Forest on the LaBiche River.

Photo S. H. Clark.

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 1913

(PART VI, ANNUAL REPORT, DEPARTMENT OF THE INTERIOR, 1913.)

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REPORT OF THE DIRECTOR OF FORESTRY.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
OTTAWA, April 1, 1913.

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 1912-3 and also the reports of the officials in charge of the different divisions. During the year the administration of the Irrigation Act was withdrawn from this Branch and will be separately reported on.

STAFF.

Last spring ten graduates of forest schools were added to the staff, but eleven resigned from the staff later to take service with the newly formed Forest Service of the province of British Columbia. Mr. A. Knechtel, who acted as Inspector of Forest Reserves, was transferred during the year to the Parks Branch. At the present time there are on the staff seventeen graduates of forest schools, and the total permanent staff is as follows:—

Head Office at Ottawa	32
Inspectors	5
Forest Supervisors	12
Forest Assistants	4
Forest Rangers	46
Inspectors of Tree Plantations	8
Outside clerical staff	9

Neither the staff nor the accommodation for it is yet adequate for the work which should be done, and work seemingly effective in favourable years may be lost by fire in dangerous seasons where the staff is not sufficient to have the necessary permanent improvements and preventive measures completed or to provide sufficient patrol. The permanent improvements are also certain to be more costly if there is not proper supervision and checking, so as to ascertain the directions in which the cost of construction may be running high and keep it within proper limits. Nowhere is this inadequacy of staff and accommodation therefor more marked than at head office, and I would again emphasize as I did last year the necessity for an adequate staff and organisation at head office if the administration and the records are to be kept in proper order.

The absolute urgency and necessity for fire-preventive measures of the most efficient kind is well illustrated by the report of Mr. J. A. Doucet, referred to later, on timber areas in the Athabaska and Peace River valleys. Young timber from 35 to 75 years old covers an area of 2,060 square miles, and young reproduction an area of 1,408 square miles, a total of 3,468 square miles, or 2,219,520 acres. To reforest such an area by replanting would cost, at the rate of $12 per acre (and it could hardly be done for less), $26,634,240. Nature has done the work at no cost and asks us only for protection. When mature, this timber, at 5,000 feet, board measure, to the acre.

would amount to 11,097,600 feet, board measure, and at a return of $1 per thousand feet, board measure, would return to the Government $11,097,600, while its actual value to the industries of the country would be ten times as much.

When young timber is burned it is frequently the case that there is no seed-supply left and reforestation by natural means is an impossibility or is delayed so as to become the work of centuries.

APPROPRIATION.

The appropriation for the year 1912-3 was $362,500, and the expenditure was divided as follows between the various services:—

Salaries at Ottawa	$ 12,000
Travelling Expenses	5,000
Forest Reserves	169,300
Fire-ranging	99,000
Printing and Stationery	10,000
Tree Planting	49,500
Forest Surveys	13,000
Statistics and Products	4,700

In regard to the appropriation I may point out that though apparently large when compared with appropriations which have been provided for forestry work in Canada, it is small compared with what is provided in other countries.

In the United States the federal appropriation for the Forest Service is $5,500,000; in India, it is $4,000,000; in Russia, $10,000,000; in Sweden, $595,000.

CORRESPONDENCE.

The letters received and sent out by this Branch are as follows:—

Number of letters received		21,101
Mail sent out—		
Letters, circulars, &c.	60,410	
Bulletins and reports	34,053	
Parcels	2,248	
Total		96,711

LIBRARY.

The library of the Branch now contains some twelve hundred volumes. Many of the volumes are gifts or exchanges, especially from other Government forestry organisations and from forestry societies and associations. Many, however, have been purchased. A considerable proportion of the volumes, including some of the most valuable and useful, consists of collections of pamphlets which have been bound. The publications of the United States Forest Service and of the Indian Forest Service are especially valuable; they are secured by exchange with the publications of this branch.

During the fiscal year 1912-3 there were added to the library by purchase seventy-nine volumes, and ninety-one volumes of pamphlets and periodicals were bound.

It is hoped shortly to start smaller libraries in the offices of the district inspectors and of the reserve supervisors, so as to have convenient for reference works which will be of most use to these officers and their assistants.

There is received in the library a total of fifty-eight magazines and periodicals. These are for the most part forestry and trade publications, including the publications of the International Institute of Agriculture. Of the magazines most are Canadian or United States publications, three are from England, two from Germany and one

each from Austria, India, Sweden and Tasmania. Some of these are kept and bound, and in all cases the important articles are preserved and indexed. This part of the work has during the year been greatly advanced by the Assistant Librarian, appointed last summer.

In work which is developing with the rapidity with which forestry has of late been developing on this continent, much of the literature appears in the form of pamphlets, issued by the various governments, forestry societies and individuals. Much of the work of the library is given to collecting, classifying and binding these.

An important part of the library consists of the photographs, of which there are now considerably over five thousand. This collection consists almost entirely of photographs taken by the officers of this Branch while in the field, and has been accumulating almost from the establishment of the Branch. The development and printing of the negatives are done in the departmental photographic laboratory, but the work of receiving, listing, storing and indexing of the photographs is done in the library of the Branch. Illustrations for reports are selected from this collection and photographs are lent for use in illustrating books, reports, magazines, newspapers and other publications.

A small collection of lantern slides, now 325 in number, is also kept in the library. These slides are used by the Branch officers to illustrate lectures and addresses, or are lent on request.

To show how important a factor the library has become in the work of the Forest Service of the United States Department of Agriculture it will be sufficient to note that, according to the report of the Chief Forester of that Department for 1912, the number of volumes in their library at Washington was 16,017, while in the district and supervisors' offices and other branches of their work outside of Washington there were 20,827 volumes. The additions to these libraries during the year were, respectively, 1,054 and 2,894. The sum of $2,000 was spent on the field libraries during the year. The district libraries number some 500 volumes or more, while the supervisors' libraries comprise 75 or more volumes. The total number of photographs in the Forest Service library was 29,133, of which 4,053 were added during the year.

STATISTICS.

The work of collecting statistics on forest production and consumption of forest products is being reorganized under the supervision of a technical forester.

Statistics on production include lumber, lath and shingles, pulpwood, poles and cross-ties and tight and slack cooperage. Annual bulletins are issued covering these four classes of products. The bulletins for the calendar year 1912 will be ready for distribution in the summer of 1913. A review of the statistics gathered by this branch for the years 1908, 1909, 1910 and 1911 is being undertaken, and a similar review will be made every five years. It is intended to resume the collection of statistics concerning the consumption of wood in mining operations, and a bulletin on this subject will be issued covering the calendar year 1913. The gathering of these annual statistics necessitates correspondence with over 3,000 firms and individuals. The work of compiling statistics from this mass of correspondence has been greatly retarded by lack of an adequate, permanent head-office staff. A strengthening of this staff would greatly enhance the value of the reports issued.

In addition to the head-office staff, a field organization is necessary, composed of men familiar with local conditions who can gather statistical information by personal visits. The services of such an official for the Maritime Provinces has been arranged for. The services of similar men in other provinces, co-operating with the provincial administrations where possible, will be of great advantage.

These annual statistics are to be followed by special studies of the wood-using industries of the various provinces. Such a study covering the province of Ontario

was completed in 1912, and the results in bulletin form will be issued shortly. A study covering the three Maritime Provinces is now being undertaken and will be completed in the summer of 1913. The other parts of the country will probably be taken up in the following order: first, the three Prairie Provinces; then Quebec, and afterwards British Columbia. These studies will be made at the rate of one a year, returning finally to Ontario and commencing a new rotation so that each region will be studied once in five years.

Special work in connection with forest products will be undertaken, and is discussed elsewhere in this report. At the Head Office a study of the structure of wood species is being made with a view to publishing a bulletin on Canadian commercial woods and a key to their identification. A collection of western coniferous woods has been completed for this work. The need for such a bulletin is shown in the confusion that is constantly arising due to the misuse of common names of wood species. An attempt will be made to standardize these common names.

The statistics compiled up to the date of this report include those relating to pulpwood, poles and cross-ties.

Canada produced in 1912 a total of 1,846,910 cords of pulpwood, valued at $11,911,415. One half of this total quantity, or 980,868 cords, valued at $6,695,833, was exported to the United States in the raw or unmanufactured form. Canada manufactured 866,042 cords of pulpwood, valued at $5,215,582, in her own mills, and the estimated quantity of pulp produced thereby was 682,632 tons, 'air-dry.'

Canadian railways in 1912 purchased 21,308,571 cross-ties valued at $9,373,869. About four-fifths of these were the product of Canadian forests. In addition to the ties purchased by Canadian railways Canada exported to the United States 539,788 cross-ties valued at $186,170. This brings the total value of ties cut in Canada in 1912 to $7,862,608.

Telegraph, telephone, electric light and power companies reported the purchase of 608,556 wooden poles valued at 1,113,524. Probably ninety-five per cent of these were cut in Canada and, allowing for the export of this class of product, it is safe to assume the above figures to represent the value of Canadian poles cut in 1912.

An estimate of the total value of the different classes of forest products is given below. The figures are rounded to hundreds of thousands and form as reliable a summary as possible with the date available:

Lumber, lath and shingles	$ 84,000,000
Firewood	50,000,000
Pulpwood	12,000,000
Posts and rails	10,000,000
Cross-ties	8,000,000
Square timber exported	1,900,000
Cooperage	1,700,000
Poles	1,200,000
Logs exported	1,100,000
Tanning material	1,000,000
Round mining timber	600,000
Miscellaneous exports	300,000
Miscellaneous products	10,500,000
Total	$172,300,000

TREE PLANTING.

The tree planting on the farms on the prairies was the first work taken up by the Forestry Branch and it remains one of the most important. The underlying purpose of the work of the Forestry Branch is to provide for the settler and the man desiring to make a home some of the main necessities for that purpose conveniently

situated and at a reasonable rate, and the supplying of trees for planting on prairie farms is a direct following out of that purpose and has helped in the establishment and beautifying of homes that in rural attractiveness cannot be surpassed in any part of the Dominion.

In the spring of 1912, 2,729,135 trees were distributed to 3,618 applicants, bringing the total distribution up to 21,650,660 trees.

The number of inspectors of tree plantations employed on the work was eight. The work done by the inspectors in educating the public and ensuring the success of the plantations is very important. That there has been practically no complaint from the public as to the work of the inspectors, while commendation of their services is not rare, is a tribute to the character of the inspectors and the good judgment with which their work has been done and reflects credit on the whole administration of their division of the Forestry Branch.

The additional half-section near Saskatoon purchased for the purpose of enlarging the nursery was not acquired in sufficient time to permit of any development work being done during the past year. The arrangement for the erection of necessary buildings is being made by the Department of Public Works. The land was kept cultivated last year in order to keep it clear of weeds and in good condition for seeding with nursery stock.

It is becoming more apparent all the time that for the necessary office-work at Indian Head some better accommodation than that now provided should be obtained. A suitable building for this purpose cannot at present be obtained in Indian Head and provision for the erection of such a building should be made.

FOREST RESERVES.

The organization and equipment of the Forest Reserves is the most important part of forest administration, inasmuch as they are the final and permanent form of the forest, and in them the management may be developed on permanent lines towards the perfected system of older lands. The systems of forest management in Europe, in the United States and elsewhere have been and are being studied, so that the methods followed here may be advanced as rapidly as possible. Improvement works of various kinds have been carried out, the regulations for cutting timber have been improved and the supervision has been closer.

Organization.—In order to systematize the administration of the forest reserves, they have been divided into four inspection districts, namely, Manitoba, Saskatchewan, Alberta and the Railway Belt in the province of British Columbia, with a district inspector in charge of each. The work of the district inspector is to lay out, in consultation with the officers directly in charge of the reserves, the organization of the reserves, the works necessary for their protection and improvement, and the appropropriation necessary, and to submit to the Director their recommendations in regard to these and other questions of methods and policy. It is also the inspectors' duty to inspect the books and records in the reserve offices, to check the expenditures so as to ascertain whether the improvement work is being done at reasonable cost, and to make such field inspections as may be necessary to determine that the work is being properly carried out. The working out of improvements in methods of lumbering operation so as to provide for prevention of fire and the reproduction of the crop will also be largely guided by the inspectors. The position of inspector therefore requires high administrative, as well as technical, qualifications.

