it specially important at this time for the government to take steps to see that all the range possible is conserved and administered so that depreciation will not again occur. Inasmuch as this range is within forest reserves this work devolves on the Forestry Branch.

Proper range administration will mean the careful managing of allotments so that the fullest use can be obtained by both small and large owners, while at the same time forage conditions are improved from year to year.

The regulations drawn up by the Forestry Branch last year and passed by Orders in Council, dated August 8 and September 24, 1913, are suited, with some minor alterations, to accomplish this result very satisfactorily. These regulations provide for administration of grazing on forest reserve range under a permit system similar to that which has been so successfully carried out on national forests in the United States. Unfortunately, however, they were not well received by the stock-growers in this district, and their enforcement has, therefore, been delayed one year until the matter can be worked out to mutual satisfaction. A brief account of conditions and the proceedings leading up to the taking of this action by the department will probably be the best way to explain matters.

To begin with, no action had been taken by the department to enforce the provision of section 17 of the Regulations for Dominion Forest Reserves of 1910 which prohibited the grazing of live stock on forest reserves. All such regulations have been a dead letter in this district, and stock have ranged free on forest range since the inception of the industry here many years ago.

This neglect on the part of the Government for so many years led the leaseholders to understand that a lease of grazing land carried with it the right of free use of forest range lying in the mountains behind. Consequently, the proposal of administering this resource came as a disagreeable surprise to the members of the ranching industry.

Owing to the lateness of the season no attempt was made to enforce these regulations in 1913. It was considered advisable, however, to have the proposals thoroughly understood by the stock growers in plenty of time to come to an understanding before the grazing season opened in the spring of 1914. Therefore, on the 29th November, the district inspector issued an invitation to the members of the ranching industry to meet at the Forestry Branch office at Kamloops to discuss the questions which would arise out of the enforcement of these regulations.

As was anticipated, the stockmen present at this meeting voiced disapproval of the policy which would compel them to pay for forest range which had been used by

them free of charge in connection with their leases, from the earliest settlement of the country.

Outside of the general objection to further taxation, the stock-owners' principal objection to the grazing regulations were directed against sections 40 and 43. Section 40 requires a minimum fee of 25 cents; which means payment for five months pasturage at the minimum fee of 5 cents per head per month. This they considered unfair in a country where stock did not spend all their time on the forest range.

Section 43, which requires notice for the movement of stock on and off the reserve, was also declared impracticable.

After considering these matters thoroughly, in accordance with instructions from the director, I suggested amendments to these sections designed to obviate these difficulties. These amendments, which were also submitted to the public through the Kamloops Farmers' Institute, recommended a separate classification of range in British Columbia as "on-and-off" range, and provided a procedure for the taxation of grazing only for such times as the forest range was actually used by the stock of the permittee, although the permit would run throughout the entire grnzing season.

I also recommended that the provisions of section 43 do not apply to the case of "on-and-off" range, and that, in place of notice of movement of stock, the permittee should make an affidavit within ten days of the time the stock was moved on or off the reserve, giving the particulars thereof.

The Farmers' Institute, after discussing these points, passed a resolution asking the Government to fence forest reserves before attempting administration.

A general meeting was called on February 18 at the Council Chamber, Kamloops, by the Farmers' Institute to discuss the whole question further. I hurried back from Ottawa to attend this meeting. In my address before it, I first announced the intention of the department not to enforce these regulations in British Columbia during 1914. I then pointed out the impracticability of the Government fencing forest reserves with a total length of boundary of not less than 900 miles. After reviewing briefly the proposed amendments to the regulations, I made the suggestion that those present at the meeting form themselves into a co-operative association as laid down in section 54 of the regulations, and that they should appoint an executive with authority to act for the whole association.

I also suggested the advisability of the Dominion Forestry Branch requesting the United States Forest Service to lend us a grazing expert who would go into the whole question thoroughly and report.

The reason for doing this was that the whole question of the administration of forest range on a permit basis has been very satisfactorily worked out in District 1 of the United States Forest Service under natural conditions practically identical with those in the Kamloops district. They have also developed an expert personnel for this administration, thoroughly acquainted with the stock-growers' side of the question as well as the objects of the Forest Service. Therefore, if we could borrow a competent man temporarily from the United States Forest Service, we could get a thoroughly reliable and unbiassed investigation of the whole question here, which would take into consideration the necessities of the situation from the stock-growers' point of view, as well as the requirements which good forestry practice would dictate. Recommendations from a man of this character would be very valuable to the ranching industry as well as the Forestry Branch.

Neither of these suggestions met with a favourable reception. The first was refused because the majority opinion was that no regulations were wanted on any basis, and that the stock-owners should do nothing whatever in this matter.

The second was objected to mainly on the ground that no outside interference was necessary. It would, however, be more consistent with true patriotism to try and benefit by the experience of others than to force upon ourselves the necessity of obtaining the same results by the roundabout and expensive method of making all the same mistakes which were made on the other side and finally reaching the same result which

we might have obtained more quickly and economically by heeding the lessons their experience can teach us.

The suggestion for the formation of a Stock-growers' Association, however, bore good fruit for at a meeting of the members of the industry held at Kamloops subsequently the British Columbia Stock-growers' Association was formed.

In this condition the matter rests at the present time. It is to be hoped that your attendance at the meeting of the association at Ashcroft on June 2 next will clear up the situation. There is no doubt at all that economic conditions demand administration of the forest range, and this will have to come eventually. The department has treated the stock-growers in a fair way in inviting their co-operation in formulating the basis of such administration. It is to be hoped, therefore, that they will conclude that it is to their interest, as well as to that of the community at large, to meet the department in attempting a solution of this question.

SURVEYS.

In accordance with the policy of the Forestry Branch to define the boundaries of all tracts of non-agricultural lands in the Railway Belt, two forest survey parties were placed in the field in May, 1913, for the purpose of making such examinations.

Each of these parties was equipped with a democrat and light team which could also be ridden and packed, and two saddle-horses. A cook and packer were attached to each party. Tents were of silk, and all equipment supplied was as light as possible for ease in packing.

Of these, Survey No. 1 was in charge of Student Assistant F. Bruce Robertson, of the Faculty of Forestry, University of Toronto, who had spent the summer of 1912 in this district. He was assisted by E. B. Prowd, of the same forestry school.

This party examined the proposed southerly extension to the Hat Creek forest reserve and the country lying on both sides of the Fraser and Thompson rivers between North Bend and Spences Bridge. This work was completed on August 15. From here a move was made to the country lying east of the Okanagan valley and Mara lake, including the west slopes and interior valleys of the Gold range in the south half of the Railway Belt.

Survey No. 2, in charge of Student Assistant C. R. Mills, assisted by H. A. Parker, both of the Faculty of Forestry of the University of Toronto, spent the first half of the summer examining the country lying south and east of the Fraser river in the Coast district of British Columbia, comprising the Hope mountains. About the middle of July this work was finished and the party with its equipment, was brought through the Hope mountains via Coquihalla pass to Kamloops. From here the party examined lands lying north of Shuswap lake and Eagle river. On September 14 Mr. Mills combined his party with that of Mr. Robertson and together they finished examination of the east side of the Gold range in the Columbia River valley near Revelstoke.

Altogether the boundaries of 4,748 square miles of proposed new forest reserves were examined by these parties as follows:—

Survey No. 1	1,880
Survey No. 2	2,069
Combined parties	799
	4,748

The agricultural lands question in forest reserves in the district has led some people to criticize the nature of the boundary examinations for forest reserves. It might, therefore, be apropos to quote from my letter of instructions to Survey Party No. 2, that part relating to this question, which is as follows:—

> "Lands to be included in the reserve should be, as far as possible, only such as are absolute forest lands.

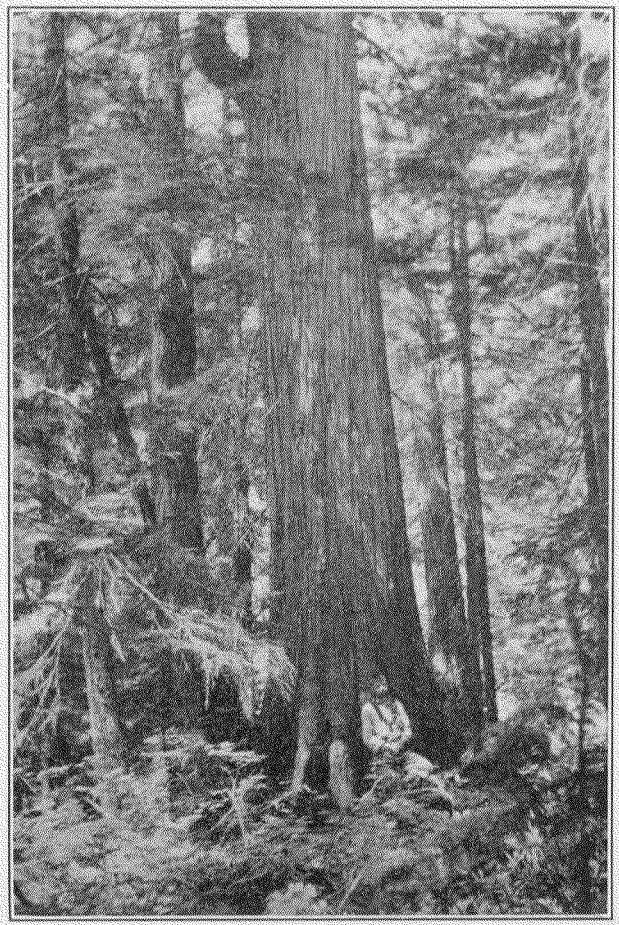


Photo by F. B. Robertson.

Western Cedar (*Thuja plicata*), Bear Creek, British Columbia.

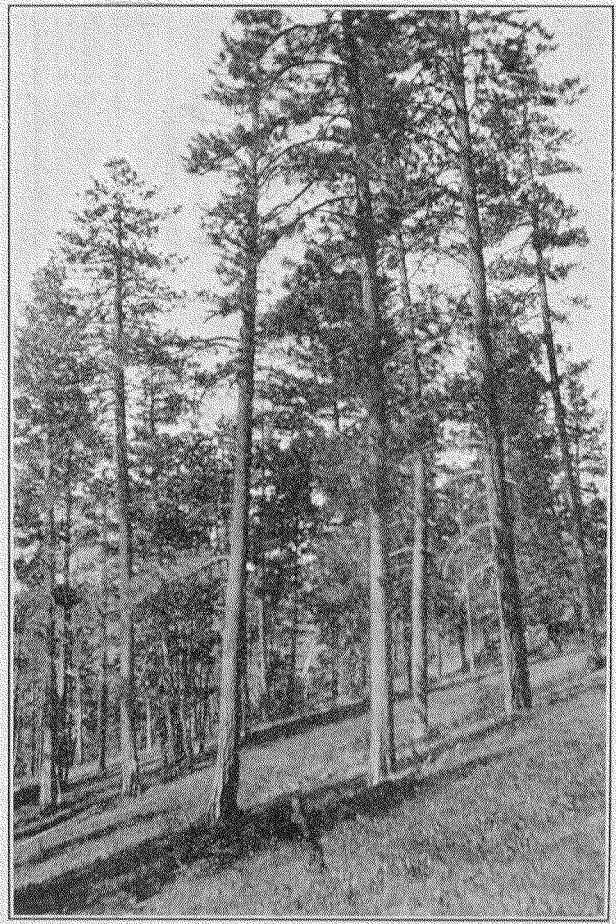


Photo by F. B. Robertson.

Bull Pine and Grass-land type, Prospect Valley, British Columbia

"In a country such as British Columbia, where farm lands are relatively very scarce, the settler should be given the benefit of the doubt in a case of any land of uncertain value for agricultural purposes. In this connection I would advise you to keep your eyes open and try to ascertain just what kinds of lands will be homesteaded in the district in which you are working. This will help you to form your judgment as to the status of the lands examined.

"Land is to be considered to be non-agricultural if the soil is pure sand or gravel, but a better criterion for your purposes is the nature of the slope and the elevation. Except in very exceptional cases it is not advisable to include any river or creek valley or bench-lands in the reserve. The inclusion of such lands always gives rise sooner or later to conflict with squatters. All reserve lands can be kept well on the hill or mountain slopes without doing any harm. In this connection it will be necessary to make flying trips with a pack outfit up the various creeks flowing into the Fraser from the south to see if there are any lands within their valleys which could possibly be used for agricultural purposes. It will also be advisable, if possible, to penetrate right through to the south side of the Railway Belt in one or two places in order to ascertain whether the southern limit of the Railway Belt could be followed altogether as a southern boundary of the proposed forest reserve."

These instructions were carried out very thoroughly, as far as I can ascertain, and I feel we can be fairly confident that the lines delineated will stand the test of time satisfactorily.

FIRE RANGING ON DOMINION LANDS.

The fire season of 1913 in the railway belt of British Columbia was probably the most successful from the protective point of view in the history of the country. While a large part of the credit for this must be given to adequate and well distributed rainfall throughout the entire season, still the increased efficiency in the patrol force was also an important factor, as evidenced by the large number of fires which were extinguished in incipient stages compared with those which got away.