In charge of each reserve is an officer designated a Forest Supervisor. The supervisor has charge of the rangers and the work on the forest reserve. He lays out the districts for the rangers, directs and supervises their work, plans the improvement works, such as trails, roads, telephone lines, lookout stations, &c., supervises the timber

operations and reports on applications for timber, has charge of timber surveys and fire-fighting. The supervisor requires good administrative ability and should have technical knowledge as well as practical experience.

The forest ranger, having charge of a district in a forest reserve, is in some respects the most important officer on the reserve, as he is charged with the actual carrying out in his own district of the work laid out. He does the cutting of roads and trails, the building of telephone lines, ranger stations and lookout stations, with necessary help at times, patrols for fire, does fire-fighting, cruises timber, supervises timber cutting and generally looks after his district.

The qualifications which a forest ranger should have are the following:—

1. Physical fitness, to be attested by medical certificate.
2. Age, which on appointment should be between 21 and 45.
3. Experience in bush work, including scaling and cruising of timber.
4. The running of a line by compass and determining distance by pacing.
5. The packing of horses in some districts.
6. Reading, writing and arithmetic sufficient to read instructions, write replies to letters and calculate the dues on any of the ordinary permits issued on forest reserves.

Pack-train Leaving the Head-quarters of the Brazeau Forest.

It is not possible at the present time to obtain many men having the full training and qualifications required for the position of ranger, and it is considered that it would be advisable to establish a ranger school for the purpose of giving them the necessary training. In all countries where forest services are established on a permanent basis—Germany, France, Sweden, Russia—such ranger schools are in existence, and the government of the United States found it necessary to establish such a school in connection with its Forest Service. The question may be raised as to whether such schools should not be established in connection with universities or agricultural colleges, but at the present time this is impossible. The colleges at the present time could not obtain the staff with the necessary experience, and it is doubtful if men could be got to attend such schools unless assurance was given that those who took the course would be given first consideration in appointments. A forest-ranger school for the

training of men already on the staff could be carried out on one of the reserves by experienced officers of the staff of the Branch, and the taking of the course successfully should be a requirement before final confirmation of an appointment as permanent.

In the meantime for all appointments of forest rangers the following minimum of qualifications should be required:—

1. Physical fitness.
2. Age between 21 and 45.
3. A reasonable knowledge of bush work.
4. A sufficient knowledge of reading, writing and arithmetic to do the ordinary work of the reserve.

The permanent forest reserve organization consists of the following officers:—

District Inspectors	4
Supervisors	12
Forest Assistants	4
Forest Rangers	46
Total	66

Improvements.—The improvements mentioned below were carried out on the reserves during the year, and the cost given includes the value of the time of the permanent forest rangers taken up on the different works. Practically all maintenance work is done by the rangers. The following is a tabulated statement of these improvements and their cost.

——	No.	Total cost.	Average.
		$ cts.	$ cts.
Rangers' houses	10	10,536 33	1,053 63
" stables	10	1,925 87	192 59
" cabins	15	4,160 40	277 36
Roads.....Miles.	103.75	5,126 24	49 50
Trails—new..... "	175	8,752 85	50 01
Trails—old..... "	191	1,225 14	6 42
Bridges	10	1,210 31	121 03
Fire-guards—			
Cleared.....Miles.	66.2	6,205 86	93 74
Ploughed..... "	101	931 73	9 22
Telephone line..... "	100	9,903 19	99 03

A reduction in average cost should be made on almost all these items when the staff is better trained and more experienced.

The carrying out of such improvements will steadily bring about conditions on the forest reserves that will locate the rangers at most convenient points, make all parts of the reserves accessible and, finally, with proper disposal of the debris from the cutting of trees, make the reserves immune from fire under care of a reasonable patrol.

Timber.—The regulations for the cutting of timber on the forest reserves heretofore established were framed with a view to supplying only the requirements of settlers, but regulations for the supply of a larger demand are now necessary. Small mills, mines, irrigation works, municipal works, schools, churches and other uses must be met, and recommendations for regulations to meet these requirements have been submitted.

The cutting of timber under settlers' permits is large on some of the reserves. For instance, in the Riding Mountain Forest Reserve the quantity of timber cut under settlers' permits was 1,729,759 feet, board measure. It is found rather difficult to control this cutting so as to have the timber taken out economically and to leave the bush in good condition. It was therefore considered advisable to make the experiment of allowing a few small mills to locate on the reserves to cut timber under settlers' permits. Three mills were allowed on the Riding Mountain Forest Reserve last year and were allowed to operate during the past winter. The privilege was subject to the following restrictions in regard to operations:—

1. Stumps shall be cut with saws and must not be cut higher than 18 inches.

2. There shall be taken and cut into lumber from every tree all portions suitable for such purpose, to the satisfaction of the forest officer.

3. The brush and debris shall be lopped and scattered or placed in compact piles for burning to the satisfaction of the forest officer.

4. As little damage as possible shall be done to young growth.

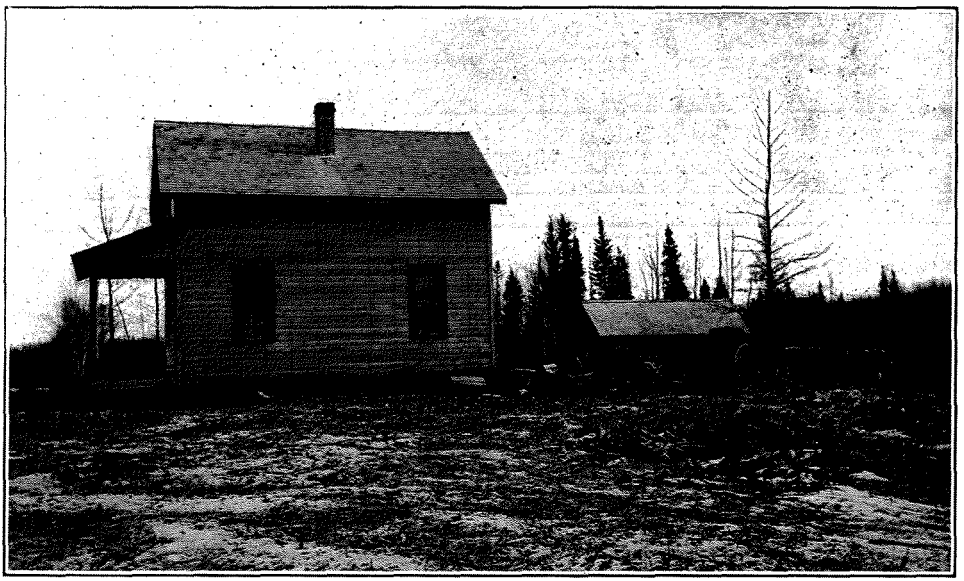


Photo T. W. Dwight.

Ranger Station at Kamsack, Sask. (Duck Mountain Forest Reserve).

Some of the mill-men have tried to get out of following these regulations as much as possible, and in such cases the results have not been satisfactory. In such cases a renewal of the privilege should not be given. Other mill-men have faithfully followed out the requirements above outlined, and in these cases there has been a distinct advance in the character of the operations and in the condition in which the forest is left. The debris has been piled in good order and the danger of fire will thus be greatly decreased. while forest reproduction is encouraged.

Several small sales of timber were made in the Rocky Mountains Forest Reserve, subject to similar restrictions.

While an effort is thus being made to improve operations on new disposals in the forest reserves, the operations on licensed berths in the reserves disposed of prior to the creation of the reserves have not been improved, and, contrary to the spirit and intention of the Forest Reserves Act, however correct it may be according to its letter,

the authority of the forest reserve officers to take any steps in that direction has been taken away. The licenses make provision for such improvement as is necessary by the following sections:

(a) The licensee shall not have the right under his license to cut timber of a less diameter than ten inches at the stump except such as may be actually necessary for the construction of roads and other works to facilitate the taking out of merchantable timber and shall not have the right to cut any trees that may be designated by the proper officer of the Department of the Interior as required to provide a supply of seed for the reproduction of the forest.

(*e*) The licensee shall take from every tree he cuts down all the timber fit for use and manufacture the same into sawn lumber or some such saleable product, and shall dispose of the tops and branches and other debris of lumbering operations in such a way as to prevent as far as possible the danger of fire in accordance with the direction of the proper officers of the Department of the Interior.

(*f*) The licensee shall prevent all unnecessary destruction of growing timber on the part of his men and exercise strict and constant supervision to prevent the starting and spread of fires.

These provisions of the licenses contain all that is necessary to make the operations satisfactory both from the standpoint of prevention of fire and reproduction of the timber. When such requirements are enforced on all other operations on the reserves and the power to enforce them on license berths exists without being put into operation, it is an unfair discrimination against the new and the small operators. Further it results in the best timberlands in the reserves, which are usually those in licensed berths, being left exposed to greater danger of fire and without any effort to control the forest crop that is to follow after the removal of the present one.

TIMBER SURVEYS

The exploration of the public lands to determine those which are non-agricultural and which should be, therefore, included permanently in forest reserves was continued by seven parties.

One party, under charge of Mr. L. C. Tilt, explored the district in southeastern Manitoba from the eastern boundary west to Range 6 east Principal Meridian, and from the international boundary north to Township 20, an area of some 3,500 square miles. The western part of the tract is prairie, which, going eastward, passes into muskeg, with sand ridges occurring in places, and finally reaches the rocky Laurentian area. The timber is jack pine on the sandy ridges, with spruce and tamarack on the lower ground. The sand ridges are not, and will not be, agricultural land, and the muskegs at present are not, but with a good system of drainage the muskegs may be reclaimed and made good agricultural land in time. Consequently, in considering the lands that should be included as a forest reserve, only the sandy ridges were included and a recommendation, which, however, has not yet received approval, is made that a tract of some 260 square miles of such lands should be set apart as a forest reserve.

The edge of the rocky Laurentian area which borders the muskeg to the east and north was not sufficiently defined by the survey to lay down an absolute line for the beginning of the non-agricultural lands, and a further survey will be made for this purpose.

One of the special points brought out in the report is the possibility of a large increase in the area of agricultural lands in the Province of Manitoba by a system of drainage of the muskegs similar to that carried on in the case of lands of the same character in the state of Minnesota, immediately to the south.

Mr. Tilt's report is being published separately.

Photo E. H. Finlayson.

Forest of Aspen (White Poplar), Balsam (Black) Poplar and Ash in Southeastern Manitoba.

Photo L. C. Tilt.

Growth of Open Jack Pine Reproduction, with Mature Timber in the Background, (Southeastern Manitoba).

Another party, under charge of Mr. W. L. Scandrett, examined the district west of the Porcupine Forest Reserve in the province of Saskatchewan. This tract is a most important watershed covering the head-waters of the Assiniboine river, which waters such an extensive district in the provinces of Saskatchewan and Manitoba, and of the Swan and Red Deer rivers, two of the chief tributaries of Lake Winnipegosis. The examination covered only an area along the outer side of the tract which would determine the boundaries of the lands which are best suited for forest purposes, and the inspection will be continued so as to get a fuller knowledge of the interior. Enough information was obained, however, to determine the boundaries of the tract which should be included in a forest reserve. The land is generally covered with spruce, tamarack and poplar, and should be capable of producing good crops of timber. Mr. Scandrett's report is attached.

A third party under Mr. C. H. Morse examined a district north and west of Prince Albert. The tract examined has borne, and a large proportion of it still bears, a good stand of timber, consisting mainly of spruce and jack pine. It forms the present main source of timber for the operations for companies having their sawmills at Prince Albert. It is also the watershed between the Saskatchewan and Churchill rivers, and for that reason in addition is of special need of protection. The character of the timber is such as to indicate that the rate of growth would be a good average. On the recommendation made in the report, which is appended hereto, a temporary reservation of an area of 557 square miles has been made.

A fourth party under Mr. S. H. Clark, whose report is appended hereto, examined lands north and east of Lac LaBiche in Northern Alberta which form the watershed of the Athabaska, Beaver and Pembina rivers. The country was a most difficult one to travel in on account of muskegs and wet land, and the timber growth, consequently, is mostly of small dimensions, as is found to be the case in all poorly drained soils in the north. The muskegs are interspersed with sand ridges upon which jack pine grows. Protection of this district from fire will be required for a long period before the trees will attain timber size, and in the end some scheme for the improvement of the drainage may be necessary.

One party under charge of Mr. H. S. Irwin, and later under Mr. F. B. Robertson, examined the lands in the dry district of the Railway Belt in the province of British Columbia. At the time the reserves in that district were established, no careful examination of the lands had been made and the reserves included only portions of the summit-plateau. The inspections made resulted in recommendations for the inclusion of the broken edges of the mountains previously reserved and of some additional ranges that had not been included in reservations. The proposed additions will include almost all of the absolute forest land in the dry district. No agricultural lands have been included. Grazing lands have been excluded as far as possible, but any such lands that may be within the boundaries will be open to access by the public under regulation.

A party under charge of Mr. H. C. Wallin completed the examination of the lands in the coast district of British Columbia north of the Fraser river up to North Bend. This district includes a large area of land which is suitable only for the growth of timber and which now has a stand of good timber which only requires proper protection and management. The chief timber tree is Douglas fir, though cedar and hemlock are also generally found, besides other less important species. The topography of the district is mountainous and from it there flow a number of streams, some of them navigable, which form very important sources of water-power. A recommendation was made for the establishment of a forest reserve in this district and this would seem to be a locality where such a reserve would be particularly valuable and necessary.

A party under charge of Mr. J. A. Doucet continued the examination of the mountainous or foothill district in Alberta lying south of Lesser Slave lake and

Photo J. A. Doucet.

Young Forest in Athabaska Valley (Grande Prairie Road).

Photo L. C. Tilt.

Young White Spruce Growing on Site of Abandoned Homestead in Southeastern Manitoba.

westward to the Rocky Mountains forest reserve. The survey was begun last year in the vicinity of Lesser Slave lake by Mr. D. R. Cameron, and the report of this work has already been published.

The area examined was some 7,330 square miles and a large proportion of this is rough broken land and considerable elevation, forming the watershed between the Athabaska and Peace River valleys. South of the Athabaska river and west of the McLeod river the land is generally low-lying and of good quality, and again to the north around Grouard, Sturgeon lake and Grande Prairie, but between these two tracts intrudes the area of elevated, broken and poor land described.

The timber on this tract is lodgepole pine, spruce, balsam fir, tamarack, poplar and white birch. There are very few areas of mature timber owing to recurrent fires. Probably eleven per cent of the area has been burned over in the last twenty years. As a rough estimate Mr. Doucet has calculated that the area examined carries 20,009,600 cords of poplar and birch, of which seventeen millions are poplar. The mature spruce and pine timber covers an area of approximately 364 square miles with a production estimated at 2,839,460,000 feet, board measure. A young forest of spruce and pine well on to maturity covers an area of 1,500 square miles and has a stand of 2,672,680,000 feet, board measure, of these species, with some 2,675,000 cords of poplar and birch intermingled. A still younger forest of spruce, pine, poplar and birch covers an area of 2,060 square miles. This younger forest, if properly protected from fire, will mean an immense source of wealth.

A resumé of the area examined is as follows:—

—	Square miles.	M. feet B.M.	Cords.
Mature spruce and pine	364	2,839,460	
Mature poplar	1,362		17,336,000
Young forest (up to 100 years old) of spruce and pine with poplar and birch intermingled	1,500	2,672,680	2,675,600
Forest of pole size (35 to 75 years old)	2,060		
Young reproduction—spruce, pine, poplar, birch	1,408		
Brulé lately burned	740		
Total	7,434	5,512,140	20,011,600

The mature spruce forest is found largely in the Smoky River valley and the trees run from 5 inches in diameter up to 24 inches and even up to 38 inches. The tract of timber on the Smoky river which is already under license is tributary to the settlement at Grande Prairie and the Peace River valley generally, and for the development of that section it is important that the timber should be thoroughly protected from fire.

Mr. Doucet recommends the inclusion of a large area in a forest reserve in order that the timber so potentially valuable may be protected and preserved for the time when the rapid development of the near future will make it of the utmost value. The proposals for protection include the appointment of some ten rangers with defined districts, the improvement of twelve trails now existing, and the extension of eight of them. Fire-lookout stations were also located.

FIRE RANGING.

The inspection of the fire patrol outside of the forest reserves in Manitoba, Saskatchewan and Alberta was placed under the charge of Mr. E. H. Finlayson, who has had considerable experience in fire ranging in Ontario, and is a graduate of the forest school of the University of Toronto. The results of this inspection even so far have fully justified the recommendation I made several years ago that such an inspector should be appointed.

The patrols in the Railway Belt in the province of British Columbia are under the inspection of Mr. D. R. Cameron, Inspector of Forest Reserves.

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

District.	Headquarters.	No. of Rangers.
Southern Manitoba	Winnipeg	9
Northern Manitoba	Norway House	12
Pas	Pas	10
Prince Albert East	Melfort	13
Prince Albert West	Prince Albert	19
Battleford	Battleford	8
Edmonton	Edmonton	59
Great Slave	Fort Smith	9
Mackenzie	Fort Simpson	—
Revelstoke	Revelstoke	16
Salmon Arm	Salmon Arm	21
Coast	New Westminster	26
	Total	202

Fortunately the season was a wet one throughout all the western provinces, except for a short time in the spring, and excepting also the Peace River and Mackenzie districts.

One serious fire occurred in the month of June in the vicinity of Golden. It started beside a logging railway in Timber Berth No. 16, which is owned by the Columbia River Lumber Company, and the almost certain conclusion is that it started from a spark from a logging engine. It would greatly decrease the danger on such railways if oil were used as a fuel, as the grades are steep and the locomotives have to work so hard that they are almost certain to throw sparks even when a wire screen is provided. The fire was noticed immediately by the logging crew and also by the fire-ranger, but owing to the debris from the right of way of the road it got such headway that it was soon out of control. Driven by a strong wind it swept toward the town of Golden, and, although it was on the opposite side of the river, only a fortunate change of wind prevented a serious disaster. The timber burned in this fire was several million feet, board measure, and, although a great deal of it will be taken out, it means that the lumber company will have to carry on much more extended operations, whether the market will warrant it or not, and it means a heavy lost in immature timber which in a few years would have been of great value. When in British Columbia I visited the scene of the fire and was pleased to find that full credit was given to the fire-ranging staff for having done everything possible to meet the emergency. It accentuates, however, the necessity for a closer patrol of the districts, a better equipment for reaching fires, but more especially the use of some better fuel for logging locomotives, and the clearing of the debris from railway rights of way and lumbering operations.

It was reported by Mr. G. O. Card, government agent at Fort Simpson, that there were fires along the Mackenzie river last year which did considerable damage, but details were not given. Mr. Card is in charge of the protective service in the Mackenzie district, but has not outlined an organization for its protection. A steamer which was built in the year 1911 will, it is expected, be placed on the Mackenzie river this season so as to be available for patrol and for taking men to fight fire when necessary.

FIRE PATROLS ON RAILWAYS.

The fire patrols along the railways were carried out by the Department for the first portion of the season, but later, under the legislation amending the Railway Act and under the regulations of the Dominion Board of Railway Commissioners, the railways were required to furnish the patrols under the inspection of the Board of Railway Commissioners and of the Department. The inspectors of fire ranging for this Branch were made officers of the Board and in conjunction with the chief inspector for the Board, after consultation with the railway companies, laid down the patrols that would be required. The inspection by the Department also covers the equipment of the locomotives and the clearing of the right of way of combustible material. Steps are being taken to organize this work thoroughly for the season of 1913, and it is hoped that it will result in efficient protection, even though the season may not be as favourable as that of the past year.

FOREST PRODUCTS LABORATORY.

The question of the establishment of a Forest Products Laboratory has been further considered during the past year, and, as the proposal has been favourably considered by the minister and yourself, it is expected that arrangements for establishing such a laboratory will be carried out during the coming year. Resolutions favouring such a laboratory were submitted by the Canadian Forestry Association and the Canadian Pulp and Paper Association.

The lines of investigation which such a laboratory could undertake and which would be of great value to the industries using forest products in Canada would be as follows:—

1. Timber Physics, which is the study of the physical and structural properties of wood and methods of seasoning and handling. It would also include a microscopic study of the structure of wood and the identification of species.

2. Timber Tests, which include studies of strength, stiffness, hardness and other mechanical properties of woods. This information will be very important where Canadian woods are used in construction or come into competition with foreign woods.

3. Wood preservation, which includes studies of methods of prolonging the life of woods, thus helping to decrease the drain on the forests. Railway ties, construction timbers, paving blocks and many other demands for the use of wood may be better and more economically supplied as a result of such investigations.

4. Wood Distillation: To determine what products can be obtained most economically by distillation from the different species of wood. Alcohol, turpentine, wood creosote and acetates are some of these products.

5. Pulp and paper, which will cover investigations of the fibres of the different species of trees in Canada and their suitability for pulp and paper making, the methods of manufacture employed and the chemical agents used, with a view to fuller use and elimination of waste.

Other lines of investigation will no doubt open up as the work develops, but it is quite clear from the above statement that such a laboratory would have a wide and useful field of operations.

REINDEER.

The reindeer herd, as reported last year, did not reach Fort Smith in the fall of 1911, but wintered some ninety miles south of that point near Fort Chipewyan. There was a plentiful supply of feed for the deer at this point and they wintered very satisfactorily and were in good condition when the spring opened, at which time they numbered thirty-two. One strayed away in April, leaving the herd numbering thirty-one. There was no natural increase.

During the winter Mr. Nathaniel Gear, the chief herder, visited Fort Smith and located, in company with Mr. A. J. Bell, Government Agent, a place for the deer. This is at Whitefish Lake, about twenty-five miles northeast of Fort Smith, and is where the timber begins to thin out to the barren lands. During the winter two small houses for the herders were erected at this point.

In May the herd were moved to Fort Smith in three scows in tow of the government steamboat *Rey,* arriving on May 20. They immediately started for Whitefish Lake, where they arrived without mishap.

In order to insure as fully as possible the holding of the deer a fence was erected to enclose, for pasture, two square miles of a promontory jutting into the lake, as it was feared that there would be trouble keeping control of the herd when the flies became bad. In June, however, the flies (bulldogs) became so troublesome that the herd ran wild, broke through all barriers and scattered. Every effort was made to collect the herd, but only twelve, all does, have been recaptured. It is exceedingly unfortunate that this should have happened, but I am informed through other sources that the flies were specially bad during the past season and that in the scrub country where the deer scattered it was a wonder that any of them were recaptured.

As the location at Whitefish Lake was now found to be unsuitable for summer range, though well adapted for winter range, Mr. Bell and Mr. Gear made an inspection in September of islands in Great Slave Lake to endeavour to select a suitable place on which to establish a permanent grazing ground for the reindeer herd. The island selected as most suitable is known as Hardisty Island. It is situated about six miles from the north shore of the lake upon the west side of the north arm, which is due north of Fort Resolution sixty miles and south of Fort Rae a similar distance. This island has an area of about six square miles and there is a similar one adjoining it, of an area of about three square miles. There is moss in abundance on both islands and it would be suitable for a herd of 200 reindeer for the next five years. Driftwood is abundant on the shores, and would be sufficient for fuel and building purposes. A sailboat would keep the herders in touch with Fort Resolution, Hay River and Fort Rae during the summer and the first-named post could be reached in one day with reindeer in winter.

Another stampede of the deer occurred in November, and after the round up it was found that one was missing, leaving only eleven.

If the deer pass through the present summer successfully at Hardisty Island in Great Slave lake, so that it is demonstrated that they can be held there satisfactorily, it would be necessary to make an addition to the herd to ensure their permanent establishment and increase. The partial failure of the shipment does not argue anything against the final success of the experiment or the usefulness of the herd. In the first shipment to Alaska made by the government of the United States the loss was much heavier, and the herds there are now one of the greatest sources of wealth of that country.

WOOD BISON.