The fire-ranging work was organized in three districts, namely, Revelstoke, Salmon Arm and the Coast, under the general supervision of this office. These districts will be taken up separately.

Revelstoke District.—The boundaries of this district are the same as outlined in my report of last year.

Two additional rangers were appointed, making a total of fourteen in all. These men were under the direction of Mr. T. Wadman, chief fire ranger at Revelstoke. Of Mr. Wadman's work both in field and office, I cannot speak too highly.

Of the fires occurring in this district during the season only one caused any trouble or expense. This was extinguished at a total cost of $116.50. Inasmuch as it burnt over mostly logged-off land, it was a benefit in that it cleared up a large amount of inflammable debris without doing any great injury to surrounding timber. The following table shows the number of fires in this district and their causes:—

Railways	7
Campers	4
Tramps	11
Lightning	15
Unknown	23

The co-operative agreement with the Provincial Government with regard to the issuing of permits for burning was carried out during 1913. This agreement was a very great help in forest protection, as it gives to the organization responsible for the prevention of fires control of the fire situation. Under it the ranger knows that he is the only man in his own district who is authorized to grant permits for fires, and he can therefore tell at any time whether any fire which is occurring is legal or otherwise.

A co-operative agreement was also made with the Provincial Government for the construction of a telephone line up the Big Bend of the Columbia river from Revelstoke. This line was built by the provincial Forest Branch, and that part within the Railway Belt was taken over by the Dominion branch, which paid the cost thereof. The Big Bend country is a very heavily timbered country in which the fire hazard is abnormally high. Transportation facilities are very poor. It was, therefore, very important for fire-protection purposes, that a means of communication should be established between Revelstoke and this country, both from the standpoint of the government and from that of the lumbermen who had large interests at stake in that district. This telephone line, therefore, should pay for itself many times over in the increased protection which is afforded to this district.

The excellent season of 1913 enabled us to inaugurate the construction of permanent improvements for better fire protection in the Revelstoke district. The first start of this kind of work was commenced last fall, when 15 miles of trail were built. These trails were mostly to lookout points and will give much better control of the fire situation in the future.

Three boats were also bought for crossing the Columbia river at different points.

The construction of these improvements is a very great step in advance, not only on account of opening up the country, but because they have shown the fire rangers that the government is in earnest in its efforts to secure adequate fire protection. The rangers have in every case been very anxious to be allowed to undertake work in their districts, and have shown much more enthusiasm and interest in their work as a result of being allowed to construct a few improvements. It is planned to carry on this work from year to year until the whole country is easily accessible, so that the fire hazard is reduced to a minimum.

A meeting of the fire rangers in the Revelstoke district was held in Revelstoke at the close of the fire season, on October 10, 1913. At this meeting, resolutions were passed commending the Government's action in inaugurating improvement work. Discussion also occurred on the question of slash disposal, which has always been the greatest source of fires in the Revelstoke district. In this connection the district inspector reported to the meeting that an appropriation had been authorized by the director for some experimental burnings by the Government for the purpose of obtaining data which could be shown to the lumbermen, to prove to them that slash-burning was an economical business proposition from their own point of view. Experience in the United States has shown that it is not the cost of slash-burning operations which primarily prevents the lumbermen from doing this work, but rather an unwillingness on their part to take responsibility for setting out fires which might get beyond control, and do damage to property belonging to themselves or other people. Where the Government or a fire-protective organization has been willing to assume this responsibility, the lumbermen have, in practically every case, been found willing and anxious to have the slash burnt up, and to pay the cost thereof.

It was expected that some experimental work of this kind would be undertaken in October, 1913, but unfortunately weather conditions were so bad that this could not be done. At the time of writing, however, arrangements are under way for the carrying out of this work in the near future. For this purpose one of the oldest and most experienced of fire rangers in the employ of the Dominion Government in British Columbia, Mr. Frank Ashdown, of Golden, has been appointed slash-burner for the Railway Belt. Mr. Ashdown will make investigations and carry out slash-burning operations in co-operation with the lumbermen in the Railway Belt.

At this meeting also there was considerable discussion regarding the efficacy of the fire patrol along railway lines established by the Board of Railway Commissioners, and the following resolution was passed:—

> "Whereas we understand it is the intention of the Board of Railway Commissioners for Canada to compel the Canadian Pacific Railway Company to

establish a fire patrol of sufficient intensity to allow the Dominion fire rangers to leave the fire protection of the lines of said railway to them,

And whereas we are of the opinion that this state of efficiency cannot be obtained until special Canadian Pacific Railway patrolmen are appointed who shall give their whole attention to this matter,

Resolved, that this meeting recommend to the Board of Railway Commissioners that such special patrolmen be required to be maintained by the Canadian Pacific Railway."

This matter will be discussed later in connection with the section of this Report dealing with the Board of Railway Commissioners and railway co-operation.

With regard to the resolution which was passed by the rangers' meeting in 1912, which was included in my annual report for that year, concerning the slash left along the rights of way of provincial roads, the fire rangers, at the meeting in October, 1913, reported that, in the cases of most new roads constructed by the Provincial Government, the slash and other debris from rights of way cleared had been properly disposed of at the time of construction. No action, however, has been taken by the Provincial Department of Public Works with regard to disposing of debris along roads already constructed.

Salmon Arm District.—The boundaries of this district are the same as outlined in my annual report of last year. Three additional rangers were taken on here also, making a total of sixteen. The addition of these men enabled us to give fairly satisfactory fire protection to all parts of this district. These men were under the direction of Mr. James Evans, of Salmon Arm, as chief fire ranger, whose efficient work in the field deserves commendation.

Burning permits were issued by our rangers alone in this district also, in accordance with the agreement entered into with the Provincial Government, and a considerable part of the rangers' time was occupied in supervising this work. Considerable satisfaction has been expressed by the public throughout the country at this arrangement, which enables them to get their permits at their own residence, instead of forcing them to come to town at inconvenient times to meet the forest officer, as was done under the provincial regime. At the same time we were enabled to make an inspection in every case of the locality to be burnt, which was never attempted in the old days.

A start was made in the construction of improvements in the fall of 1913 in this district also, which, though small, has had a good effect, both in increasing the esprit de corps of our rangers, and in showing to the public that the branch really means business in its efforts to secure fire protection.

Some 10 miles of trail were constructed in the most inaccessible portions of the district.

The fire boat on Shuswap lake was overhauled at the beginning of 1913 and a new engine installed. These repairs were badly needed, and put the boat in good shape for the work it had to do.

A supplementary appropriation was passed for the construction of a new launch for Shuswap lake, but this was delayed so long that the boat was not finished until after the close of the fire season. This new boat is better designed to meet the conditions on Shuswap lake, and will be put into commission at the beginning of the fire season of 1914. The old boat will be transferred to Adams lake, where it is expected it will render valuable service.

The creation of new forest reserves in the Salmon Arm district will make necessary re-arrangements of fire-rangers' districts. This was not effected last year, however, as there was no appropriation available for organization of administrative work on these new reserves. The fire protection was therefore handled on them by the fire-rangers as in the past.

The following table gives the number and causes of fires in the district:—

Railway	1
Settlers	1
Campers	2
Lightning	4
Unknown	4
Other causes	1
Not classified	13

Coast Fire-ranging District.—The Coast fire-ranging district extends from North Bend to the western limit of the Railway Belt. It falls into two natural divisions, viz.: (1) Mountain and (2) Valley.

The Mountain division includes all of the Belt on both sides of the Fraser between North Bend and Hope, thence on the south side of the river southwest to Cultus lake and on the north side westerly to the north arm of Barnard inlet, keeping an average distance of about 6 miles back from the river.

The Valley division comprises the lower Fraser flats from Agassiz to the coast.

A description of the timber resources of this country, found in an appendix of your report for 1912-13, being the report of a reconnaissance survey by Mr. Wallin, need not be repeated here.

The fire hazard in this district is probably one of the highest in the world, especially in the timbered portions of the Valley district, and on the transition hill country along the borders thereof.

This hazard is largely human in origin, owing to the presence of a very dense population, settled in a country where timber growth is very dense and luxuriant. This results in numerous large accumulations of slash extending in some places, notably south of New Westminster, where subdivision has been carried out, for miles along the main highways. While the Coast is in the main a country of heavy precipitation, yet there appear periods of drought sometimes protracted for weeks at a time. Unfortunately, moreover, these are most liable to occur in the early spring and in fall, at times when the accumulation of dead matter from last season's growth is not covered up with green vegetation. A fire, therefore, occurring at such a time in the valley division could run for miles through a densely settled country, and, besides, destroying many million feet of tremendously valuable timber, would do incalculable damage to property, and probably result in a large loss of human life.

The great anxiety of settlers to clear wooded land and the absolute necessity of using fire as the only means of accomplishing this result make the danger of such a national calamity always imminent in dry seasons. Therefore, any system of fire protection in this country, to be adequate, must be designed to obviate this hazard.

I found, on taking up the question of organizing the fire ranging on the Coast district in the spring of 1913, that the needs of this country had not been thoroughly appreciated in the past. After going thoroughly into the question with the Crown Timber Agent at New Westminster, who handles the fire-ranging business for the Forestry Branch, I recommended the employment of four additional rangers, bringing the total number in the Coast district up to twenty-five, or one man for every 92,000 acres. This force, augmented in dry seasons by extra temporary short-time guards and provided with the necessary trails, lookouts and other improvements to open up the country, should suffice to give adequate protection.

This force is directed by Mr. E. W. Beckett, Crown Timber agent at New Westminster, assisted by Mr. James Selkirk, Chief Fire Ranger. These men have the interests of the Forestry Branch and the protection of their district at heart, and knowing local needs and conditions as they do, are making a record of which they may well be proud, as the fire-table below will show. Credit is also due to Mr. Walmsley of the Crown Timber Office at New Westminster, who has handled all the records and

accounts in connection with our work in a very satisfactory manner. The following is a list of fires, with their causes, for the season:—

Railways	50
Settlers	18
Campers	36
Tramps	5
Engines	5
Lightning	13
Unknown	6
Others	11

Out of the 114 fires which occurred in the Coast district during 1913 only two caused any expense in fighting. Of these the fire on timber berth "X" did much good by having cleaned up a large area of heavy slash, while the amount of timber destroyed was very slight.

The issuing of permits for burning was retained by the Provincial Government during 1913, and while the Dominion rangers were advised in nearly every case in which a permit was issued, yet it is thought that better control of the situation could be obtained were our own men to have charge of this work. In this way, not only would the organization responsible for the protection of timber handle the setting out of fires adjacent thereto, but much needless duplication of fire-wardens and consequent expense would be saved by the Provincial Government. I am glad to say that just a week prior to the time of writing an agreement was completed whereby this work will be handled by Dominion fire-rangers in the future.

The employment of extra rangers so depleted the appropriation available for the Coast district that improvement work was not possible until the fall, when it was found possible on account of the good fire season to devote a little money to this work.

The start made, while small, has encouraged the rangers greatly, and it is expected that further work will be done during 1914.

Some ten miles of trail were constructed and three cabins built back in the mountains to serve as headquarters for rangers in inaccessible districts.

A fine fire-boat was constructed for use on Harrison lake and the Fraser river, but owing to the late date at which the appropriation became available it was not completed until last winter. This boat is, however, in commission at the time of writing, and should give very valuable service.

The first ranger meeting ever held in the coast district was held at New Westminster at the close of the fire season on October 2. It was attended by all the rangers in the district. Discussion took place on many subjects of prime interest in forest protection, such as disposal of slash, issuing of permits, methods of fire-fighting, etc. Several rangers came prepared with improvement plans of their district which showed much care and thought in development.

This opportunity for the interchange of views was very much appreciated by the rangers, and aroused great enthusiasm. It is hoped to make the meeting a yearly affair in each district.

RAILWAY COMMISSION CO-OPERATION.

The co-operative agreement between the Fire Inspection department of the Board of Railway Commissioners and the Dominion Forestry Branch with regard to the handling of the railway patrol required by the Board under general order 107 was carried out during the fire season, 1913. Districts 1 and 2 of the British Columbia division of the Canadian Pacific railway were handled under my supervision as fire inspector for the Railway Belt.

Representations were made by the Canadian Pacific Railway to the Railway Board for a decrease in intensity of the patrol required by the board on the basis of the use of oil-burners through forested sections. In my annual report to the chief fire inspector for 1912, I pointed out, however, that this conversion had been only incompletely carried out, as coal-burners were operated quite frequently over the lines. For this

reason, and because the condition of the right of way was very unsatisfactory, so that any sparks from coal engines, cigarette or cigar stubs from trains or careless use of fire by tramps along the right of way, would almost certainly get away in dry weather, I recommended to the chief fire inspector that the original special patrol measures specified be required for 1913. I also asked for a responsible man at the head of the railway patrol with whom I could deal authoritatively in all matters pertaining to this work.