The patrol of the district in which the herd of wood bison are located was continued by Messrs. G. A. Mulloy and P. McCallum. Several bison were sighted and tracks of larger numbers were seen, but no sufficient data to determine definitely the number in the herd were obtained. The number is estimated between 200 and 300. No wolves were captured, nor was there sufficient evidence to show that they were making any serious depredations on the herd. Copies of Mr. Mulloy's reports are attached.

Respectfully submitted.

R. H. CAMPBELL,
Director of Forestry.

DOMINION LANDS REVENUE—FORESTRY BRANCH, 1912-13.

Reserve.	Timber permit Fees Dues and Rental.	Seizures.	Hay Permits	Grazing	Rental.	Trees.	Oats.	Building Permit.	Irrigation.	Total.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
Beaver Hills	46 00	62 65	4 50							113 15
Cypress Hills	209 65	24 33	187 20							421 18
Duck Mountain	1,827 89	60 55	22 00							1,910 44
Moose Mountain	21 25		77 50							98 75
Nisbet			2 00							2 00
Pines	212 75		9 10							221 85
Riding Mountain	3,015 56	1,301 20	113 40							4,430 16
Rocky Mountain	7,547 61	6,505 25	111 70		81 93			10 00		14,256 52
Spruce Woods	46 50		37 50		30 00					114 00
Turtle Mountain	154 75		117 10	92 75						364 60
British Col. Reserves	0 75		12 00		124 60					137 35
Indian Head Nursery						561 12	345 65			906 77
Land Offices										
Lethbridge									270 85	270 85
Calgary									2,961 12	22,961 12
Medicine Hat									3,712 50	3,712 50
Swift Current									534 10	534 10
Moosejaw									286 25	286 25
Maple Creek									173 17	173 17
Calgary									24,693 59	24,693 59
Irrigation Office									862 00	862 00
Totals	13,082 71	7,953 98	694 00	92 75	236 56	561 12	345 65	10 00	33,493 58	56,470 35

Timber Permits issued, 1912-13.

Reserve.	No. Permits.	Building Logs.	Roof Poles.	Fence Rails.	Fence Posts.	Lumber.	Ties.	Mine Props.	Fuel.	Dues.	Agency.
		Lin ft.				Ft. B. M.		Lin. Ft.	Cords.	$ cts.	
Beaver Hills	10	3,460				103,151			1,156	46 00	Yorkton.
Moose Mountain	16								156	21 25	Estevan. Regina.
Cypress Hills	321	576,465	86,700	106,600	103,995				3,582	113 28	Medicine Hat.
The Pines	53	34,245	2,600	10,000	4,100				1,150	203 80	Prince Albert.
Cooking Lake	4	200	700	3,800	420	14,25			10	1 00	Edmonton.
Spruce Woods	36	1,000							666	34 25	Brandon.
Turtle Mountain	214	1,400				33,200			4,692	128 75	Brandon.
Riding Mountain	424	23,212	550	2,300	12,205	1,358,263			3,354	2,176 70	Dauphin.
Duck Mountain	248	14,638	2,550	11,900	15,818	812,349			1,126	1,217 37	Dauphin.
Rocky Mountain	203	161,323	26,685	31,930	28,714	1,014,250	60,000	40,250	1,993	1,108 65	Edmonton. Red Deer. Calgary. Lethbridge.
British Columbia Reserves	3	4,400								0 75	Kamloops.
Totals	1,622	820,343	119,785	166,530	165,252	3,335,463	60,000	40,250	17,885	5,051 80	

HAY PERMITS ISSUED, 1912-13.

Reserve.	No. of Permits.	Quantity cut.	Revenue.
		Tons.	$ cts.
Beaver Hills	3	30	4 50
Cypress Hills	24	636	75 70
Duck Mountain	15	145	22 00
Moose Mountain	24	635	70 00
Nisbet	1	3	2 00
Pines	6	66	9 10
Riding Mountain	52	1,039	111 40
Rocky Mountain	22	650	60 45
Spruce Woods	7	109	18 00
Turtle Mountain	2	45	5 50
British Columbia Reserves	3	60	7 50
Total	159	3,418	386 15

STATEMENT showing the quantity of Timber and Revenue received during the Fiscal year ending March 31, 1913, on License Timber Berths within Dominion Forest Reserves.

MANITOBA.

Reserve.	Berths.	Area.	Quantity Cut.		Revenue.		
			Lumber.	Logs Cut.	Royalty.	Rent.	Total Revenue.
		Sq. M.	Ft. B. M.	Logs.	$ cts.	$ cts.	$ cts.
Riding Mountain	6	64.00	500,000	47,575	87 13	320 00	407 13
Duck Mountain	11	110.78	.....	83,825	.....	553 94	553 94
	17	174.78	500,000	131,400	87 13	873 94	961 07

ALBERTA.

Rocky Mountain	30	732.61	13,063,319	16,608 fence-posts 1,483,200 laths. 40,739 ry. ties. 14,960 lineal feet piling 81,663 logs 59½ cords cordwood.	6,231 26	3,667 26	9,898 52

BRITISH COLUMBIA.

Total for Dominion Forest Reserves	Pt. 1 berth	38.50 945.89	 13,563,319	....	..... 6,318 39	192 50 4,733 70	192 50 11,052 09

License Berths in Manitoba Forest Reserves.

		Duck Mountain Reserve.				
		Quantity Cut.			Revenue.	
No. of Berth.	Area.	Lumber.	Logs.	Other Products.	Royalty.	Rent.
	Sq. Mi.	Feet B. M.			$ cts.	$ cts.
14	3.30					16 50
15	4.53					22 65
23	6.67					33 35
25	2.49					12 45
25a	10.81					54 05
26a	5.16					25 84
48	4.50					22 50
Pt. 571a		(See Riding Mountain all included in Riding Mountain)				
742	6.24					31 20
986	50.00		60,000			250 00
1,089	2.25					11 25
1,120	14.83		23,825			74 15
	116.78		83,825			553 94
551d	18.00					90 00
571	4.75					23 75
Pt. 571a	23.25		36,175			116 25
575	18.00	500,000	11,400		87 13	90 00
	64.00	500,000	47,575		87 13	320 00

License Berths in Alberta Forest Reserves.

		Rocky Mountains Forest Reserve.				
		Quantity.			Revenue.	
No. of Berth.	Area.	Lumber.	Logs.	Other Products.	Royalty.	Rent.
	Sq. Mi.	Feet B. M.			$ cts.	$ cts.
36	45.33			475 lin. ft. dry mining timber		225 85
36a	47.92	3,676,415	32,434	59⅓ cords of cordwood	2,104 61	239 60
80	47.34					236 70
179	44.68					223 40
253	11.17	2,624,438	45,980	1,444,150 laths	1,491 78	55 85
292	20.58					102 90
569	21.33	46,297*	3,249			106 66
579	33.31				55 49	166 55
594	6.13					30 65
606	3.00					15 00
Permit 1,098	37.45					187 25
1,099	45.20			40,739 ry. ties 14,960 lin. ft. piling	795 86	226 00
1,154	17.34					86 70

License Berths in Alberta Forest Reserves—Continued.

		Rocky Mountains Forest Reserve.				
		Quantity.			Revenue.	
No. of Berth.	Area.	Lumber.	Logs.	Other products.	Royalty.	Rent.
	Sq. Mi.	Feet B. M.			$ cts	$ cts.
1,115	17.25					86 25
1,118	88.95					444 75
1,122	82.17					410 85
1,124	1.70			108 fence-posts	185 07	8 50
1,157	6.93	368,459				34 65
Rocky Mountain Park						
1,219	40.61					203 05
1,246	3.50					17 50
1,292	10.31	5,853,396*		13,143 fence-posts.. 379,050 laths.....	1,190 81	56 55
1,302	7.07					35 35
1,327	6.91					34 55
1,384	8.23	494,324		3,357 fence-posts..	408 27	41 15
1,393	10.24					51 20
1,412	23.02					115 10
1,413	21.50					107 50
1,414	7.50					37 50
1,415	6.68					33 40
1,429	9.26					46 30
	732.61	13,063,329	81,663	†	6,231 26	3,667 26

*Fire-killed timber; of the total of 13,063,319 feet, board measure, 5,899,693 feet were fire-killed.
†The total of other products comprises 1,823,200 laths, 40,739 railway ties, 14,960 feetlineal of piling, 16,608 fence-posts and 59⅓ cords and cordwood.

License Berths in British Columbia Forest Reserves.

Pt. 420	38.50					192 50

Photo N. M. Ross.

General View of Buildings at Indian Head Forest Nursery Station.

Photo N. M. Ross.

Russian Poplar Test Plantation, Indian Head Forest Nursery Station.

APPENDIX No. 1.

REPORT OF THE CHIEF OF THE TREE-PLANTING DIVISION.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
INDIAN HEAD, SASK., March 31, 1913.

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

SIR,—I have the honour to submit herewith my 13th annual report, dating from March 31, 1912.

General conditions throughout the prairie provinces affecting tree growth have during the past season again been very favourable. In most sections there has been an abundance of rainfall, rather above the normal, and all reports relative to the growth of farm plantations are most encouraging. Beyond this there is nothing of particular importance to note in regard to the general progress of the outside tree-planting work. The interest in tree-planting and home beautifying is continuing to increase throughout the West as indicated by the establishment of new nurseries, the comparatively large appropriations now being set aside by the larger towns and cities for park work, and especially by the Canadian Pacific Railway Company for planting on their own property, and also to supply stock to farmers residing on land purchased from the company.

INSPECTION WORK.

Two new inspectors were engaged for the summer season, namely, Messrs. B. R. Morton and Wm. Kynoch, both of the Faculty of Forestry of the University of Toronto. Mr. J. N. B. McDonald, who had been on the staff for a number of years, resigned early in the spring to take up commercial nursery work in Alberta.

The following tables give, in summary form, (1) the districts covered in 1912 by each inspector, together with details of the distribution, and (2) a classification of the applicants on the 1913 list:—

TABLE 1.

INSPECTORS' DISTRICTS AND DETAILS OF ALLOTMENT OF TREES

Inspector.	District.	Number of men on list.	Number of trees received.	Number of trees allotted.	Average number of trees per applicant.
W. Guiton.....	Main line C. P. R., Fleming to Maple Creek.....	1,042	524	464,102	885
A. P. Stevenson.	All railway lines in Manitoba.....	663	314	269,375	857
A. Mackintosh..	Eastern Sask. G.T.R., Yorkton Branch, Pheasant Hills Branch C.P.R.....	694	192	205,975	1,072
W. MacDonald..	Southeastern Sask. Soo line, &c....	904	468	456,100	974
James Kay.....	Pheasant Hills Branch (west of Saskatoon) G. T. R. Goose Lake Branch.....	1,064	530	580,650	1,095
G. Kennedy....	Regina Branch C.N.R., main line				
	C.N.R. Sask. Outlook Branch....	1,017	487	508,000	1,043
J. Cowie.....	Southern Alberta, North to main line, C.P.R	885	445	440,300	989
B. Morton	Railway lines Northwestern Alberta	710	261	287,600	1,101
W. Kynoch....	Railway lines Northern Alberta ...	638	298	237,850	798
	Totals	7,617	3,519	3,449,952	average 980

NOTE.—Above figures will be somewhat altered on account of supplementary forms to be added to shipping list.

TABLE 2.

TABLE OF CLASSIFICATION FOR 1913 DISTRIBUTION.

Class.	Number.
A—1. Number of applicants on inspection list	7,617
2. " " who have received trees	4,820
3. " " " not "	2,797
B—1. Number of applicants receiving trees in 1913	3,519
2. Old " " "	2,105
3. New " " "	1,414
C—1. Number of applicants not receiving trees	4,098
2. Old " " "	2,715
3. New " " "	1,383

NOTE.—There will be a slight alteration of the above figures before the 1913 shipping list is completed, on account of supplementary forms not yet received.

It will be noticed that about fifty per cent of the applicants on the inspectors' lists are not to receive trees, that is, of a total of 7,617, only 3,519 are to be supplied this spring. Of the remaining 4,098, 2,715 are men who have received trees from us for two or more years in succession and are not now entitled to further supplies as long as the demand from new applicants is so great. To 1,383 new applicants trees were not granted for various reasons, the chief being lack of proper preparation or the fact of their ground not being arranged suitably in relation to buildings.