Owing to objections by the Canadian Pacific Railway, neither of these recommendations was carried out by the board. All that was required of the railway company was a section patrol by regular employees in conjunction with their ordinary work.

When the co-operative work undertaken by the Dominion Forestry Branch with the Board of Railway Commissioners was inaugurated, it was the idea of the former that this work should be so organized as to make the railway company provide patrol along railway lines sufficient to make the said lines fire-proof. It was, accordingly, thought by the Forestry Branch that we should be enabled to dispense with patrol work by the Dominion fire rangers along railway lines altogether, and thus for the same money give much better protection to inaccessible regions lying back from the railway, which have hitherto been unprotected. Unfortunately, however, these patrols, as established under the order of the Board to date, were not of such a nature as to warrant the Forestry Branch in withdrawing its own patrol force from the region of the railway. This is manifested in the fact that the forty-two fires set by locomotive sparks were all extinguished by the Dominion fire rangers. It is evident from this that if the right of way of the railway company is to be protected by the company to such a degree that all fires started will be checked before they get away, increased patrol requirements will have to be ordered by the board.

Recommendations were made again to the board in my annual report for 1913 for the placing of this patrol work under a special organization. In this report I stated that, unless the action was taken, the whole co-operative scheme undertaken by the Forestry Branch with the Board of Railway Commissioners in connection with order 107 would be of little use to the Forestry Branch so far as it would relieve it of the patrol of railway lines.

Under the section-patrol system I do not believe that the Forestry Branch, which is, in the final analysis, responsible to the people of this country for the protection of timber from fire, will ever be able to entirely withdraw our fire-patrol organization from the vicinity of the railway.

With regard to the patrols specified by the board for 1913 I would say that every effort was made by the Canadian Pacific Railway officials to comply with the requirements of the chief fire inspector. My recommendations secured prompt attention, and, although some orders issued by higher officials seemed to lose force in the process of filtering down to the actual men who did the work, nevertheless, on the whole, credit is due to the company for the way they handled the whole business.

In my report for 1912 I stated that conversion to oil-burners between Kamloops and Revelstoke was completed during 1912. Increased traffic, however, rendered necessary the introduction of new motive power by the company on district 1. These engines were coal-burners, which, during the early part of the season, were operated at various times throughout the whole district. Representations made by me to the company resulted in action being taken by them limiting the use of coal-burners to the division between Kamloops and Revelstoke, so that after the 1st of July no coal burners were operated on regular trains between Revelstoke and Field. Several engines were, however, being used by contractors on double-tracking between Revelstoke and Field throughout the season. It is probably true that the use of oil as fuel will reduce the fire hazard along railway lines by at least 75 per cent. The intermittent use of coal-burners in an oil-burning section, however, prevents basing protection at this reduced hazard. To remedy this state of affairs as far as possible under my

authority the patrol requirements in district 1 were increased at the end of July from a minimum section-patrol of one round trip per day to a minimum patrol of two round trips per day, one in the forenoon and one in the afternoon.

At the beginning of the fire-season of 1913 the right of way of the Canadian Pacific railway in districts 1 and 2 of the British Columbia division was in a deplorable state. Repeated urgings by the board resulted in considerable improvements being made during 1913 in the matter of right of way clearing, about half the mileage being well cleaned up. These improvements consisted of the following:

Clearing of the Okanagan and Arrowlakes Sub-Division rights of way by contract. This work was well done.

Clearing of the rights of way by extra gang between Craigellachie and Sicamous, and between Sicamous and Salmon Arm. This work was also well done.

Cutting and burning of brush in district 2 between Lytton and Yale. This work was, in general, well done, although certain danger points were not as completely cleared up as might be desired.

The inspection work done by the Forestry Branch in co-operation with the Board of Railway Commissioners was carried out on the same basis as last year, namely, two divisional fire inspectors, one for lines east of Sicamous and one for lines west of Sicamous, under my supervision.

The table below gives the number of fires, with their causes, occurring along the Canadian Pacific Railway that were discovered by Dominion fire rangers or divisional fire inspectors:—

Sparks from locomotives	42
Tramps' camp fires	12
Lightning	1
Sectionmen burning ties	1
	56

Respectfully submitted,

D. ROY CAMERON,

District Inspector of Forest Reserves.

APPENDIX No. 6.

REPORT OF THE INSPECTOR OF FIRE-RANGING.

OTTAWA, March 31, 1914.

R. H. CAMPBELL, Esq.,
Director of Forestry,
Ottawa.

SIR,—I have the honour to submit my annual report covering the work of the fire-ranging organization in the provinces of Manitoba, Saskatchewan, and Alberta during the season 1913.

In the matter of fires we have again been rather fortunate, for, although the fire season as a whole was not as wet as that of the preceding year, there was considerable precipitation fairly well distributed over the season. Dry spells did occur, but these were not of sufficient duration or intensity to cause any very great danger. I think, too, we may claim a fair degree of improvement both in point of numbers and organization. Although there has been some improvement, the fact remains that the occurrence

of the first dry season will put our organization to a very severe test; it is necessary, therefore, that such parts of the work as have been attempted should be improved upon, and details which have not as yet been worked out must receive attention.

For convenience I will give this report under two main headings, viz:—

1. Fire Protection along Railway Lines.
2. Fire Ranging on Crown Lands.

FIRE PROTECTION ALONG RAILWAY LINES.

The action taken by the Railway Commission in connection with railway fire protection has been the subject of several reports; there is, therefore, no necessity for detailing the requirements of the Board. They may be briefly enumerated as follows:—

1. Fire protection appliances.
2. Non-use of lignite coal.
3. Proper supervision of tie-burning.
4. Cleaning right of way.
5. Ploughing of fire-guards.
6. Establishment of a patrol force.

Appliances.—During the season ninety-eight engines were inspected by our men. Further, a large number, of which we have no record, were inspected by the various officers in the operation department of the board. In the great majority of cases the appliances were found to be in good order, while in a few instances defective screens were discovered, or the required connection between the overflow pipe and ash-pan had been neglected. In such cases the necessary repairs or alterations have been made without carrying the matter to head office. Generally, we may say that these appliances are now receiving attention that was almost or entirely lacking a few years ago. That locomotives still cause fires, even when spark-arresters are in repair, is evidenced by the number of fires still attributable to engines, but it is a certainty that with the greater care exercised in the repair of damaged screens the fires from this source are decidedly fewer in number, and when fires do occur with screens in good repair it is generally through the use of a low-grade or finely powdered coal. I think that it is now very seldom that an engineer or fireman will purposely destroy a screen in order to allow for greater draft, a practice that was quite common a few years ago.

Lignite coal.—This coal is prohibited by the board for use in railway engines, and, though it is sometimes used, such cases are comparatively rare. Coal samples were taken by our men at various points—Hudson Bay Junction, Prince Albert, and west of Edmonton on the Grand Trunk Pacific. In two or three cases such coal proved on analysis in the Department of Mines to be lignite. No action was taken, however, further than to issue warning against future use of such coal.

Tie-burning.—There is not the same great carelessness in the burning of old ties that was experienced some years ago; nevertheless, it still appears to be a difficult matter to get section employees to exercise the proper and necessary care in this work. On many occasions I have noticed burning tie-piles along the line without there being any guardian within such distance that he could control the fire, and although no serious damage resulted last season it is evident that greater care is necessary in the destruction of old ties.

Fire-guards.—Protection by means of fire-guards is designed primarily for the open farming and ranching country, and hence it has little significance to us from the standpoint of forest protection except where such land borders immediately on the

timber land, and in such cases it is customary to have the patrol system overlap a little on the farming country rather than attempt the construction of fireguards through the heavy brush.[1]

Right of Way Clearing and Patrol Service.

A. Canadian Pacific Railway.—The work done by this company in right of way clearing on lines over which I have jurisdiction was all handled by the regular section employees. All the lines concerned, namely, the main line from Winnipeg to the Ontario boundary, the Lac du Bonnet and Teulon-Arborg subdivisions, are in very fair condition. In the province of Alberta the Alberta Central railway, a subsidiary railway from Red Deer westward, comes under my inspection, but as only a few miles of steel have been laid, and as the line runs through an essentially farming country, it is as yet of little importance to us from the forest-protective standpoint. Shortly, however, the steel will be laid westward, penetrating the Rocky Mountains reserve, and it will then probably be necessary to establish special measures of protection.

On these subdivisions the patrol was carried on by the regular section employees, and, although this is not usually a satisfactory method of patrol, it has been effective for the past two years, these lines not being particularly dangerous ones.

B. Grand Trunk Pacific Railway.—(a) Superior Division, from Elma to Ontario boundary. In the spring of 1913 this line was in a rather unsatisfactory condition in regard to right of way, but during the summer considerable improvement was brought about, and by the end of the season the right-of-way conditions were fairly satisfactory.

The patrol service, however, was very poorly carried out, ostensibly on account of the motor speeder which was supplied the patrolman being frequently in disrepair. In such case it has been the practice of the company to have the patrolman ride freight trains, and this method of patrol is, of course not satisfactory. The one man that was ordered for this beat ceased work during the season, and for some time his beat was patrolled by the man to the east of him on the Ontario side.

Grand Trunk Pacific Railway: (*b*) Edmonton to Yellowhead.—This line has for the past few seasons been the source of considerable worry to us, as a result of the indifferent and dilatory attitude shown by the company to the requirements of the Railway Act as applied to right-of-way conditions. Vigorous action was taken in the fall of 1913, however, which resulted in the employment of a large extra gang to clear the line. Latest reports show that a very satisfactory clearing was made from Edson west, and east of that point the line was also to receive proper attention.

Here, too, the patrol service was very loosely carried on. Motor speeders were continually reported in disrepair, and the patrol men riding on freight trains. A patrol of five men on motor speeders from Wabamun to Yellowhead was prescribed for this line. Although a man can cover twice the distance by motor speeder that he can on an ordinary "jigger," it will be necessary for us to have the company resume the use of the hand machine unless they can provide a regular and satisfactory patrol with the motors. It is intended this year to have some spare cars and parts available, so that there will be no excuse for disruption of the organization on occurrence of a minor accident.

C. Canadian Northern Railway. (*a*) Rainy River and Ridgeville Subdivisions.—As a direct result of a hearing before the Railway Commissioners in the fall of 1912, these lines were splendidly cleared up in the spring of 1913, and considerable work of this kind was also done during the ensuing summer to maintain the right of way in satisfactory condition. Four men patrolled the lines on "jiggers," and as considerable care was exercised by the administrative officers of the company, the patrol service was very satisfactory indeed.

[1] The above remarks apply to all the companies concerned, namely, the Canadian Pacific, the Grand Trunk Pacific, the Canadian Northern, and the Edmonton, Dunvegan and British Columbia railways. In the succeeding paragraphs the work done by each company is referred to separately.

Photo by W. N. Millar.

Cleared Right of Way, Canadian Northern Railway, Clearwater Forest, Alberta.

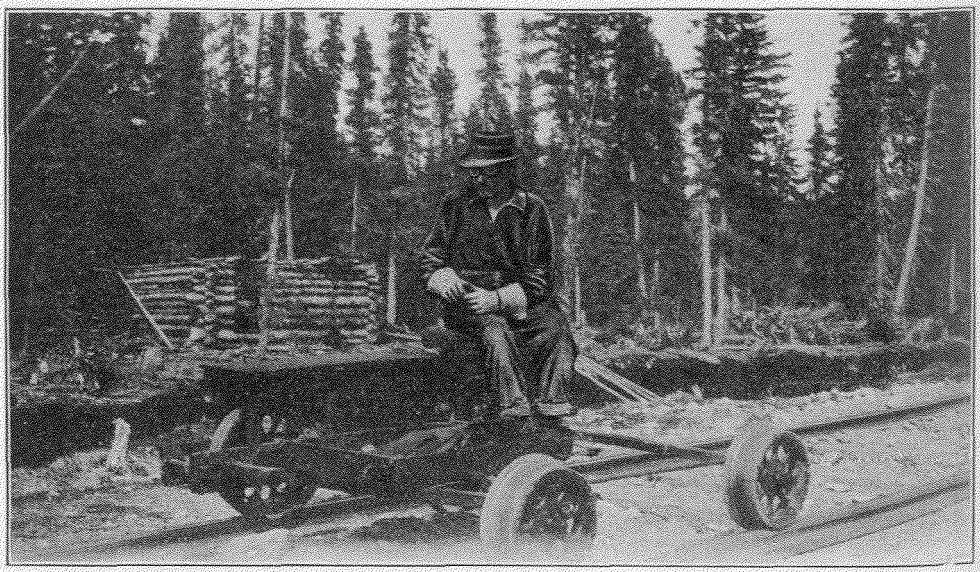


Photo by W. N Millar.

Reserve Speeder on Canadian Northern Railway, Clearwater Forest, Alberta.

Canadian Northern Railway: (*b*) Gypsumville subdivision.—This line is not of great importance to us from our standpoint, as it traverses a fairly well settled country and there are also extensive bodies of water and sloughs along its course so that the fire hazard is not great. Although considerable work was done in right-of-way clearing, the line is not yet up to the desired standard. The patrol was carried on by the regular section employees.

Canadian Northern Railway: (*c*) Swan River, Erwood, Hudson Bay and Prince Albert Subdivisions.—These subdivisions have for a long time been the worst with which we have had to deal. Previous to 1912 repeated fires occurred as a result of railway operation and a great amount of damage was done to timber. The right-of-way was never properly cleared, and, as the country is a dangerous one in dry seasons, many fires resulted. In the spring of 1913, however, a considerable sum of money was expended by the company and the debris, accumulated through many years of neglect, was removed. Fourteen special men patrolled the line on velocipedes, and very satisfactory service was rendered.

Canadian Northern Railway: (*d*) Crooked Lake and Duck Lake subdivisions:—The same conditions as prevailed on the lines described in the immediately preceding section were also evident on the Crooked Lake subdivision, and similar action was also taken to clear the line. Good work was also done on Duck Lake subdivision which crosses the Pines forest reserve for some 8 miles. Both these roads are now in a fairly satisfactory condition. A special force of five men formed the patrol force, four of them patrolling from Prince Albert city to Big river, the fifth man patrolling that section of the Duck lake subdivision which traverses the Pines reserve.

Canadian Northern Railway: (*e*) Athabaska subdivision:—The right of way was well cleared and the patrol by regular section employees seemed to meet the demands.

Canadian Northern Railway: (*f*) Edmonton to Yellowhead (under construction):—A certain amount of work was done on this line, but there still remains a considerable amount before the line is up to the standard desired. Eight men patrolled the grade from the Pembina river westward, but the organization did not receive the same attention and care found on the other Canadian Northern lines. This was due, of course, to the fact that the line was under construction. The steel has now been laid, however, and hereafter it ought to be an easy matter to organize an efficient patrol service.

D. Edmonton, Dunvegan and British Columbia Railway:—This line is under construction from Edmonton north by west to the Athabaska river near Mirror Landing, and thence westerly along the south shore of Lesser Slave lake. On first inspection it was found that the usual conditions for lines under construction prevailed: since then, however, considerable clearing has been done and by the end of next season the line ought to be in very fair condition. Patrol was carried on by eight special men, patrolling for the most part on foot. Steel is now laid as far as Athabaska Crossing, so that it will be possible to patrol up to that point with velocipedes. West of the Athabaska the patrol will be on foot or horseback until steel is laid, after which the velocipede patrol will take its place.

E. Hudson Bay Railway:—This railway does not come within the jurisdiction of the Railway Commission, and the burden of fire-protection rests with our own fire-ranging organization, being part of the work of the Pas fire-ranging district. The line was well cleared up at the time of construction, so that conditions are now almost entirely satisfactory. The patrol service on the line was not what it ought to have been largely owing to the incompetency of the then chief ranger in carrying on the work of supervision. Under competent supervision there is no reason why we should not organize just as effectively as the railways, and the fact that we are more directly concerned but accentuates the necessity for efficient service. No great damage occurred on this railway with the exception of the loss of one construction camp and stores by fire.

Inspection.

The following men were appointed and acted under my direction in the inspection of railway fire-protective operations:—

Thomas McNaughton, Prince Albert, Saskatchewan., assisted in the general inspection of railway lines in the three provinces. Mr. McNaughton covered a great deal of ground during the season. All of the lines were inspected by him at least once, and most of them several times. As I also covered most of the lines frequently, it was possible for us to keep in constant touch with conditions all over the country. It is found that making quick jumps from one part of the country to another is productive of the best results.

Enoch Tennant, Hudson Bay Junction carried on a detailed inspection of the railway lines which traverse the district of which he is chief fire ranger. Mr. Tennant was provided with a motor speeder, and rendered very efficient service in the fire-inspection work.

Peter Lind, Sprague, Man., carried on a very efficient inspection of Canadian Northern lines in southeastern Manitoba.

A. C. Smith, Wabamun, Alta., inspected the lines of the Grand Trunk Pacific and Canadian Northern in northern Alberta.

Fires.

The record of fires which occurred along railway lines in 1913 is as follows:—

1. *Causes* (and numbers attributed to same) —	
Engines	109
Section-men and employees	37
Clearing right of way	6
Travellers, tramps, etc.	21
Unknown	47
Total	220
2. *Areas burned over*—	Acres.
Grasslands	1,100
Young growth	2,536
Timberland	330
Old slashing	140
Total area	4,106
3. *Damages*—	
Timber and young growth	$ 6,000
Railway property	10,800
Construction engineers' property	2,500
Total	$19,300

A bad fire which occurred on the Hudson Bay railway destroyed Construction Camp No. 8, belonging to MacMillan brothers, railway contractors, is said to have started from the right of way and resulted either from a clearing fire or from the camp-fire or smudge of some person travelling along the line. The damage to the camps and supplies is placed at $10,000, while an additional loss of supplies and equipment valued at $2,500 was sustained by the railway engineers. In addition to the actual loss, great inconvenience was caused owing to the difficulty of replacing the supplies destroyed. This fire accentuates the necessity for the exercising of greater care in the protection of camps by railway contractors. In all probability this camp could have been safely fire-guarded at time of building by the expenditure of a very few hundred dollars. Generally in the case of construction fires it is the country that suffers the loss as a result of carelessness; in this instance the contractor bears the loss.

Speaking generally for right of way conditions on all lines, a great deal of good work has been done. Lines that one or two years ago were dangerous fire-traps have now received attention, and the fire hazard has been greatly reduced. It only remains for the companies, by a comparatively small expenditure each year, to maintain the lines in the condition to which they have been brought. The large expenditures which in the last two years devolved upon the companies are due to neglect in previous years, and cannot be taken as yearly costs of maintenance of the right of way in safe condition.

A railway company is admirably adapted to the operation of an effective patrol service, for, with the large number of employees continuously on the ground and a good administrative officer, the roadmaster, always present, it is a simple matter to see that patrol is regularly performed; help is also always available within reasonable time in case of fire. This is exemplified in the case of the Canadian Northern, where thirty-four men patrolled a total mileage of 655.3 miles, the total cost amounting to $11,947.32. Although these figures indicate an average mileage per man of 19 miles, the normal average beat is between 20 and 23 miles in length, the reason for the 19-mile average being that on construction lines the patrols were only 15 miles in length. Taking the above figures, the average cost per mile for the whole season was $18.23, which figure will be reduced as steel is laid on lines under construction. On the Hudson Bay railway the cost was approximately $20 per mile, but the service secured was not so satisfactory. As steel is laid further northeast, however, it will be quite possible to increase the efficiency without increasing the average cost per mile. The Grand Trunk Pacific patrols were so erratic that it is difficult to arrive at approximate cost, and as the service was not by any means efficient, such figures would have little significance.

FIRE RANGING ON CROWN LANDS.

The fire-ranging organization is responsible for forest fire-protection on the Dominion lands of the three provinces which have not been included within forest reserves. The work is, therefore, confined to the northern parts of these provinces, with the exception that in Manitoba it also extends across the southeastern part of the province. The total area to which attention is given embraces some 125,000 square miles, although only a small part of this large tract is given really adequate protection. Each ranger district includes a great deal of country to which for several reasons it is not possible or advisable to give much attention. In the first place, the appropriation does not provide sufficient funds for the maintenance of a sufficient staff to secure absolute fire-prevention all over the country; in the second place, some parts are impossible or so difficult of travel that it would be a physical impossibility for the ranger to travel at the rate he must go in order to cover ground; third, the danger of fire in some places is so small that the expenditure of a large amount of money on fire protection would be out of proportion and, hence, an economic mistake; and fourth, the timber in some parts is of such little value and so widely scattered that it would not be wise to establish the intensive patrol that is required in heavily timbered districts. In spite of the above limitations in the degree to which forest protection should be applied, the fact remains that a considerable addition must be made to our staff in order to provide ample protection to those parts where intensive patrol is justified.

The whole territory coming under this inspection was divided into nine large districts as follows: 1, Southern Manitoba; 2, Northern Manitoba; 3, The Pas; 4, Hudson Bay Junction; 5, Prince Albert; 6, Battleford; 7, Edmonton; 8, McMurray; 9, Slave.

In the Slave district the supervision of the fire protection work devolves upon the Government agent located at Fort Smith. In each of the other districts there is a chief fire ranger whose sole duty in the fire season is the administration of the

fire-ranging organization. Nearly all of the chief rangers are yearly men and in the winter time their time is devoted to land examinations, timber cruises, and work in connection with forest reserves. The total staff, exclusive of chief rangers, numbered about 130 men, most of whom were retained for the full season. While the staff as a whole was undoubtedly better than in previous years, there is still room for an immense amount of improvement, both in regard to the kind of men appointed to the work and in the attitude of the men to their work. The qualifications for a good fire ranger are not quite such technical ones as those for a forest ranger; nevertheless, there are certain fundamental qualifications which a man must have if he is to make a good fire ranger. He should be physically fit; he should not be too old; he should be an experienced woodsman and be able to get along under all sorts of trying conditions; he should be able to read and write sufficiently well to make record of his actions and observations; he should have stamina, foresight, and good judgment in the handling of men, so that when necessity arises for the hiring of help to fight fire he may properly control his force; and, finally, he should himself have had experience in fire-fighting. These qualifications are essential, and without them a man cannot be a first-class fire ranger. When we get a staff fully manned with rangers of this character, we shall be well on the road to efficient fire protection. That such men are available is evidenced by the fact that there are already many of them on the staff. Such men are found in different parts of the country, working for lumber companies, on survey parties, and in other industries and pursuits interested in and operating in the woods.

Southern Manitoba.

This district includes the northern half of the peninsula between lake Winnipeg and lake Manitoba, the area to the east of the southern half of lake Winnipeg and the belt of forest land stretching southeast to the international boundary (just west of lake of the Woods) and east to the Ontario boundary. The whole district comprises an area of some 8,000 square miles. The peninsula between the lakes abounds in swamps and muskegs, the country being generally low and flat. Merchantable timber of saw-log size does not occur in large quantities, the few good patches that exist being almost wholly confined to the shores of lakes and watercourses. Formerly there existed some good blocks of timber in the northern part of the peninsula bordering lake Winnipeg, but this timber has long since disappeared through logging operations. The chief value of the timber in the peninsula lies in its use as cordwood, for not only is it used locally by the settlers for fuel, but large amounts of cordwood are shipped to Winnipeg for consumption as fuel in that city. The chief species found are spruce (white and black) jack pine, poplar, and tamarack. The country to the east of lake Winnipeg is as yet but little explored, but for the past two seasons a large number of prospectors have penetrated the various water courses emptying into the lakes from the east. Here, too, the timber species are spruce, jack pine, poplar, and tamarack, but the quantity of timber which will be found there is as yet rather problematical, although several good blocks were observed by our ranger in this district. In the southeastern part of the province, extensive marshes and muskegs are found, the country being rather similar to that between the lakes. The main species are also the same, although towards the lake of the Woods red pine is found, also a little black ash and birch enters into the composition, though not in merchantable quantities. There is a certain amount of lumbering for saw-timber, but the main timber industry is the cutting of cordwood, both for local use and for shipping.

Although the above remarks would indicate that there is not a great amount of saw-timber in the district and that lumbering on a large scale is not carried on, this has resulted largely from extensive fires which have done great damage in past years. In most places where these fires have occurred, however, there is a good reproduction coming up, and it is to the interest of the whole country that this reproduction should

be protected. It is particularly desirable that the Winnipeg river water-shed should be protected in order that the stability of water-flow may be ensured.

Eight fire rangers were employed throughout the season, four in the peninsula one east of the lake, one in the Winnipeg River district and two in the southeastern portion of the district. The method of patrol varied, of course, with the conditions driving, walking and canoeing all being called into play.

The fire loss in southern Manitoba for the season of 1913 was very small, practically the only fires which occurred being confined to marsh and hay lands. A wet season prevailed, and to this the absence of destructive fires is in a large measure due. With the exception of the district to the east of lake Winnipeg it should not be necessary to make any considerable additions to the staff of the district. It must be remembered that in the appointment of permanent men for the season there is always a certain part of the wages spent in retaining the men through wet weather spells. With one additional man in the northern part of the peninsula we should have a sufficient staff of permanent men, while temporary additions might be made as occasion demands. East of the lake there should be several additions to the staff in order to provide adequate protection during the rush of prospectors to the country. Patrol there is almost entirely by canoe, and, as the rivers are for the most part rapid, travel is more or less difficult and slow. It is hoped that a fire-patrol boat will soon be put in operation on lake Winnipeg, and such a boat should be required to spend considerable time along the east shore of the lake. The mere presence of such a boat has a deterrent effect on those who might otherwise be careless with fire. The scattered nature of the timber would make it an impossibility to establish special telephone connection, and the construction of expensive lookout towers would not be justified; there are, however, some ridges in the district where inexpensive lookouts could be established by the use of materials close at hand.

Northern Manitoba.