District inspected by W. B. Guiton.—1912 plantations are reported in good condition, 96 per cent of cuttings and 85 per cent seedlings living. A few failures due to neglect were found chiefly in the newer districts west of Moosejaw. No winter-killing in this district. Plantations set previous to 1911 have made sufficient growth, so that cultivation is no longer necessary.

District covered by Angus Mackintosh.—1912 plantations in good condition. Failures chiefly in cuttings, probably about 30 per cent loss. Older plantations have made splendid growth, some being now 14 to 20 feet high. In some few cases (about 20) plantations have failed. In practically all these cases farms have changed hands and the new owners neglected the trees. Such evergreens as were seen, planted 1912, were doing splendidly. Season was very favourable for tree growth.

District covered by Wm. Macdonald.—1912 plantations in splendid condition. Loss of trees about 10 per cent. Plantations of 1911 and 1910 in good growing condition. In a few cases plantations on very heavy soil had been retarded by too much moisture. In cases where plantations are now well grown farmers are taking cuttings and seed to extend their plantings. Evergreens planted 1912 very good, practically no failures.

District covered by James Kay.—1912 plantations fair, lack of knowledge main causes for failure. Ninety-five per cent of trees living, 1911 plantations and previous ones suffered more or less from frost during fall and spring of 1910 and 1911. Extremely hot in June, but more than normal rainfall during rest of season. Some plantations set back by hail in 1911.

District covered by Geo. Kennedy.—1912 plantations good, 95 per cent living, largest per cent of failures in cottonwood seedlings. Plantations of 1911 in good condition, average height 5 feet. Plantings of 1910 and earlier average 15 to 17 feet.

Ash in the older plantations is now growing vigorously. June very hot but no bad effects noticed. Some extensions to plantations in this district have been made from cuttings taken from the older trees.

District covered by Jas. Cowie.—Latter part of June very hot, but no bad effects noticed except where preparation had been indifferent or where there had been lack of cultivation after planting. Planting of 1911 made good growth and wintered well except along Calgary line, Canadian Pacific Railway, where instances of maple, cottonwood and willow killing back were noticed, 1910 and previous plantations showing up well. Greatest loss from winter-killing between Calgary and Cochrane. All evergreens of 1912 planting were most successful.

District covered by Wm. Kynoch.—1912 plantations on the whole in good condition, no serious damage from dry hot spell in latter part of June, cottonwoods suffering most. Eighty-five per cent of trees in 1911 plantations growing well. Plantings of 1910 suffered badly from severe drought in that season, clearly showing importance of thorough preparation. All previous plantations in good shape, except a few which had been neglected. Ninety-five per cent of evergreens planted 1912 living and doing well. This class of stock is very much appreciated.

District covered by B. R. Morton.—Ninety-five per cent of 1912 trees growing. All older plantations in good condition. Some failures in cuttings, due principally to shallow planting. In few cases cuttings were destroyed by cutworm, especially noticed when planting was done on old garden ground. Some damage from frost noticed in all Alberta plantations, but nowhere serious except in the vicinity of Gleichen, where large cottonwoods had been killed outright, possibly due partly to late cultivation in summer and too much irrigation during late growing season. There seems to be a tendency to stop cultivation just a little too soon, that is before the older plantations are in condition to be left alone. As a consequence grass and weeds get a foothold and retard the growth of the trees.

OFFICE WORK.

	April 1st, 1911, to March 31st, 1912.	April 1st, 1912 to March 31st, 1913.
No. planting plans prepared	3,004	3,000.
No. pieces mail received	12,249	14,161 (includes 3,000.
No. pieces mail sent out	20,382	21,466 (plans franked).
No. new files added	2,696	2,943.

Note—This does not include bulletins, these being sent out from the office at Ottawa.

EXHIBITS.

The usual exhibits were prepared for the summer fairs at Calgary and Brandon, and as in past seasons these proved to be of considerable interest to a very large number of the visitors.

LECTURES.

Mr. A. P. Stevenson addressed a number of meetings in Saskatchewan during the latter part of November and December. These meetings are held throughout the province in connection with the extension work of the Provincial College of Agriculture.

NURSERY WORK.

For actual nursery work the past season proved to be one of the best we have yet experienced. The growth of all stock was particularly strong and germination of seed good, resulting in very even stands. No trouble was encountered this spring from late frosts which so frequently injure many of the young seedlings just at their tenderest stage.

Owing to the unusually early freeze-up in the fall of 1911 practically no seed was sown that fall. Ash seed was put in as early as possible last spring, about April 7, and fortunately germinated very well, but the seedlings did not reach as large a size as usual when the seed is sown in the fall.

The following areas were devoted to the different kinds of trees:—

Broad-leaved—		
Maple, 1 year	21 acres.	
Ash, 2 year	20 acres.	
Ash, 1 year	21 acres.	
Caragana, 1 year	3 acres.	
Willow, cutting stock	5 acres.	
Russian Poplar, cutting stock	2 acres.	
		72 acres.
Coniferous—		
Transplants	7 acres.	
Seed-beds	1 acre.	
		8 acres.
Total under nursery crops		80 acres.

The following quantities of stock are available for distribution this spring:—

Manitoba Maple, 1 year	1,363,500	
Green Ash, 2 years	1,613,750	
Russian Poplar Cuttings	293,250	
Red Willow Cuttings	291,625	
Acute-leaf Willow Cuttings	394,000	
Caragana, 1 year seedlings	119,375	
Norway Poplar Cuttings	6,000	
		4,081,500

Conifers for distribution or permanent planting:—

White Spruce, 5 years, transp.	14,678	
Lodgepole Pine, 4 years, transp.	31,389	
Jack Pine, 4 years, transp.	21,478	
Scotch Pine, 4 years, transp.	1,735	
Pinus Mughus, 4 years, transp.	60	
" ponderosa, 4 years, transp.	68	
" flexilis, 5 years, transp.	265	
Colorado Spruce, 5 years, transp.	1,573	
Norway Spruce *var. septentrionalis* 6 years, transp.	1,300	
Siberian Larch, 4 years, transp.	514	
Balsam Fir, 7 years, transp.	306	
		73,366
		4,154,866

A considerable quantity of this stock will be required for permanent planting on the Indian Head nursery and also for setting out on the new nursery station near Saskatoon.

COLLECTION OF SEED.

The past was not a particularly good seed-year for any varieties, elm and tamarack being practically unprocurable, while Manitoba maple was a very light crop. Green ash produced a fair crop. The following seed was collected:—

Broad-leaved—

Manitoba Maple, in Qu'Appelle Valley, near Indian Head	60½	2 bus. bags.
At Portage la Prairie	3	"
Near Medicine Hat	5	"
At Brandon	2	"
Total	70½	"
Green Ash, in Qu'Appelle Valley, near Indian Head.	98	"
Caragana, on Nursery Station	585	lbs.
Lodgepole Pine, from Morley, Alta.	24½	"
Jack Pine	18½	"
Bull Pine, near Kamloops, B.C.	18½	"
White Spruce, Manitoba	18	"
Western Larch, near Cranbrook, B.C.	3	"

CONIFERS.

Seed-Beds.—Four thousand square feet of seed-beds were sown to Scotch Pine, Lodgepole Pine, Jack Pine, White Spruce and Tamarack. The seed-beds of 1911 show a good growth and a fine stand in almost all cases.

Transplants.—The following seedlings were moved last spring from the seed-beds to transplant rows:—

Scotch pine, 2-year seedlings	28,036
Lodgepole pine, 2-year seedlings	54,396
Jack pine, 2-year seedlings	21,384
White spruce, 3-year seedlings	154,867
Tamarack	53,464
Siberian larch, 2-year seedlings	4,000
Total	316,147

EVERGREEN DISTRIBUTION.

As stated in my last report a distribution of a limited number of evergreens was made last spring. Altogether we dug about 100,700 four and five year transplants of pine and spruce. The greater number of these were shipped out in consignments varying from 100 to 500 plants. Inquiries were made, during the latter part of the season, from all those who received these trees and from the reports returned the results of the first planting have been extremely successful. In the majority of cases the applicants report a loss of only from one to three per cent, and in no case has a loss of over five per cent been reported. Such a showing speaks well for the care which the planters must have bestowed on the handling of this stock and indicates that the farmers fully appreciate the value of the conifers.

Two hundred and fifty-three shipments were sent out; 25 of these went to Alberta, 158 to Saskatchewan and 20 to Manitoba.

This distribution will be continued again this spring, and it is hoped that equally good results will be secured.

PERMANENT PLANTATIONS.

The established permanent plantations continue to make good progress; already some of the earlier plantings of the quicker-growing varieties, such as Russian poplar and cottonwood, clearly show the feasibility of the prairie farmer growing his own fuel in a very short time if he so desires. After seven season's growth on the nursery a very fair quantity and quality of fuel could be cut out of the poplar and cottonwood plantations. The cottonwood, however, on the nursery has clearly shown the unsuitability for planting in pure stands. The growth is far too open and permits of too rank growth of weeds and grass. When planted in equal mixture with maple, however, the results are excellent.

The older plantings of conifers are now showing more noticeable results—particularly the tamarack and Scotch pine. Some small plantings of Siberian larch have been most successful, and indicate that this variety may prove of considerable value for prairie planting.

Some eight and one-half acres were added to the permanent plantings this spring, viz.:—

Siberian larch and Maple	2¼ acres.
Jack pine and Caragana	1¾ "
Lodgepole pine and Caragana	¾ "
White spruce and Caragana	1¼ "
Norway spruce (*Picea excelsa septentrionalis*) and maple	1 "
Norway poplar and maple	1½ "

ORNAMENTAL GROUNDS.

The hardy shrubs and herbaceous perennials made a good showing during the season, the lilac being particularly fine in the early summer. The annuals, as usual, provided an abundance of bloom, adding to the attractiveness of the grounds in the neighbourhood of the buildings.

GENERAL FARM WORK.

No new ground was broken up this season, as it was not practicable to handle a larger area than at present under cultivation with the available labour. As usual the necessary feed—oats and hay—was raised on the nursery, and some 55 acres summer-fallowed, besides the ploughing and cultivating required in the plantations and nursery plots.

NEW BOARDING HOUSE.

A new boarding house was erected and will be ready for occupation early this spring. This will give us accommodation for from ten to twelve additional men, which has been very badly needed during the past two seasons.

Respectfully submitted,

NORMAN N. ROSS,
Chief of Tree Planting Division.

Photo N. M. Ross.

Sample Plot of Siberian Larch (planted 1908) Indian Head Forest Nursery Station.

Photo N. M. Ross.

Sample Plot of Jack Pine (planted 1908) Indian Head Forest Nursery Station.

APPENDIX No. 2.

REPORT OF DISTRICT INSPECTOR OF FOREST RESERVES FOR ALBERTA.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
CALGARY, March 31, 1913.

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

SIR,—I have the honour to submit herewith my first annual report as district inspector of Dominion Forest Reserves for the Province of Alberta.

NAMES AND AREAS OF ADMINISTRATIVE UNITS.

There are three forest reserves in the Alberta inspection district, divided into seven administrative units. The names of these divisions, with the headquarters and area of each, are shown in the following table:—

TABLE 1.

ADMINISTRATIVE DIVISIONS OF THE FOREST RESERVES IN ALBERTA.

Forest.	Headquarters.	Acres.
Crowsnest	Pincher Creek, Alta	856,960
Bow River	Calgary, Alberta	1,998,360
Clearwater	Rocky Mountain House, Alberta.	2,460,800
Brazeau	Coal Spur, Alberta	2,506,880
Athabaska	Coal Spur "	1,696,640
Cooking Lake	Calgary, "	17,360
Cypress Hills	Calgary, "	99,840
	Total	9,690,840

In addition to this area a total of 1,690,080 acres of proposed extensions of the forest reserves in the district are also covered by the forest rangers, and are being administered in co-operation with the Dominion Land Office pending final action by Parliament on the recommendations.

These extensions are as follows:—

TABLE 2.

PROPOSED ADDITIONS TO DOMINION FOREST RESERVES IN THE ALBERTA INSPECTION DISTRICT.

Forest.	Area of Proposed Addition.
	Acres.
Crowsnest	126,560
Clearwater	228,480
Brazeau	580,480
Athabaska	754,560
Total	1,690,080

It is further proposed to make very large additions to the forest reserve area north of the Athabaska river, extending from the Lesser Slave lake to the Rocky Mountains and including a strip of rough, mountainous or hilly country which separates the agricultural region south of the Athabaska river from the agricultural region of the Peace River country. The examinations of this land are not yet completed and none of it is as yet under administration.

PERSONNEL.

There were employed during the year in the district office, in addition to the inspector, an accountant and one stenographer. On the reserves there was a total of 164 employees. The grades and total salaries of these employees are shown in the following table:—

TABLE 3.

TABLE OF EMPLOYEES ON RESERVES.

Title.	Number.	Salary.
		$ cts.
Supervisors	11	6,150 64
Forest Assistants	5	2,073 10
Forest Rangers	56	31,939 81
Clerks	6	1,728 12
Labourers	86	8,421 62
Total salaries		50,313 29

It should be noted, however, that during the course of the year there were numerous changes in the force, largely through resignations. Of the supervisors, five resigned and one was transferred. Four of the men who resigned accepted positions with the British Columbia Government and one went into private work. The maximum number of supervisors employed at any one time was four. Of the forest assistants, one resigned and two were promoted to supervisory positions. The maximum number of forest assistants employed at any time was three. Of the clerks two resigned. The maximum number of clerks employed at any one time time was three. Of the fifty-six forest rangers employed, twenty-four were employed for periods greater than nine months and thirty-two for periods of less than nine months.. The temporary labourers were practically all employed for periods of less than three months.

The total expenditure on the various forest reserves in the Alberta inspection district is shown in the table below. In this table the expenditure is also classified under the seven major accounts into which forest reserve expenditures were divided during the past fiscal year.

TABLE 4.

DISBURSEMENTS ON THE FOREST RESERVES OF THE ALBERTA INSPECTION DISTRICT.

Name of Forest or Office.	Salaries.	Expenses, Supplies, &c.	Buildings.	Telephones.	Trails and FireLines.	Fires.	Total expended.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Alberta Inspection Office	4,518 38	2,919 93	.....	.....	.....	.....	7,438 31
Athabaska	1,950 31	543 03	.....	.....	.....	.....	2,493 34
Clearwater	5,749 99	2,317 37	941 40	.....	2,862 47	.....	11,871 23
Crowsnest	10,659 49	2,469 91	1,630 63	5,156 89	1,768 55	58 95	21,744 42
Cypress Hills	3,284 39	486 45	15 90	.....	320 51	.....	4,107 25
Brazeau	9,240 26	2,983 47	1,519 00	642 37	1,985 27	.....	16,370 37
Bow River	11,377 53	2,505 54	2,595 36	122 65	1,368 75	.....	17,969 83
Cooking Lake	749 82	14 00	.....	.....	.....	.....	763 82
Grand totals	47,530 17	14,239 70	6,702 29	5,921 91	8,305 55	58 95	82,758 57

NOTE.—No expenditures were made on Account No. 6—Nurseries.

It is almost platitudinous to say that the success of any administrative organization depends primarily on the character of its personnel. The great fundamental problem in all organizations having a number of employees is the improvement of the standard of these employees. One need only recall the revolution which the efficiency expert has produced in modern industrial plants, the training school for employees maintained by so many of the more complex manufacturing and distributing industries, such as department stores or electrical supply factories, or the naval and military service schools which train the men to greater efficiency in their duties, to realize that everywhere, in all branches of industry, the need of special training is realized and active steps are being taken to provide it. In the work of forest protection and administration this need is in no degree less urgent. In European countries such as Germany, France and Switzerland, employees in the governmental forest services are required to undergo a long and painstaking course of training and to serve an apprenticeship extending over years. In the British India forest service men are trained for rangers and higher positions at the forest academy established and maintained since 1878 by the Imperial Government at Dehra Dun, where instruction is given both in English and in the vernacular. In the United States all employees of the service below the grade of Associate United States Forester are required to pass a rigid practical examination to qualify for employment and are then employed only in subordinate positions on probation and are required to demonstrate their fitness for permanent employment before being accepted by the service. Higher positions are filled only by promotion from lower grades, and promotion and increase in salary are given for merit alone. In Canada the fact that forest employees require any special qualifications or training has scarcely yet been realized. It might be well to call attention to the variety of employees in the service of the branch in this district alone. These include twelve distinct classes, as follows:—Forest Supervisors, Forest Assistants, Forest Rangers, Fire Guardians, Surveyors, Book-keepers, Stenographers, Carpenters, Cooks, Packers, Teamsters and Labourers. The qualifications for a cook, a surveyor, a stenographer or a carpenter are fairly well defined and can be readily appreciated by anyone. So also the forest assistant must have a technical training in forestry which involves a college course in the science as a general rule. But when we come to the forest ranger no such special requirements are realized. There is an almost total failure to appreciate that the work of a forest ranger is a highly specialized employment calling for a physical and mental equipment and training no less susceptible of

exact definition than is the profession of the surveyors, the cook or the book-keeper. Present-day methods of fire protection for standing timber are as much advanced over the methods of twenty years back as is the modern motor fire-truck an improvement over a bucket brigade. In similar measure have the requirements for the position of forest ranger advanced, although this has not been generally realized. No longer in those countries where forest fire protection has been developed along modern scientific and practical lines, is the forest ranger handed an axe and a badge and told to go out into the woods and prevent fires, any more than is the modern soldier given a war-club and told to go out and fight the enemy. The present-day ranger is a unit in a highly perfected organization. Fires are located for him by lookouts stationed on peaks selected with all the care of a topographer choosing triangulation stations, and equipped with range-finder, telescope, compass, maps and telephone. He receives his call to action by telephone, telegraph, wireless or heliograph. Instead of rushing out coatless and hatless to wage a single-handed fight with whatever tool is handiest, he considers his carefully drawn fire-plan, notes on his topographic map the lie of the land at the fire; decides upon the forces necessary for its control and the quickest way to get them on the ground, and then by means of his telephone he sends to that fire enough men and horses fully equipped with tools and provisions to smother it in its very incipiency in less time than the old-style ranger would have taken to gather together his grub-pile and saddle his horse. This is no idealistic picture, but an actual accomplishment fully developed and regularly employed by government and private owners of timberlands who control more timber several times over in the United States alone than stands in all Canada.

Moreover, fire protection does not by any means exhaust the duties of a ranger on the reserves. It is now generally realized that forest reserves are not created to take timber out of use but to put it to use under methods of scientific forest management that will insure its continuation as a permanent crop instead of permitting it to be exhausted at one cutting. If it is realized that it takes from four to six years of collegiate training to give men the fundamentals of this art of forestry it will be conceded that the forest ranger, upon whom falls the duty of carrying out the plans for scientific forest management, cannot be fitted for these duties unless he has been specially trained for them. It might well be asked, if a forest ranger is not simply a man who can ride a horse and swing an axe, *what his qualifications are.*

Putting aside the fact that rangers in the Canadian service are not infrequently unable to produce even these rudimentary qualifications, it might be answered that a forest ranger should be a man in perfectly sound physical condition, not too old to endure the hardships of wilderness travel—say, between 20 and 45—a first-class experienced woodsman, able to pack, cook, establish camps in a sanitary manner, and handle horses and boats. He should be either a practical lumberman acquainted with both the woods and the milling end of the business or a practical stockman, or both. He should have at least a common-school education. He should be able to make all kinds of compass surveys and prepare simple maps, to cruise timber, to lay out, estimate and construct trails, to erect forest telephone lines, install instruments and maintain them in working order, to plan, estimate and construct ordinary log and frame buildings, to handle crews of men, to deal tactfully with forest reserve users and mountain travellers and sportsmen. He should have some knowledge of elementary silviculture, know the common trees and forage plants of the region, know something of the habits of the fish and game animals and enough of forest insect and fungus diseases to recognize an infestation on sight. Needless to say, he should have had previous practical experience in fire-fighting before being placed in a responsible position involving the direction of such work. A ranger must also be able to write concise, intelligent reports on all lines of his work, to maintain the necessary office files and records and must be thoroughly conversant with all the various laws and regulations which he is called upon to enforce and administer;

being empowered to arrest without warrant, he must be familiar with the legal machinery of his province and know how to present and handle his case in court, to collect evidence, and establish his charge with competent testimony.

It may well be asked where men with such varied qualifications are to be obtained, and it must be admitted that they cannot be found in Canada to-day. Yet forestry as it is understood and practised by almost every civilized and progressive nation in the world, in Germany, France, Switzerland, Austria, India, South Africa, Japan and the United States (to cite only leaders in the movement) demands that men with these qualifications be secured to form the very foundation of a forest organization. The experience of foreign countries is enlightening. In Germany and other European states where forestry has been practised for generations, forest academies conducted to a large extent under government auspices prepare men for the grades that correspond to the forest ranger, and subsequent training at their own expense in government employment completes their preparation. In India, the Philippines and Japan, government training schools have been established. In the United States, training has been supplied to some extent by special ranger schools, of which quite a number exist in connection with state and other universities, and also by the government itself through its ability to select only suitable candidates, as determined by a qualifying civil service examination, and then train these men in its organization, under civil service rules that require a man to show satisfactory results or suffer dismissal.

In Canada, where we have one of the few large bodies of virgin timber left standing in the world to-day and where we have such great areas of land suited primarily for timber production and nothing else, we lag far behind other nations in our forest policy; but it is the boast of every Canadian, at least those of the West, that things are done in Canada while other nations are awaking to a realization of their desirability. In the creation of a forestry service commensurate with the dignity of Canada as the leading member in the group of overseas Dominions, an opportunity is offered to make good this claim. The method is comparatively simple. The fundamental requirement is to place the employees of the Branch under Civil Service rules, which will provide for employment only on a merit basis as determined by a suitable examination; for adequate salaries to attract qualified men, which need be little larger than are already being paid for unqualified men; for promotion only for efficiency and for tenure of office during good behaviour and satisfactory service. This is essential in order to establish the work on a permanent basis and attract men of character and ambition from employments where there is a ready market for their services to one where the market is of necessity restricted. The second requirement is the establishment of a training school where employees may be thoroughly equipped in those lines with which they are not already familiar. This need not be an elaborate or expensive institution. It should be located in a timbered region, preferably on one of the reserves, where the course of training can be strictly practical in character. At it, men who have had a reasonable previous experience in the fundamentals, and what is equally important, who are under some incentive to perfect themselves along the lines offered in the course of instruction, could undoubtedly be trained to meet our requirements in from six to nine months. The possession of suitable experience can readily be determined as already suggested under the Civil Service Commission through a qualifying examination. The incentive to secure further training can be supplied by requiring candidates for permanent employment to pass a second examination covering the more detailed qualifications which we cannot now expect candidates to possess, and attaching an increased salary to these advanced positions. In time similar schools in connection with the various colleges and universities would no doubt be established, as has been done in other countries and the government school might then be discontinued or merged with a neighbouring institution, if one existed. In spite of the unusual demand for labour of all kinds, the

extraordinarily high cost of living in the western provinces and the relatively small salaries offered by the government, no unusual difficulty has been experienced in getting satisfactory assistants except in the grades of forest ranger and forest supervisor. The difficulties encountered in securing good supervisors is largely technical of lack of suitable ranger material, because a first-class forest supervisor is, in the last analysis, simply a sublimated forest ranger plus a certain knowledge of technical forestry which almost any man with sufficient general education, intelligence and ambition can acquire. A supervisor must be a practical administrator, thoroughly experienced in all lines of forest reserve work and should preferably be selected by promotion from the ranger staff or from those forest assistants who have duly qualified themselves by practical field experience after graduation, and who possess the necessary executive ability. Given, therefore, an adequate staff of forest rangers selected on a basis of fitness and trained in the manner indicated, the development of a sufficient complement of supervisors and other higher officers would become one of simple evolution.

FIRES.