The district embraces an immense tract of country from the foot of lake Winnipeg down the Nelson river and its affluents to Split lake; also, east to Island lake, God's lake and the Hayes river. This area of some 11,000 square miles is much broken up by the exceedingly numerous lakes and water courses, and and by the occurrence of numerous and extensive spruce and tamarack swamps and muskegs. Some parts are particularly rough with low irregular ridges and igneous outcrops. In some localities a fairly good soil is reported, on which it is claimed that hay and the coarser cereals could be grown, but it is altogether unlikely that agriculture will come into prominence in the near future, if ever. The country is for the most part wooded, but good blocks of merchantable timber are few and rather widely scattered. Practically the only lumbering carried on is for the supply of local demands, the logs being sawn at the small mills at the various posts and missions. Great damage has been done by fire, and it is estimated that fully 75 per cent of the country has been swept by fire within comparatively recent times. However, there is a good reproduction on such areas, an estimate being that from 40 to 50 per cent is growing up to spruce, jack pine, poplar, birch, and tamarack. This reproduction, in addition to the few remaining blocks of good timber, demands protection. The fires in past years have to a large extent been due to the thoughtlessness and ignorance of the Indian. An example of this may be cited from one of the chief fire ranger's reports, speaking of some country far over near the Ontario boundary: "The country was burnt over about five years ago, much good timber being destroyed. Four or five families of Indians live there, and when dry wood has disappeared from the immediate vicinity of their camps they simply move nearer to where there is dry wood. These few Indians must be responsible for the thousands of acres destroyed by fire, as they are the only people that make use of those waters and country." This

carelessness on the part of the Indian has to a large extent been removed, as will be explained later on, but another danger has arisen in the progress of railway construction, and, though we may possibly be able to keep proper control of the fire situation along the railway line itself, vast quantities of supplies are being freighted in by the water route from Norway House to Split lake, so that there are hundreds of men engaged along this route, and, as a camp-fire is required by each party several times a day. there is great danger of fires being left to "burn out."

Patrolling the main water-routes by canoe, Mr. Blackford had a staff of sixteen men, only part of that number being retained for the full season. This staff of rangers is somewhat unique, in that most of the men are half-breeds and Indians, only three white men being employed. Although these half-breeds are not as good fire rangers as the best of white men, they are superior in this respect to the type of white man which we could get in that country for the funds available; and the chief ranger has so organized and controlled them that the patrols are very regularly made, and fires have been kept under control since the inception of the work in that district. Another feature of Mr. Blackford's work which continues to yield results is the "Indian Volunteer Fire Ranger" staff, consisting of the chief and important Indians in the various tribes of the district. These men have given Mr. Blackford great assistance in controlling the fire situation, for, by the example of careful attention to their own camp-fires they create an interest, generally, in the necessity for proper precaution. That he has been able to win the help and good-will of these men reflects very favourably on the foresight which he has exercised in supervising his work.

The improvements carried on consisted in making repairs and additions to the house of the chief ranger; the construction of a small dock and the building of a skiff to facilitate handling of supplies; taking out logs for use in construction of a small boat-house and workshop; making necessary repairs to the houses at Split lake and Oxford House; and getting out logs for the erection of a cache at Island lake.

No damage of any account resulted from the fires of the past season. Very few fires were discovered at all, and they were extinguished before any damage had been done. In the fore part of the season a short dry spell was experienced, but fires were kept in control. During the balance of the season the fire danger was retarded by the large amount of precipitation. The season, therefore, was a most successful one, and it is greatly hoped that the Indian populace can be prevailed upon to continue in the exercise of the proper precaution which has marked the work of the past two years.

The Pas.

This district embraces roughly the country within a radius of about 100 miles east, north and west of the town of The Pas, the larger part of it being in the province of Manitoba, and a small part extending into Saskatchewan, the approximate area of the whole being 10,500 square miles. The country is typically northern, being comparatively low, flat and much broken up by numerous lakes, water courses, spruce and tamarack swamps and muskegs. Along the Saskatchewan river, which is the main water course, and to which practically all the waters of the district are tributary, there are immense stretches of marsh and hay sloughs with but little timber. Down as far as Grand Rapids, east of Cedar lake, the river is alluvial, and, in addition to depositing bad sandbars in ever-changing positions, it is divided into almost innumerable channels and cut-offs, making navigation rather a trying proposition. Speaking generally for the whole district, the timber is of small size and consists of spruce, jack pine, poplar, tamarack, and a little birch. Spruce is practically the only species sawed into lumber and exists as merchantable timber in rather scattered blocks and the greater part of it is already under license or permit to timber operators and tie contractors. The good blocks are nearly all found along the route of the main rivers and lakes. The best of it is found up the Carrot river, which empties into the Saskatchewan a few miles above The Pas, and on the Sipanok channel. An immense amount of timber has been

harvested for ties in the construction of the Hudson Bay railway. The one big saw-mill of the district constitutes the main industry of the town of The Pas. In this country, too, great damage has been done by fire, most of the country having been burnt over at one time or another. A very fair reproduction is found, however, which of course requires protection in addition to the remaining merchantable timber. The Saskatchewan river is very subject to floods, and it is therefore absolutely necessary for the welfare of the country that further fire depredations should be as far as possible prevented. Until the advent of the railway the fur trade was the one means of subsistence to the populace of the district, and for a long time to come it will continue to be the livelihood of the outlying people; this offers, therefore, a further incentive to fire-protective work.

The main danger lies, of course, in the large number of travellers along the route of the railway, and also by canoe along the navigable waters adjacent to the line. In the past few months, also, there has been a rush of goldseekers to the Beaver Lake region, and, as all such stampedes include a number who are not aware of the danger of fire, it will be necessary to keep close watch on this route.

A staff of twelve men was maintained for the entire season, of which (as previously indicated in this report) four men patrolled the railway line, the other six men being well distributed over the district, and patrolling by canoe the more dangerous watercourses and lakes. The patrol of the Saskatchewan river where, as a matter of fact,there is but little timber, but where on account of the large number of travellers it is necessary to have patrol of some kind, was carried on by the chief ranger in a motor boat. Much more careful supervision will be necessary before the work of the district will be by any means satisfactory. Next season, however, it is hoped that a new chief ranger will be installed and it will depend largely on the efforts of the new man whether the service reaches the desired efficiency or not. Normally the district should not be a hard one to protect, but with the added excitement of railway construction and gold rush the task becomes a much more difficult one.

The motor boat which was purchased for the use of the chief ranger has not on the whole been a success, for although they have managed to get about fairly well, serious difficulties were met with in the engine, mechanically, and also on account of excessive fuel consumption. I have already recommended, however, that the boat be kept in commission for the coming season, when a much better idea may be obtained as to exactly what improvements should be made.

During the season the fire loss was practically nil, with the exception of the fire in MacMillan Bros.' construction camps, previously mentioned. Altogether some 1,000 acres were run over by fire, but of this only 200 acres was open young growth, the balance grass land. The season was generally wet, and muskegs were filled with water, so that there was but little danger of fire spreading over extensive areas.

Hudson Bay Junction.

The district includes the Porcupine and Pasquia hills, and may be roughly defined as the country lying between the Thunderhill branch of the Canadian Northern railway and the Carrot River valley, east towards lake Winnipegosis, and west to the prairie country approximately south and north of Tisdale. About one-third of the district is in the province of Manitoba, the other two-thirds in Saskatchewan. This area of some 8,500 square miles is much broken up by the hills above mentioned. In these hills, and bordering them, are extensive spruce-tamarack swamps and muskegs. The lumber industry is quite highly developed, nearly all the villages and towns of the district being the seat of a lumbering industry. The principal species found and used for this purpose is spruce; jack pine, poplar and tamarack also exist in large quantities, while to a lesser extent white birch is found. Enormous damage has been done by fire, one hundred million feet of timber having been destroyed in the years 1908 and 1909 alone; also in 1910 and 1911 considerable loss was sustained, to say nothing

of the years previous to 1908. In the neighbourhood of 50 per cent of these fire-swept areas have established a forest cover of poplar, both white and black, and although this species is not of very great value for lumber, it is of great importance as fuel-wood. Furthermore, in many places there is a reproduction of spruce beneath the poplar cover, which, if properly protected, will doubtless re-establish itself. This point has not been considered by various lumbermen, who have stated that the main type is poplar. Easily seen, therefore, is the necessity for fire protection. The country is well broken up with drivable streams, so that with protection and conservative lumbering there is no reason why the lumber industry should not continue on a permanent basis.

The district was patrolled by a staff of twelve men, who, with one exception, were retained for the entire season. The men were well distributed over the district, patrolling on foot, by saddle-horse, or driving, as occasion demanded. On the whole, the staff was an efficient one and good work was done. Altogether some 50 miles of trail were opened up, and a certain amount of cleaning up done on existing trails. The chief ranger of this district, Mr. E. Tennant, is a particularly efficient chief, having had many years' experience in timber operations and being thoroughly familiar with the district of which he has charge. As previously mentioned, he also carried on the inspection of railway work for the district.

The fire damage for the year was comparatively small, the loss of merchantable timber being confined to 150,000 feet, board measure, while some 1,650 acres of young growth were destroyed, and 3,400 acres of old slashing and 2,600 acres of grass lands burned over. Good fire protection can be provided in many places by the establishment and use of lookout towers on prominent hills, and already two trails have been opened up from the railway to the eastern summit of the Porcupine hills with this object in view. The most noticeable thing about the work of the district was the increase in efficiency over that of previous years, and if the same improvement can be made from year to year we will soon have a very effective organization indeed.

Prince Albert.

The district extends west of Prince Albert city some 80 miles, north to Isle à la Crosse lake and Lac la Ronge, and east down the Saskatchewan valley to the Sipanok channel, involving, roughly, an area of some 13,000 square miles. Just north of the Saskatchewan river for some 25 miles and extending westward along the line of the Canadian Northern the country is fairly well settled up; farther north, the country is but slightly settled, while in the vast lake country still farther to the north there are practically no settlers other than those at Hudson's Bay posts, missions, and Indian settlements. The general contour of the country is comparatively flat, although there are numerous sand ridges, especially in the valley of the Saskatchewan river. The country is much broken up by numerous lakes, muskegs, spruce-tamarack swamps, and sloughs. The timber is, generally speaking, of comparatively small size and more or less widely scattered. By far the greater part of the accessible merchantable saw-timber has already been cut or is under license to one of the two big lumber companies operating in the district, and large amounts are being cut yearly. In addition to the above companies, there are numerous smaller cordwood operators engaged in the district. The cordwood areas of the district are to a large extent the source of the fuel-wood supply for the country south as far as Regina. A large part of the district has been swept by fire, with the result that much land formerly covered with spruce has reproduced a dense growth of aspen. In places, however, these aspen areas have seeded to spruce, and if good fire protection is afforded, spruce forests of large extent can undoubtedly be established. The district is normally a dangerous one, for the average precipitation is comparatively low. The country, too, offers access by canoe to the Churchill and other northern waters, so that numerous prospectors, trappers and hunters are continually going into the north country, and, as many such men are very

careless in the use of fire, great danger results. In the southern parts many settlers have filed on quarter-sections which can never be profitably farmed, their intention evidently being to cut all the cordwood and then abandon the homestead. It is unnecessary to say that settlers of this description leave the homestead a veritable fire-trap, with dry inflammable tops and brush scattered haphazard about the place.

Eighteen fire-rangers were retained for the entire season. In the more settled parts patrol was mainly carried on by horse and rig; farther north, where roads are few and water communication is not continuous, the men travelled mostly on foot; still farther north, in the lake and river country, patrol was entirely by canoe. The majority of the men were, of course, located in the southerly and more dangerous parts, while in the north the districts were large, altogether too large, in fact, for good protection. The service was decidedly better than in previous years, although much further improvement is required, both in personnel and the details of organization. The work was in charge of Mr. A. Williscraft, a man thoroughly familiar and experienced in such work and to his efforts the greater part of improvement is entirely due.

The fire damage was small, some 2,500 acres of young growth, 100 acres of cordwood timber and 1,800 acres of grass land having been burned over. The season was abnormal, the precipitation being above the average; at the same time there were several fairly dry periods, but fires were kept in control. No elaborate improvements were carried on, the trail work being for the most part confined to clearing up of existing trails.

Considerable areas of the districts have already been created forest reserves, and several large reservations are proposed at the present time. When these are all on an established basis of forest management, much will have been done to retard the fire danger. For the northern parts a combination sail-motor-boat is now under construction. Such a boat is undoubtedly an innovation, but will certainly greatly facilitate fire patrol on the big lakes, where with a canoe a ranger may often be stormbound for days at a time.

One great misfortune suffered in the district during the summer was the destruction by fire of the plant of the Big River Lumber Company at Big River. In June the sawmill was burned down, and later on, in August, the planer was also completely destroyed by fire. This plant was one of the finest in Western Canada, although perhaps a little too large for the locality in which it was situated. In addition to the loss of the mill hundreds of people were thrown out of employment, and it was necessary to dispose of large quantities of rough lumber which was in the yards; none of the latter, fortunately, was destroyed.