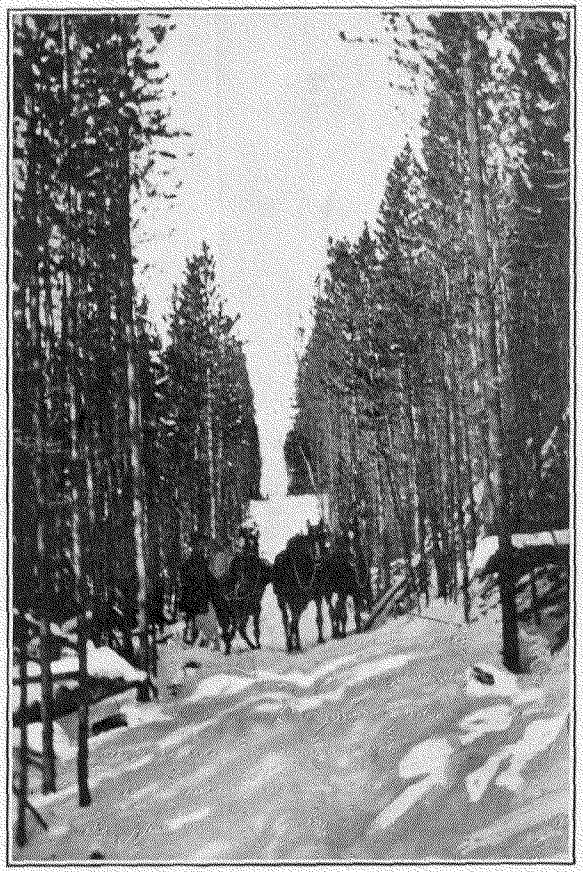
During the fiscal year ending March 31, 1913, the fire record in the Alberta Inspection District was unusually satisfactory. The number, causes, cost of control, and damage caused by fires in the district are shown in the tables given below. In these tables are shown, not only the fires which occurred within the boundaries of the Forest Reserves, but also all fires which occurred within the boundaries of proposed additions to the reserves, and a number of fires which were fought entirely outside of any Reserve or proposed addition, but which, if allowed to burn unchecked, might have threatened an adjacent Forest Reserve. The total number of fires which occurred inside the forest reserve boundaries was twenty-two, while eleven fires which occurred outside the boundaries were placd under control by the forest rangers.

TABLE 5.

TOTAL NUMBER OF FOREST FIRES REPORTED BY CLASSES ON EACH RESERVE.

Forest.	Class 'A.'		Class 'B.'		Class 'C.'		Total.	
	Inside.	Outside.	Inside.	Outside.	Inside.	Outside.	Inside.	Outside.
Crowsnest	1	2	0	1	0	2	1	5
Bow River	0	0	0	0	1	0	1	0
Clearwater	0	1	0	0	1	1	1	2
Brazeau	15	0	0	2	3	1	18	3
Athabaska	0	0	0	0	0	0	0	0
Cooking Lake	0	0	0	0	0	0	0	0
Cypress Hills	1	1	0	0	0	0	1	1
Total	17	4	0	3	5	4	22	11

Note—Fires are classified as follows:
Class A.—Camp-fires and other small fires not covering more than a few square rods.
Class B.—Small forest fires extinguished without any extra help or expense and generally covering not more than five acres.
Class C.—Large fires requiring extra help and expense.



Clearing on the Forest Trail, Bow River Forest.

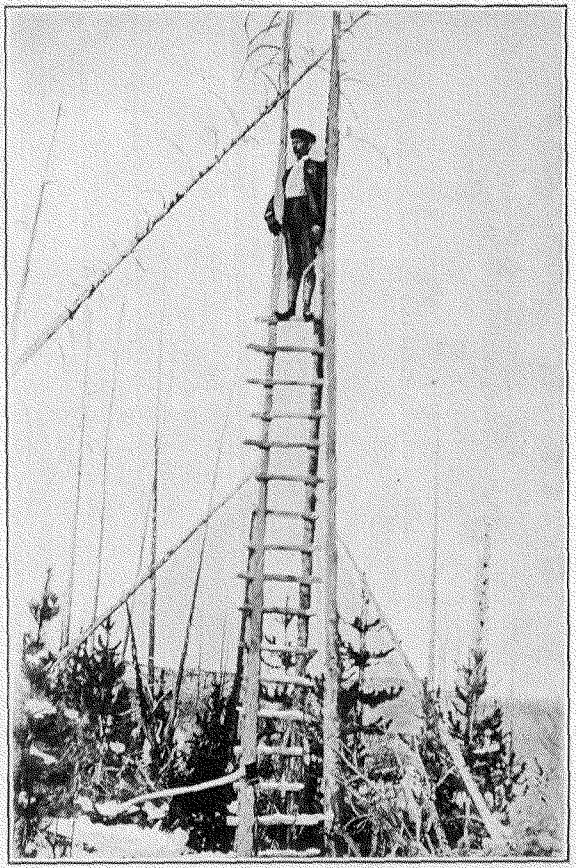


Photo L. C. Tilt.

A Forest Lookout Station on the Brazeau Forest.

TABLE 6.

CAUSES OF ALL FIRES REPORTED.

Forest.	Ry. Construction.	Locomotives.	Clearing Land.	Camp Fires.	Lightning.	Dropping Match.	Unknown.	Total.
Crowsnest	0	2	0	0	1	1	2	6
Bow River	0	0	0	1	0	0	0	1
Clearwater	1	0	1	1	0	0	0	3
Brazeau	1	20	0	0	0	0	0	21
Athabaska	0	0	0	0	0	0	0	0
Cooking Lake	0	0	0	0	0	0	0	0
Cypress Hills	0	0	0	2	0	0	0	2
Total	2	22	1	4	1	1	2	33

TABLE 7.

EXPENDITURE FOR FIRE FIGHTING BY FORESTS EXCLUSIVE OF RANGER LABOUR.

Forest.	Temporary Labour.	Supplies, Transportation, etc.	Total Cost.	Values of Voluntary Assistance.
	$ cts.	$ cts.	$ cts.	$ cts.
Crowsnest	48 00	10 95	58 95	5 00
Bow River				150 00
Clearwater				345 00
Brazeau				395 00
Athabaska				
Cooking Lake				
Cypress Hills				
Total	48 00	10 95	58 95	895 00

TABLE 8.

FIRES REPORTED FROM EACH FOREST SHOWING MONTH OF OCCURRENCE.

Forest.	May.		June.		July.		August.		Sept.		October.		Total.	
	In.	Out.	In.	Out.	In.	Out.	In.	Out.	In.	Out.	In.	Out.	In.	Out.
Crowsnest	0	1	1	2	0	0	0	1	0	0	0	1	1	5
Bow River	1	0	0	0	0	0	0	0	0	0	0	0	1	
Clearwater	1	2	0	0	0	0	0	0	0	0	0	0	1	2
Brazeau	1	2	0	1	0	0	0	0	17	0	0	0	18	3
Athabaska	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cooking Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cypress Hills	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	3	5	1	3	0	0	0	1	17	0	0	1	21	10

TABLE 9.

DAMAGE CAUSED BY FIRES ON EACH FOREST.

Forest.	Area of Reserved Land.	Area of Unreserved Land.	Damage to Timber or Reproduction on Reserved Land.			
			Timber Destroyed or Damaged.		Value of Reproduction Destroyed.	Total.
			Quantity.	Value.		
	Ac.		M. Ft. B.M.	$ cts.	$ cts.	$ cts.
Crowsnest	0	17	0	0 00	0 00	
Bow River	400	0	10	30 00	220 00	250 00
Clearwater	170	70	14	21 00	800 00	821 00
Brazeau	135	132	0	0 00	150 00	150 00
Athabaska	0	0	0	0 00	0 00	0 00
Cooking Lake	0	0	0	0 00	0 00	0 00
Cypress Hills	0	0	0	0 00	0 00	0 00
Total	705	219	24	51 00	1,170 00	1,221 00

A number of interesting points are brought out by a consideration of these tables. It will be noted, for instance, in Table No. V, that fifteen of the Class 'A' fires occurred on the Brazeau Forest Reserve. Table No. VIII indicates that all these fires occurred in the month of September. The fifteen Class 'A' fires, together with one Class 'C" fire and one Class 'B' fire, were all started on the Brazeau Forest Reserve on the same day by the one locomotive operated by Phelon & Shirley, contractors for the Grand Trunk Pacific. It was found upon examination that this locomotive was not equipped with a spark-arrester, and upon its being immediately so equipped the starting of fires from this source was eliminated. All these fifteen Class 'A' fires were set within an area of not more than a square mile, and many of them did not attain a size larger than a few square feet, being extinguished almost at once.

A consideration of Table VI shows that over 75 per cent of all the fires reported last year were caused by the railways. The total number of such fires was twenty-four, of which seventeen were Class 'A', one Class 'B' and six Class 'C.' The railways accounted for six out of the nine Class 'C' fires which occurred. Sixteen of the railway fires were on the line of the Grand Trunk Pacific, one on the Canadian Northern Western and two on the Crowsnest branch of the Canadian Pacific railway. None of these roads were at the time complying with the order of the Board of Railway Commissioners relative to fire patrol.

It will be noted from a consideration of Table IX that the largest fire occurred on the Bow River Forest Reserve. This fire, which covered 400 acres, started from an over-heated stove in the camp of a log-driving crew employed by the Great West Lumber Co., on the Red Deer river. It occurred in the month of May and was put under control by the employees of the company at no expense to the government. This fire was confined exclusively to new slash, which accounts for the comparatively small damage to reproduction. The fire causing the greatest damage was that which occurred on the Clearwater early in the month of May, before the reserve was placed under administration. This fire got a good headway in slash made by tie contractors for the Canadian Northern Western railway and burnt over about 170 acres, part of which was timbered and part covered with a good growth of reproduction. On the Brazeau the small damage caused by the Class 'C' fires is accounted for by the fact that these fires were confined almost exclusively to denuded areas or grass-lands.

It will be noted from a consideration of Table VII that the expenditure made by the government for fire-fighting was very small. In almost every case the person responsible for the fire was known and was compelled to place the fire under control or did so voluntarily.

Table VIII shows very clearly the character of the season. It will be noted that of the thirty-three fires reported twenty-five occurred during the months of May and September, while only five occurred during June and August, there being no fires at all during July. The month of May last year was comparatively dry, and the first half of June was exceptionally dry. From about the middle of June until well along into September frequent rains occurred, especially in that portion of the forest reserve lying between the Bow river and the Athabaska but north of the Athabaska river the season was comparatively dry, becoming extremely dry in the far northern end of the Reserve, although no fires occurred in this portion of the mountains. Very large fires, however, are reported to have occurred along the Peace river, the smoke from these fires obscuring the landscape in the Athabaska Forest Reserve during several weeks in September.

It is impossible from a consideration of the past season's fire-record to arrive at any conclusion in regard to the efficiency of the men employed on the various forest reserves, because the season was so remarkably favourable that no real test of efficiency was afforded. A much better opportunity was afforded to test the ability of the organization to take advantage of the favourable weather conditions which prevailed to promote the general development of the forest reserves along fire-protective lines.

It will be readily understood that in a region where distances are so great and labour so scarce there is little possibility of adjusting the forest-protective force to the character of the season except in the most general way. It is practically necessary to employ a certain number of men early in the season and maintain them, under pay for a period of about six months, regardless of the character of the weather conditions during that period. When it is realized that it takes some of these men a week or ten days of hard travelling to reach their stations from the railway, the impracticability of taking on and laying off men according to the season becomes readily apparent. At the same time it is felt to be the duty of any fire protective organization not only to prevent and extinguish fires during season of employment, but also, when conditions are favourable, to improve and extend the facilities for fire prevention and suppression. Such facilities consist very largely of permanent improvements in the nature of roads, trails, bridges, cabins, &c. This feature of the work will be further dealt with under the heading of Permanent Improvements, because it is felt to be the only means by which the Forest Reserves can be placed in a condition to be successfully protected from fire within a reasonable time and at a reasonable expense.