Battleford.

The character of the country in this district resembles very much that just described for the Prince Albert district, with the exception that settlement runs up in a more distinct line to the edge of the forest land. It may be defined as the area lying between the Prince Albert district and the boundary of the province of Alberta, altogether some 6,500 square miles. Topographical features are very similar, the same flat country with low ridges being in evidence. The lumbering industry has not been developed to the same extent, owing to the lack of railway facilities for marketing of the product; most of the sawing is done by small portable mills located here and there throughout the southern part of the district. North of the Beaver river, in the Waterhen Lake region, there is some of the best spruce, perhaps, found in northern Saskatchewan. This is still for the most part green, and all efforts should be made to keep it so. For the rest of the district the saw-timber is not so good, being more or less scattered in small blocks. There are large quantities of merchantable cordwood which at present has only local use. With the construction of a railway,

however, it will be possible to harvest and market great quantities of fuel-wood. A large area has been fire-killed, as in the case of other districts, and there are enormous quantities of good, dry cordwood which, it is feared, will lose its value ere a railway reaches the district. In many places the reproduction of jack pine is very dense, while in others poplar has established the forest-cover with a light reproduction of spruce below.

Seven men were employed throughout the season, five working south of the Beaver river, patrolling on foot or driving as conditions permitted. The remaining two men patrolled by canoe the lake and river country in, and to the north of, the Beaver River valley. In this district the average calibre of ranger is perhaps better than in any of the other fire-ranging districts; all the men were comparatively young, sturdy, and good for any amount of hard work. South of the river the district was exceptionally well patrolled, and what is now most necessary to increase the efficiency of organization is improvement work. During the season some existing trails were cleaned up and some new ones cut. A good cabin and stable for one of the men were also built, the frame of a second one constructed, and a good lookout station erected all at very small cost of ranger labour, and with practically no additional expense. Improvements of this nature can easily be undertaken at the times when conditions do not necessitate active patrol duty, so that when the danger time comes, the ranger can be close at hand with his supplies, fire-fighting equipment and probably a fresh horse. In the country farther north the rangers had proportionately more ground to cover, and hence but little was undertaken in improvement work. Good work was done by all of the men in providing head office with detailed information and maps of their districts.

The fire damage for the year was comparatively small, no damage being done to merchantable timber, and the loss confined to 3,600 acres of young growth and some 36,000 acres of grassland. The season was a fairly wet one, but there were times when conditions created anxiety; at such times, however, the organization successfully withstood the fire danger.

Edmonton.

This is by far the largest district included in our present fire-ranging organization. It embraces all the timber country north of Red Deer and east of the Rocky Mountains forest reserve; it includes also the Peace River block and the Peace River valley down as far as Vermilion chutes, the Athabaska river down to Grand Rapids, and the vast area of country lying between the portions of the Peace and Athabaska rivers above defined; and, lastly, the Lac La Biche country east to the Saskatchewan boundary. Roughly speaking, an area of some 48,000 square miles indicates the extent of the district. A large part of this area has, of course, been opened up to settlement and settlers have for the past few years been pouring into the country. To describe the country topographically is impossible in this report; suffice it to say that practically the whole area is drained by large rivers which rise in the mountains—the Saskatchewan, the Athabaska, and the Peace. Between these rivers are high ranges of hills, which become lower as the rivers recede from the mountains. The intervening country is a network of rivers and streams, the largest of which also rise in the mountains. The country is much broken up with lakes, spruce-tamarack swamps, sloughs, and muskegs, making travel extremely difficult and confining it more or less to well-defined highways. The country has been repeatedly swept by fires, until at the present time but a small proportion of the timber retains its virgin state. To appreciate the awful destruction and loss one has but to travel through the foot-hills of the Rockies and witness the untold quantities of timber fire-killed and rotting on the ground, and not only in the foothills but almost generally throughout the district fire has at one time or another waged its dreadful toll on the timber resources. Fortunately, however, there are millions of acres of reproduction, pine, spruce, and poplar, which

Photo by G. P. Melrose.

Muskeg Brulé (Sec. 4, Tp. 56, Rge. 20, west of 2nd Meridian).

Photo by C. H. Morse.

Brule in Maligne Valley, Brazeau Forest, Alberta.

if carefully protected will one day restore the forest cover, thus ensuring a bountiful supply of forest products and increasing the stability of stream-flow.

A great deal of lumbering has for many years been carried on in the southern portion of the district, and saw-mills are to be found on all the main rivers; also, many hundreds of miles of railway have been laid with ties cut from the district, so that, in addition to the fire hazard under ordinary conditions, there are thousands of acres of old slashing, adding materially to the danger of fire. North of the Athabaska river there are practically no mills of large size and cutting has not been so general, being solely for the supply of a rather small local demand. On the Simonette, Smoky and other northern rivers, many fine blocks of timber are found which will without doubt play an important part in timber supply to the northern part of the province.

Up to the present time the only highways into the northern country have been the Grande Prairie trail, the road from Athabaska and the Athabaska river. Travellers entering the country, therefore, have had to resort to camping out, and, of course, this has been the source of numerous fires. Now, however, a railway is penetrating the district, and even if in itself it constitutes a source of danger, it will materially decrease the number of campers and camp-fires. Formerly a railway penetrating a new country was a sure indication of wholesale destruction of timber by fire; now, however, with efficient legislation for railways under construction, it is hoped that the catastrophes of this nature may be prevented. In the southern part of the district railway construction is also progressing rapidly, but the worst danger with which we have to contend is the prospector. This part is coming year by year under more efficient forest administration, however, and it is hoped that the apparently imminent danger may be largely offset.

Distributed over this enormous district was a staff of about forty men, practically all of whom were retained for the entire season. Patrol was more or less confined to the main avenues of travel, for it is along such roads that the main danger exists. The men were well distributed, so that all parts of the district received some measure of protection. On the Athabaska river, protection was afforded by a stern-wheel patrol boat equipped with fire-fighting apparatus. This boat patrolled between the Pembina river and Grand Rapids. The work of the whole protective organization of the district was under the direct supervision of one chief fire ranger, Mr. R. H. Palmer, of Edmonton. Splendid work has been accomplished by him in the organization of the district, but one has only to glance at the map to see that subdivision of the district is the first thing necessary in order to provide increase in efficiency of administration. Another problem that faces us is the protection of timber in the Peace valley and on the islands of that river. This can best be handled by the provision of a good patrol boat of the same type as that on the Athabaska river, but of larger size and greater power.

It is reported that 75,000 acres were burned over, of which by far the greater part was grassland and old slashing; of the balance, 7,000 acres was covered with young growth; and 100 acres consisted of merchantable timber on which 200,000 feet, board measure, was destroyed. The season was, therefore, a successful one as regards fire protection. This was largely due to wet conditions, but, as many fires were extinguished by the men, it is safe to say that there has been improvement over previous years. Under favourable conditions the staff seems to have been sufficient, but to hold our own in drier and more dangerous years would severely tax an organization of treble the number of men. It is necessary, therefore, that additions should be provided for in the future organization.

McMurray.

This district embraces the country along the Athabaska river and its tributaries, from Grand Rapids to the outlet of the river into lake Athabaska. The most important affluent is the Clearwater river, which joins the Athabaska at McMurray. Altogether the district may be said to include some 12,500 square miles. With the exception of isolated settlements at the various Hudson's Bay posts and missions, the country is

entirely unsettled and in no part of the district do we find anything more than a mere trace of farming. The mainstay of the essentially Indian population has been the fur trade, and only lately have the mineral resources of the country attracted the general attention of prospectors. The best timber of the district is found in the valley of the Clearwater river, and although here the timber counts some good blocks of spruce it is almost wholly confined to the immediate valley of the river. Along the Athabaska some fair blocks of spruce are noted, but the most striking timber found there is the black poplar (" cottonwood," as it is called in that country, or balm of Gilead), which grows to a surprising size on the banks and alluvial islands of the river. As for the country back from the river, it is of the general northern description, large spruce-tamarack swamps and muskegs interspersed with low jack-pine and poplar ridges. Most of the country has been subjected to fire, with the result that a large proportion of the timber is of small size. Sufficient timber will be found in the valleys of the rivers, however, to supply the demands of the country for many years to come, but, as the development of mineral resources is likely to increase, and as they will enhance considerably the value of the timber, it is most necessary that fire should be kept out as much as possible.

Eight men were employed for the entire season, patrols being established on the Athabaska throughout the entire distance from Grand Rapids to the lake, the Clearwater river, the House River trail (which is an alternative route from McMurray to House River above Grand Rapids) and the Lac LaBiche trail. Patrol on the rivers is, of course, entirely by canoe, while the trails are covered either by pack-horse or on foot. For the first time since its inception the organization was placed under the exclusive direction of a chief fire ranger, Mr. J. M. Hill, of McMurray. Although there is room for much improvement in the district, the closer supervision over the work of the men has fully justified the appointment of the chief ranger.

The season was a most favourable one, and the fire loss exceedingly small, 1,000 acres having been burned over, of which about 400 acres consisted of young growth, the remainder being open and grass land. At the mouth of the Athabaska river there are extensive marshes and swamps covering hundreds of square miles; fires also occurred there, but owing to the wet nature of the area it is an impossibility to take any action other than preventing the spread of fire to higher and drier land. The area of such marsh land burnt is, of course, not taken into account. In the next few years the fire danger will be considerably greater on account of the influx of prospectors and travellers, but it is hoped that the ranger staff will be able to hold its own.

Slave.

The district embraces the valley of the Rocher and Slave rivers from lake Athabaska to Great Slave lake; also the Quatre Fourche river, and the Peace river up to Vermilion chutes. Generally speaking, the district is not well timbered but in many places extensive blocks of spruce are found. At the mouth of the Peace and Quatre Fourche rivers, and extending up the Peace river for some 20 miles there is very fine timber, indeed, in several blocks containing at least 100,000,000 feet of spruce. Good timber is also found on the Slave river between Fort Smith and Great Slave lake, large quantities of which are yearly cut by the Hudson's Bay Company to supply local demand. In other parts of the district the timber is smaller and does not exist in such large blocks as those just mentioned. The black poplar also reaches large size in this district and although very subject to heart-rot, it will undoubtedly be used to a considerable extent as development goes on. Although most of the timber along the rivers is green, a large part of the country has been burned over in previous years. As is the case in the McMurray district, however, with careful protection there will be sufficient timber to meet the demands of the country for many years to come.

Patrolling the district were two regularly appointed fire rangers, one working from Lake Athabaska to Smith Landing, the other below Fort Smith. A new patrol boat

was sent down the river during the season, and will patrol from Fort Smith to Great Slave lake. As the boat did not arrive till mid-season, and as it was some time before it could be fitted up, it was not possible to make more than one trial trip. On this trip a full patrol was made from Fort Smith to Great Slave lake, and the boat proved satisfactory. Above Smith Landing is another small steamer which, when properly equipped with new machinery which is to be sent down, will be available for fire-protective work. The idea is that each boat will be in charge of a fire ranger and have a crew of engineer, fireman, and additional help as may be necessary. The operation of such boats will greatly increase the protection, as, after all, a man, even with an assistant, makes but slow progress in ascending the swift waters of those large rivers. During the past season continuous patrols were made from Fort Chipewyan to Smith Landing by the fire ranger, but each time the return upstream was very difficult and slow. The work of the district is under the direction of Mr. A. J. Bell, Government Agent at Fort Smith, Alberta. The fire situation seems to have been kept well in hand, no merchantable timber having been destroyed. Altogether, about 15,500 acres of young growth was burned over, of which a considerable amount was scrub poplar reproduction of but little value. The season was a fairly favourable one, though not so wet as that experienced in other districts.

A district to which we have as yet been able to give but scant attention is that below Great Slave lake, the Mackenzie river and its tributaries. On the Mackenzie river itself there is perhaps not much large timber, but up the Liard and some of the other large rivers it is reported that there is fine timber. Protection in such a remote district is, of course, a very difficult matter, the country in itself being of such enormous extent and communication very slow. It will, therefore, be difficult to work out an efficient organization for fire-patrol and the best thing that could be done would be to establish a good fire-patrol boat working from Great Slave lake northward.

GENERAL.

The fire record for the season in all of the above districts and along railway lines is as follows:—

Causes—	Number.
Campers, surveyors, prospectors, etc.	164
Locomotives	109
Careless clearing of land by settlers, etc.	66
Section-men on railways	32
Clearing right of way	11
Threshing engines	3
Logging engines and small mills	2
Deliberately set out	2
Lightning	1
Causes unknown	121
Total	511

Areas burned over—	Acres.
Merchantable timber	580
Young growth	34,136
Old slashing	28,540
Grasslands	86,200
Total	149,456

It is seen that 86,200 acres of the burned area was grass land, and the balance of 63,256 acres—a little under 100 square miles—was forest land. Estimating that 90 per cent of the area under patrol is forest land (namely, 112,500 square miles), it is seen that about 0·09 per cent (nine one-hundredths of one per cent) of the forested areas was burned by fire during the fire season of 1913. The amount of merchantable timber destroyed was comparatively small, being less than one million feet, board measure. The greatest loss, by far, is represented in the destruction of over 34,000 acres of young growth, which, given a nominal value of three dollars per acre, represents a loss of $102,000. Other losses to property as a result of forest fires would add

to this loss by $25,000, making a very conservatively estimated total loss of $127,000—an amount greater than the total expenditure for fire protection over the total area concerned. This loss is very small as compared with other years; nevertheless it is clearly shown that even in a most favourable year the amount of loss to the timber resources of the country is such as would warrant the expenditure of more money for its protection. Although the expenditure of more money is urged, it is of great importance just how such funds should be spent. The present staff is not large enough, yet it would not suffice to merely add to the number of rangers employed. More emphasis must be laid on improvement work, for, no matter if the staff numbers into the thousands, in a dangerous year but little can be done unless the wherewithal to fight fire, namely, roads, trails, and equipment, is present. The most feasible policy to this end is at the present time being carried out in the establishment of forest reserves. It is a difficult matter to carry on extensive improvement work on open Crown lands, but by creation of reserves and the administration of them on a rational basis, establishment of organized patrol, construction and maintenance of roads and trails and the control of forest users, the problem is much simplified.

Reference to the area table shows that over 28,000 acres of slashing was burned over, again emphasizing that the present careless method of logging adds greatly to the fire hazard. Present legislation provides for the proper disposal of slash from lumbering operations, but legislation is not effective unless it is enforced; and the present method of inspection of cutting operations does not secure the desirable and necessary compliance with regulations. Stringent regulations have been provided in the case of railways, and these are being properly enforced at considerable expense to the railway companies concerned. Railway operation has for a long time been considered as a source of fire-danger, and action has been taken to offset, as far as practicable, this danger. The presence of slash in the bush has also been recognized as a factor in the source of fire, yet the compulsory action for the removal of such slash by timber operators has not been effected.

The fire table indicates that once again campers, prospectors, hunters, and others travelling the timbered country were the most prolific source of fires. Those people are always on the move, and the difficulty is that the quicker they move the more likely are they to leave a camp-fire unextinguished. On the other hand, the fires resulting from careless clearing of land have decreased over the previous year, and this feature is a most pleasing one to note; nevertheless, more effective legislation is required covering this phase of the question as well as the camp-fire problem, in order that we may compel more careful observance of the principles of conservation. Many of the fires caused by such agents occur along provincial roads either under construction or supposedly completed. Along nearly every such road piles of slash are left which become very dry and inflammable and all that is necessary to start a bad forest fire is that some careless person should throw a burning match or other ignited substance into this slash. By far the greater proportion of fires started which are extinguished by our rangers result from the surrounding conditions of the woods as regards slash and débris.

During the season I visited all of the districts with the exception of northern Manitoba. An extensive trip was made from Athabaska to Fort Smith and thence back to Prince Albert by way of the Clearwater river, Lac la Loche and the Beaver river waters. This trip will be dealt with in a separate report, as it was more or less distinct from the rest of my work. My general impressions of the organization are, I think, conveyed in the reports on the various districts. As far as can be seen there has been improvement, yet after all, no real test of efficiency will come about until we have a dangerous fire season.

Respectfully submitted,

E. H. FINLAYSON,
Inspector of Fire Ranging.

APPENDIX No. 7.

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

MONTREAL, QUE., March 27, 1914.

R. H. CAMPBELL, Esq.,
Director of Forestry,
Ottawa.

SIR,—I have the honour to submit the report of the Forest Products Laboratories for the year ending March 31, 1914.

On being appointed Superintendent of the Forest Products Laboratories in June, 1913, I made a trip to the United States Forest Products Laboratory at Madison, Wis., where I spent five weeks in a study of their organization and work, with a view to utilizing their experience with various phases of the work as much as possible, so as to avoid, as far as could be, the difficulties with which they had to contend, particularly in the early days of the institution. Moreover, since up to the present time, this laboratory has been the only one in America whose field is forest products, a study of their work is extremely desirable in order that unnecessary duplication of research be avoided, and that, where the work on Canadian woods parallels similar work done by them on United States woods, the details should be exactly similar in the two laboratories, so that the results obtained in each may be combined or compared with the minimum of effort and possibility of error. This is particularly desirable in the case of tests of mechanical properties of timber, as the work, often very extensive, of various investigators in this line, has been rendered almost valueless from the non-observance of this principle, whereas, by conforming more closely with the researches of others the work of each would have supplemented that of the other, resulting in greatly increased value for both.

Since it was determined that the divisions of timber tests and timber physics should be instituted first, and that of pulp and paper follow immediately, the corresponding divisions at Madison received the most careful study. Through the courtesy and co-operation of the various officials of the laboratory, all available information was placed at my disposal and a great deal of valuable data, otherwise unobtainable, were secured and will be of immense service to our laboratories later on. Too much cannot be said in appreciation of the interest and support which the staff of the United States Forest Products Laboratory have displayed in our work, both during my visit there and later. The notes and data secured during this visit are now on our files here and are the basis of a very large part of our organization plans.

On returning from Madison, I first took up the matter of co-operation with McGill University. Many conferences were held with the various officers of the University, including Principal Peterson, Dean Adams, of the Faculty of Applied Science, Mr. Vaughan, bursar, Mr. Burrell, assistant bursar, Dr. Ruttan and Professor Mackay, of the Faculty of Applied Science, and also the Governors of the University. These gentlemen, and indeed all connected with the university, are very enthusiastic in their support and have done all in their power to aid us. As an outcome of these negotiations, memoranda have been prepared for the Governors and for Dean Adams, embodying the terms of our affiliation with the university. Copies of these memoranda are appended to this report.

The matter of accommodation was also considered in conjunction with the university authorities, as this is to be provided by the university. Temporary quarters

were provided in the Old Medical building, consisting of two rooms for office and two rooms in the basement for the work of timber physics and the drafting in connection with timber tests and other work. The experimental work in timber tests will be done in the testing laboratory of the Macdonald Engineering building, which is one of the best equipped testing laboratories on the continent. In addition to the testing machines installed there at present, we are installing a Hatt "Impact machine" and an Olsen "Universal testing machine", which are particularly necessary for our purposes.

Regarding permanent accommodation, the building known as the "Joseph" property, now owned by the university, was first considered. This building is at present occupied by the Officers' Training corps, but will be vacated by them on the completion of their new armoury which is to be constructed this summer. During the negotiations for the use of this building, the university purchased a house on University street, known as the "Molson" house. As it was known that the university had no immediate use for this property, permission was applied for to investigate it with a view to taking this in lieu of the "Joseph" property.

The considerations involved as to which was most suitable to our needs were several. In the first place, it is a much larger building and is so laid out that we can install our paper machine without any addition to the building, which was not the case with the Joseph property. Then, too, this building is in close proximity to the Applied Science buildings of the university and to connect with the steam-supply line, from which we will draw our heat and power, will require only a very short conduit, whereas, in the case of the Joseph property, about 900 feet of conduit would have to be laid, and this would entail considerable cost. The foundations of the building are not at present in very good repair, but it is probable that they can be put into such shape as to suit our purposes without entailing too great an expense. The Board of Governors of the University have agreed to turn this building over to us for a period of four years. This will make no difference to our arrangements for the use of the testing laboratory.

Following the precedent of the United States Forest Products Laboratory, an Advisory Committee has been instituted to supervise the general policy of the laboratories. In selecting the men for this committee attention was paid to the following points:—

1. The interest manifested in work of this nature.

2. Experience with wood products.

3. Willingness to take the time and go thoroughly into the questions that may come up from time to time.

4. The confidence and esteem in which he is held by his associates and the public.

We have been extremely fortunate in finding men of the requisite qualities who are willing to act in this capacity, and enthusiastic in their support of the work and aims of the laboratories. Four of these may be considered as representing the university on the committee. These are Mr. F. H. Wilson, of the Board of Governors, and Dr. Frank D. Adams, Dr. R. F. Ruttan and Prof. H. M. Mackay, of the Faculty of Applied Science. The other members of the Advisory Committee are men prominent in commercial and technical work of a nature closely allied to that of the laboratories. These are Mr. Carl Riordon, of the Riordon Pulp and Paper Company, Montreal, Mr. Judson A. DeCew, Consulting Chemical Engineer, Montreal, and Mr. R. O. Sweezy, General Manager of the Montreal Engineering Company. All of these gentlemen have displayed very great interest and have shown themselves willing to make considerable sacrifice of their time to further the interests of the laboratories.

The appointments to the technical staff up to the present are as follows: W. B. Campbell, in charge timber physics; R. W. Sterns, in charge timber tests; W. G. Mitchell, N. W. Trapnell, L. L. Brown, S. D. McNab, assistants.

Several other appointments have been made to take effect at a later date. Notable among these is the appointment of Mr. John S. Bates to take charge of the division of pulp and paper. Mr. Bates is at present in the laboratories of A. D. Little, Inc., Boston, Mass., U.S.A., where he has already distinguished himself by his researches on pulp and paper—notably by his work on the utilization of the waste of Southern pines.

In addition to the appointments to these technical positions, a small clerical staff, consisting of two stenographers and an office boy, has been appointed.

No heavy apparatus has been installed up to this time, with the exception of the Impact testing machine and Universal testing machine previously mentioned as having been purchased for use in the testing laboratory. Both of these machines were purchased from the Tinius Olsen Company, of Philadelphia. They are at present being erected in the laboratory. Other equipment purchased includes one Bausch & Lomb-Zeiss microscope, one Sartorius chemical balance, one Freas electric oven, and a stock of glassware, etc., for the chemical laboratory. Draughting equipment, including two Universal draughting machines, three tables, and scales, squares, triangles, etc., has also been installed.

A considerable start has been made towards the establishment of a library and reference files to contain all available literature on forest products, and on all subjects related to this. Included in this will be a file of catalogues of manufacturers of all supplies and of various wood products, as well as accumulated clippings of all items of interest in this connection found in the current literature. We aim to include in the library all information published from now on. A classification system has been arranged to cover all this literature so as to make all information on any subject immediately available to the laboratory. The preparation of this system and the putting it into operation has been quite an undertaking in itself, but ready and complete reference to the contemporary literature is vital to the efficient working of the institution. The filing of the correspondence has also been arranged so that all correspondence relating to any one product is together, so that we will be able to accurately estimate the relative demands for information along the different lines and shape the investigations of the laboratory accordingly.

A system has been worked out, also, to keep records of the work as it goes through the laboratories. These records are to be kept in such a way as to make them independent of the personnel of the staff making the observations; that is to say, in the case of one man leaving or changing to some other part of the work, his successor will not find it necessary to duplicate any of the work previously done. This end can be attained only by means of an efficient system constantly and carefully managed.

Already the public are beginning to look to the Forest Products laboratories for information of all kinds in relation to various wood products. In the great majority of cases we are able to furnish this information from the knowledge at hand, but it frequently happens that this is impossible for the reason that no work has been done on the subject. The variety and extent of the inquiries already received indicate very clearly that the laboratories will fill a very real want of the users of wood in this country.

Although the laboratories have not yet been able to commence any original research work, both by reason of the time necessary to obtain proper equipment and proper personnel and also the delay which is necessarily incurred in collecting properly authenticated specimens, the laboratory has prepared some literature which should be of considerable interest and value to lumbermen and others concerned. The first of these publications deals with the organization and purposes of the laboratories and is for the purpose of acquainting the public with the ideas and scope of the work. This will pave the way for future publications and will make them proportionately more valuable by increasing the number of people who will become interested. Another circular is now in the hands of the printer and is on the subject of the "Chemical Utilization of Wood Waste." This circular is intended to give a brief outline of

the various processes in use at the present time, for utilizing the various important forms of waste, without going into the technical details of any of them. This circular will cover a great many of the inquiries which we receive. A bulletin on the use of Wood-Paving Blocks has also been prepared and is now ready to be printed. This latter is a compilation of all previous literature on the subject and also includes something of the experience and opinions of various engineers and other authorities on the question. This bulletin will, it is expected, be of great value to the city and town engineers who are interested in good pavements and who wish to keep informed regarding the latest and best practice in this respect. The preparation of these two latter publications also serves another purpose, in that we require all the available information for our own reference and this makes a most convenient method of collecting it. For instance, in preparing the bulletin of Paving Blocks, it was necessary to get in touch with the engineers of all the more important Canadian cities, as well as with those interested in wood preservation in general. This has resulted in the accumulation of a mass of extremely valuable information which will be of very great use to us later on when we are in a position to do some original investigation and demonstration on this subject.

As previously stated, no laboratory research work has been done as yet owing to lack of material for test. The first work of this kind will be an investigation of Douglas fir, and the material for this has been cut and is now on the way to the laboratories. The shipments consist of portions of five typical trees from each of three localities and records are being made of each of these from the time of cutting so as to have at hand complete information as to these specimens

Respectfully submitted,

A. G. McINTYRE,

Superintendent of the Forest Products Laboratories.

APPENDIX No. 8.

REPORT ON WOOD BUFFALO.

AURORA, ONT., July 9, 1913.

R. H. CAMPBELL, Esq.,
Director of Forestry,
Ottawa.

SIR,—I beg to submit a summary of my investigation of the conditions affecting the Wood Buffalo in the Slave River district, or rather a review of the information obtained during my two years travel in this country. I will also respectfully submit a few suggestions in regard to their future protection and welfare.

WOOD BISON.

The country in which the last wild herd of buffalo roam is situated west of the Slave river. The southern boundary of the district is formed by the broad expanse of the Peace river, from a point on it opposite the lower end of the Caribou mountains to its mouth, or rather its junction with the Slave river. The western boundary is the Caribou mountains, which run northwest and southeast some 150 to 200 miles west of the Slave river. The northern limit, of course, is Great Slave lake from the mouth of the Slave river to some point beyond the mouth of the Big Buffalo river.

The climate is not as severe as one would expect. In winter, although at times during January the temperature goes down very low, it remains about 10 or 20

degrees below zero Fahrenheit, and, as the air is very dry, it is not uncomfortably cold. Spring sets in near the middle of April, and all the snow is gone by the middle of May. All vegetation advances very rapidly owing to the long hours of sunshine. Summer, although very short, is luxurious in its production of new growth. Fall is usually very much prolonged, the sloughs and smaller rivers freezing solid long before the first snow falls. This country and climate seems to suit the wood buffalo to perfection. The snowfall is not so deep that it covers the feed in sloughs and small prairies beyond their reach. Added to that, the open places are not so large that the snow becomes packed by the wind, thus preventing them from tossing it aside with their huge heads. If the wind blows too hard, they can easily take shelter behind some thick bluff of timber or move on to some small slough where the grass is long and abundant and which is entirely surrounded by dense bush.

The chief difficulty in exploring this country and obtaining statistics of the wood buffalo is its lack of navigable rivers. The Little Buffalo river which drains this country is of little or no practical use for exploration purposes, as it is so very crooked; although I suppose it might be used as a supply base for parties rounding up the buffalo in the northern section, if that step is ever taken. Of course, added to this, are the usual difficulties of travel in the north; the prolonged spring when the country is boggy and flooded deep with water (see my report of our trip in June, in 1911, in regard to the great difficulty we had with pack-horse travel); the short summer when the flies worry to death both man and beast; the long cold winter when travel by dog-sled is the only practicable means, and when the very nature of the undertaking means a new soft trail through dense bush and deep, drifted, open places. But these are every one surmountable difficulties, that is, by men or animals of the requisite stamina. Another problem, and undoubtedly one of the greatest, is the difficulty of food supply. No wandering bands of Indians inhabit this country. They one and all stay at the different posts on the Slave river, only making short hunting excursions into the country for moose and fur, and then travelling light, far and fast. Therefore all supplies have to be taken with the party from the start. The party becomes self-supporting and self-dependent, as no succour from any outside source can be expected. As far as the buffalo themselves are concerned their investigation is more or less a matter of luck. Owing to the dense undergrowth one might pass within a few hundred feet of a band of them and never know of their existence. An experienced guide is absolutely necessary, one who knows the whole country thoroughly, who knows from experience where the different bands are likely to be found, as there are huge tracts of the country which the buffalo seldom, if ever, visit. Even then he is often disappointed and may travel for weeks without seeing them.

But I am wandering from my subject of facility of investigation. To put it in as few words as possible, the successful investigation into their condition and correct compilation of their numbers will have to be left until a sufficient number of supply depots placed at suitable points are established; or until they are confined in a certain part of the country. The only result which can be obtained from the kind of work we have been carrying on is a report on their favourite habitat and a rather inaccurate estimate of their numbers.

Investigation tends to show that they are scattered in small bands and individual animals up and down the whole country from the Peace river to Great Slave lake. Salt mountain, which runs parallel, or nearly so, to the Slave river, forms their eastern boundary in the central part of the country, that is, directly west of Fort Smith. In olden times the salt plains at the foot of this range of hills used to be a favourite stamping ground for them. In "Old King Bouillon's" time, when he and his band lived at the mouth of Salt river, the buffalo could be hunted by horses on the plains just as the great herds were on the western prairies. But no buffalo ever come as far east as that now. They seem to have learned by experience that they are safer in the dense woods.

There are two sections of the country which they prefer. One, the northern, is situated east and south of Big Buffalo lake. The other, the southern, 75 miles or so

southwest of Smith's Landing. Between these two tracts there is a strip of country on the west side of Salt mountain which is higher and drier than the country farther west. Quite a few individual animals and small bands inhabit this part of the country, wandering north and south. Whether they are strays from the main herd or separate bands I was unable to determine.

Now to come to the question of numbers. I cannot claim to be as great an authority on this question as circumstances seem to indicate. The animals are too widely scattered and too roving in their movements from time to time to admit of any one giving an accurate estimate of their numbers. Indian information, unreliable at the best, seems to be uncertain and contradictory. Chief Squirrel, who has the reputation of knowing the country better than anyone else, is very vague in his ideas of their numbers. So at best my calculations must not be relied upon too implicitly. Owing to a multiplicity of circumstances too numerous to mention here, I never succeeded in getting in touch with the southern herd—that is, the main body. But as, owing to Mr. Radford's exertions and those of the Royal Northwest Mounted Police, more was known about them than the more northern ones, I was able to arrive at a fair estimate of their numbers.

The northern herd is divided into at least three separate bands. One of these occupies the country P. McCallum and I visited last fall. We managed to see only three of them, getting quite close to them, but from the signs left in wet sloughs, main trails and feeding grounds, there must have been from fifty to sixty of them in the immediate vicinity. Thirty-five or forty miles farther west is located the band which I visited in March last with the Indian guides. This band is about the same size. There is also a very much larger band farther north and west of this, in the vicinity of Buffalo lake. This information is so well authenticated and so generally known among the Indians that one cannot help but believe it true. To visit this last herd would almost necessitate starting in from a point on Buffalo lake and a basis of supplies at that point. Thus you see the number of animals in the northern section approximate from 180 to 200 head.

The herd inhabiting the central southern part of the country can be safely placed at from 200 to 250 head.

This leaves the individual animals and small bands in the central strip. I have encountered several of these, but only one at a time. Around Grassy lake, which is from 50 to 60 miles west of Fort Smith, many tracks were seen, and the Indians hunting in that country often encounter them. So we can safely place their numbers at the low estimate of one hundred head.

Recapitulating, then, my estimate would be from 500 to 550 head. There is much evidence to show that there may be very many more, but we have at least a minimum estimate to work upon.

Much has been said about their size relative to that of the plains buffalo. It may be a matter of surroundings or setting that makes them appear so large, but I think on an average they are very much bigger in every way than the plains buffalo. Some of the bulls we saw were very large, enormous in size and height. The size of the skulls of dead animals found in the bush also seemed to indicate a very much larger development. This may be due to their secluded condition and the abundance of rich feed to be found in their grazing grounds.

It is true that there are not the number of calves that one would expect; that is, judging by the tracks. The calves and their mothers stay with the larger bands as much as possible. They are never met with roaming around alone. When feeding about or moving slowly along the calves are always in the centre, so it is hard to see them or count them. Their tracks are thus pretty well covered up with the enormous imprints of the bulls' hoofs. With this large band seen by me last March were at least three "coming year-old" or young born last spring. That is all we could make out before the herd closed up in defensive formation, with the big bulls forming a ring outside and the cows and calves in the centre. At different times in other parts of the

country we have noticed the tracks of young, both old and fresh; but not enough of them, as I have said, to account for the natural reproduction. However, there must be a fair reproduction as a great proportion of the band was composed of three and four-year-old animals. The two animals which McCallum and I saw feeding together last fall were from three to four years old, and were in splendid condition.

Although I have already spoken of the country in which they are generally to be found, a few further words about their natural habitat will not be "mal à propos." Their preference in the early summer is the rolling poplar and jack pine country. Through the jack pine, where the pine needles cover the ground, and grass is rather scarce, their trails are worn deep and well defined. Here they come in the hot summer days to get away from the flies, digging deep wallows where they can roll and throw fine sand over themselves. The trees all along the trails and near the wallows are used as rubbing posts and the lower branches broken off for 8 feet or more on the tree-trunks. In the open poplar coppices the grass and vetches or wild sweet-pea grow very abundantly. This makes splendid feed. Our horses prefer it very much to the rank slough grass and marsh hay.

Towards fall, when the sloughs in which this country abounds begin to dry up, they move out into the open. All winter long these small open places are their feeding-grounds. Of course, when the snow becomes deep, a herd of them can feed over each slough or meadowland only once, because the snow becomes trampled and packed as hard as pavement. Thus they have to keep moving from one open place to another all winter.

Contrary to my expectation, we did not find the timber wolves very numerous. As you see by my previous reports, we were singularly unsuccessful in trapping or poisoning any of these animals. They are not very numerous. Added to this, we found that they generally strike across country to the eastern side of the river about the time when the caribou are due in their yearly migration from the barren lands to the woods. This is the only time of year, that is, in winter, when the snow gets deep, that they are any menace to the buffalo. In fact, for a time I had come to the conclusion that the timber wolves had very little to do with lack of increase in the buffalo herds. But last March on my trip with the Indians I found that the wolf scare was not all "mere balderdash." In this case five or six timber wolves of enormous size were keeping pretty well in touch with this herd. We found, as stated, a two-year old bull (or at least a small part of him) which had been killed and eaten by this band of wolves. Of course the buffalo are not afraid of the wolves when in a band. They can easily protect themselves against such a few wolves as that. But the latter wait their opportunity, living between times on rabbits, I suppose, until one animal, relaxing his vigilance, strays too far from the main herd. Then they corner him. He puts up a gallant fight, but the odds are too great and he falls an easy victim. My regrets at finding this state of affairs and the futility of all our trapping and weary travelling for two years you may well imagine. The wolf question will have to be dealt with, I am afraid, in another manner, as two men, however well equipped, cannot cover the ground and do the work necessary for the complete destruction of the wolves at this season of the year. Our failure was due more to the lack of a competent guide than anything else.

In regard to the destruction of the buffalo by Indians one cannot but come to the conclusion, after living with them as I have done, that there is little or no fear in that direction. They are all too much afraid of the Northwest Mounted Police. The Chipewyans as a class are rather cowardly and superstitious. They have come to know that any transgression of the law is speedily followed by punishment. They are all inveterate gossips and know that any crime committed would reach the ears of the police very quickly. Moreover, moose are fairly plentiful, as well as other game, while in winter, caribou abound on the east side of the river. So I think there is no danger whatever of the Indians transgressing in this manner.

For years, in fact ever since the buffalo have been protected by law, it has been the custom of the Royal Northwest Mounted Police at Smith's Landing to make at

least one yearly excursion in winter through the buffalo country. This was all right as far as it went. The information gathered on these trips was no doubt valuable, but as far as protecting them from their natural enemies, the wolves, went it was of little use. The appointing of two buffalo guardians in the year 1911 was a further step in the right direction, but is there not a very much simpler and cheaper way of ensuring a very sufficient protection? It costs considerable to keep two men on salary and to send in supplies for them. Moreover, two men can never adequately look after the protection of these animals, spread, as they are, over such an immense extent of country, that is, all the way from the Peace river to Great Slave lake.

The only feasible plan is to raise the bounty for wolves killed in this district. I understand that it has been raised this year. That is the only method by which the Indians can be persuaded to get right after them and eradicate them. As it is now, an Indian won't set a trap for a wolf unless the latter bothers his line of fur traps or steals from a fish cache or bothers him in some such manner. He won't waste a trap on a wolf because when he does catch him his hide is not very valuable and he may have some difficulty in getting the small bounty. With that same trap—and every trap is valuable—he could very much more easily catch a lynx, marten, beaver, or even fox, and be much more highly rewarded for his pains. Raise the bounty for this section and keep it there until all the wolves are exterminated. Make every Indian an involuntary buffalo protector and you will simplify this question to a few hundred dollars instead of incurring an expenditure, insufficient in its efficacy, of perhaps thousands of dollars.

Furthermore, I would suggest that Mr. A. J. Bell, or at least the Indian Agent at Fort Smith, be commissioned to send an investigation or inspection party through the buffalo country once or twice a year. Being on the ground he would necessarily know best whom to send and at what time of year a party of this kind would accomplish the most.

Regarding the feasibility of confinement of the different herds inside some suitable enclosure, I have little to say, beyond that I think it would be rather a larger undertaking than Mr. Bell anticipates. Of course, once confined in a stretch of country like the peninsula between the Peace and Slave rivers they could be easily and cheaply watched and protected. This "round up" would have to he done in the summer and early fall. The season is short and the work would have to be rushed. The different herds in the northern part are spread over a big territory, so quite a number of men would be needed to sweep the country. Nevertheless, this step must finally be taken if the buffalo and their increase are to be protected properly.

Respectfully submitted,

GEO. A. MULLOY.