The fire-protection work on the Forest Reserve forms the basis of the entire administration, and at the present time can be considered the most important work that we are undertaking. The general organization has already been described in previous reports, but it might be well to note briefly the developments during the past year. The entire Forest Reserve area in this district has been divided into seven administrative units as indicated in Table 1. These units have been placed under the charge of Forest Supervisors, who have subdivided them into fire-protection districts placing a ranger in charge of each district. The Districts are laid out on topographic lines, consideration being given to the fire danger, the timber and the facilities for communication within the district. They naturally vary much in size, the smallest being about 25,000 acres and the largest 500,000 acres. The average for the entire district last year was 211,000 acres per ranger. If our personnel was up to a high standard of efficiency, and the permanent improvements needed on the forest reserves were completed, I believe that this average would be satisfactory. I do not mean that entire immunity from fire could be promised with an intensity of fire patrol such as we had during the past year, but in considering this question the fact must be remembered

that the Rocky Mountains are not covered with mature timber of any great value and the danger of fire starting is not by any means excessive. It is obvious that an area of forest land which supports only a growth of reproduction of which little is over forty years of age, does not have the same value as an equal area of land in merchantable timber. This reproduction, of course, has a value which justifies a certain expenditure in order to protect it from fire, but no one can argue that this expenditure should be as great as in the case of merchantable timber, nor that the fire protective force would be justified in attempting to restrict the area burnt over under a given set of conditions to as small an acreage as in the case of merchantable timber. We are, therefore, not justified in attempting to provide absolute immunity from fire-damage in the Rocky Mountain Forest Reserve, but only such a degree of protection as is justified by the value of the resources under our charge.

Considering, therefore, the condition of our personnel and the lack of improvements and facilities for communication within the reserves, I feel that the average area entrusted to each ranger is too great, and that it should be reduced to not more than 150,000 acres. This will involve a material increase in the force, even to guarantee a reasonable security from destructive fires. In addition to having a special force of fire rangers during the dangerous season, the other work on the reserves should be so planned as to supplement the work of the fire-patrolmen.

Temporary crews, such as road and trail gangs or survey crews, should be employed as much as possible only during the most dangerous season, and should be distributed throughout the reserve so that they may act as a reserve force in cases of emergency.

As regards the existing conditions on the Rocky Mountains Forest Reserve as a result of previous fires, former publications of both the Forestry Branch and the Geological Survey have described these conditions in more or less detail. My inspection work has now enabled me to cover in considerable detail almost the entire reserve from the international boundary to the Athabaska river. Everywhere it is found that fires have caused enormous destruction of merchantable timber within the past fifty years. The mature stands of merchantable size now constitute only small isolated islands of green timber in a vast area of denuded land or young reproduction. Various estimates of the amount of land in the reserve now bearing merchantable timber have been given, running as high as 25 per cent for that portion south of the Red Deer river. I believe that this estimate is approximately correct, but the destruction by fire has been far more widespread north of the Red Deer than it has been to the south, so that, in my opinion, not more than 10 per cent of the entire reserve area south of the Athakaska river now bears timber of merchantable size and quality.

The most important step in the organization of the fire-protective work during the past year has beeen the preparation of fire plans for each of the forest reserves. Since adequate fire protection is fundamental in the practice of forestry, too much emphasis upon securing such protection can scarcely be placed at the beginning of such administration. The purpose of a fire plan is to put in clear-cut concrete form all the information available with regard to the fire danger, the supply of men available for fire fighting, the means of communication within the reserve, the facilities for securing assistance from distant points if necessary, and numerous other kinds of information which are ordinarily carried in the heads of those officers charged with work of this character, but which do not form a part of the permanent records of the organization. The fire plan not only serves the purpose of making available permanently all information of value in regard to the fire situation within and adjacent to the forest reserve, but it also serves the very valuable purpose of bringing to the attention of forest officers themselves the location of areas of particular danger or portions of the forest reserve which present unusual obstacles to ready access. Naturally the degree of success with which a fire plan can be prepared depends to a considerable extent upon the accuracy and detail of the acquaintance of the officer

preparing the plan with the country under consideration. Fire plans for all the reserves in the Rocky Mountains have been prepared for several years, but will have to undergo constant revision for several years before they assume definite and more or less permanent form. It might be pointed out that work of this kind has been carried out on many of the national forests of the United States where the preparation of definite plans of action in the case of fire emergency has been carried to such a state of perfection that it is readily possible for a ranger of ordinary intelligence, even though wholly unacquainted with the country, to take hold of a ranger district and merely from the available data in the form of the District Fire Plan have at once at his finger ends information in regard to the country and the fire-fighting and fire-locating facilities which, without the plan, would ordinarily take months, or even years, of personal study of conditions to secure.

PERMANENT IMPROVEMENTS.

The work of extending the roads and trails, constructing cabins for the use of forest officers and in other ways improving the facilities for rapid communication within the forest reserves has been continued throughout the year. A total of $27,754.91 has been expended on work of this character, of which $6,825.16 was for labour performed by the forest rangers.

For very evident reasons, the work of constructing permanent improvements on the reserves during the past year has not been wholly satisfactory to me. When I took charge of the district at the beginning of the last working season, I found absolutely no preparation for work of this character whatever, and no organization or system in existence whereby the essential preparatory work could be accomplished At the same time, the pressure to place the reserves on a better basis for protection—a very natural result of the disastrous fire season of 1910—was great. Moreover, fairly ample funds were available for a season's work, and with little danger from fire, owing to the favourable season, it seemed highly desirable to make a start on work of this character, even without the careful preparation that I would ordinarily have required. To handle this work on a thoroughly sound basis, it is first necessary that a reconnaissance be made of each reserve by a qualified forester to determine the proper division into ranger districts as indicated by topography, timber and fire-hazard, the logical and practical site for the district head-quarters, the routes which the primary and secondary trails must follow, the alignment of the telephone system, the possibilities of establishing a lookout system for fire location and the special improvements, such as bridges, ferries, roads, etc., that are needed. If an accurate topographic map is available, this work is very greatly simplified. We had no such maps, in fact, no maps of any value whatever, and, therefore, no opportunity to lay out a general plan in advance. Even had we had the general plan as a foundation for handling work on a business-like basis, we should then have made detailed examinations of the most urgent projects, prepared plans and estimates for the trails, cabins, bridges, etc., and determined the location and status of the proposed building sites by suitable surveys and search of land office records, before undertaking any construction. All this, however, would have consumed a great amount of time, in fact, considering that even before we could begin to get this data we had to hire and organize a personnel, I did not feel that we could adopt this procedure and get any work done at all. I, therefore, adopted the system of approving such projects as seemed, from the data at hand, least likely to be wrong, and spent about two-thirds of my time in the mountains with the supervisors assisting them to select suitable projects. That some mistakes would occur was inevitable, but on the whole we were fairly successful in avoiding the establishment of monuments to our lack of adequate preparation. I find that out of 56 completed and 28 uncompleted projects, or a total of 84 projects undertaken, only four show the results of lack of proper planning in faulty construction or unreasonably excessive cost. Meanwhile, however, we have been securing the information needed to handle the permanent improvement work in

a systematic manner, deciding upon standards and specifications and developing a system of procedure, and during the next fiscal year will confine our work largely to projects which have been given adequate consideration and which must be built according to definite standards established by the district inspector.

In the following tables I have shown the improvements made on each of the forest reserves with the itemized cost of the same. The first set of tables shows those projects which are completed. The second set is those projects which are incomplete or which are merely preparatory for next year's work. Here also I have shown all the maintenance and repair work which cannot be classified as specific projects.

TABLES OF COMPLETED IMPROVEMENT PROJECTS.

TABLE 10.

CROWSNEST FOREST.

Class of Improvement	Length.	Number.	Labour.	Cost.							
				Materials.	Tools.	Subsistence.	Transportation.	Miscellaneous.	Memo Charge Ranger Labour.	Total.	Average per mile per Unit.
	Miles.		$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Roads	¼	..	198 00	32 00	.. ..	64 13	. .	.....	44 40	338 53	.....
Trails (Secondary)	50	..	293 00	.....	...	116 88	10 00	.....	250 15	670 03	13 46
Telephone Lines	51	..	2,226 41	862 18	326 28	745 03	652 32	115 15	440 10	5,367 47	105 25
Ranger Stations	.....	1	123 42	500 75	4 45	127 86	115 00	.....	174 97	1,046 45	.....
Barns	.....	2	68 60	73 99	.....	31 67	.....	.....	47 32	221 58	110 79
Cabins	.....	1	26 00	20 30	.....	13 00	26 50	.....	84 70	170 50	.....
Bridges	.....	5	435 67	10 75	.. . .	184 17	94 00	.....	151 30	875 89	175 18
Totals	.....	..	3,371 10	1,499 97	330 73	1,282 74	897 82	115 15	1,192 94	8,690 45	.....

TABLE 11.

BOW RIVER FOREST.

Class of Improvement.	Length	Number.	Labour.	Cost.							
				Materials.	Tools.	Subsistence.	Transportation.	Miscellaneous.	Memo Charge Ranger Labour.	Total.	Average per mile per Unit.
	Miles.		$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts
Trails, Secondary	123	..	1,061 45	.....	.....	111 55	13 00	.....	1,056 70	2,242 70	18 23
Trails, Standard	18	..	....	.. ..	. .	.....	..	....	404 66	404 66	22 48
Cabins	.....	3	150 24	55 99	....	.....	59 00	.....	107 38	372 61	124 20
Ranger Stations	.....	1	313 12	456 73	.....	88 50	124 72	....	283 57	1,266 64	.....
Barns	... ...	2	228 50	120 02	.....	84 75	64 12	.....	312 08	809 47	404 73
Bridges	.....	1	84 00	12 00	....	.....	.....	.....	102 45	198 45	.....
Totals	.....	..	1,837 31	644 74	.....	284 80	260 84	.....	2,266 84	5,294 53	.....

TABLE 12.

CLEARWATER FOREST.

Class of Improvement.	Length.	Number.	Cost. Labour.	Materials	Tools.	Subsistence.	Transportation.	Miscellaneous.	Memo charge Ranger labour	Total.	Average per Mile per Unit.
	Miles.		$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Roads	7	..	544 75	.....	8 10	65 55	.....	.....	75 20	693 60	99 09
Trails (Standard)	34	..	1,020 62	.....	20 95	267 21	.....	.....	388 16	1,696 94	49 91
Trails (Secondary)	42	..	74 25	.....	.....	.....	.....	.....	174 99	249 24	5 93
Fence (Pasture)	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cabins	.....	4	308 75	124 60	.....	.....	227 96	.....	592 70	1,254 01	313 50
Totals	.....	4	1,948 37	124 60	29 05	332 76	227 96	.....	1,231 05	3,893 79	.....

TABLE 13.

BRAZEAU FOREST

Class of Improvement.	Length.	Number.	Cost. Labour.	Materials.	Tools.	Subsistence.	Transportation.	Miscellaneous.	Memo charge Ranger labour	Total.	Average per Unit per Mile
	Miles.		$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Trails	60	..	1,085 75	72 95	23 25	455 25	88 32	259 75	.....	1,985 27	33 09
Cabins	.....	5	234 85	860 27	.....	166 07	84 25	33 50	715 36	2,094 30	418 86
Barns	.....	4	.....	91 90	4 65	50 46	0 95	.....	454 47	602 43	150 61
Lookout Statn's.	.....	1	.....	1 35	.....	.....	.....	.....	26 96	28 31	28 31
Totals	.....	..	1,320 60	1,026 47	27 90	671 78	173 52	293 25	1,196 79	4,710 31	.....

TABLE 14.

CYPRESS HILLS.

Class of Improvement.	Length Furrow.	Number.	Cost. Labour.	Material.	Tools.	Subsistence.	Transportation.	Miscellaneous.	Memo charge Ranger labour	Total.	Average per furrow per mile.
	Miles.		$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Fire-guards. ...	330·5	..	304 11	.....	.....	.....	.....	.....	.....	304 11	0 92
Totals. . ..	330·5	..	304 11	.....	.....	.....	.....	.....	.....	304 11	0 92

TABLES OF UNCOMPLETED IMPROVEMENT PROJECTS.

TABLE 15.

Improvement Project.	Length.	No.	Cost Ranger Labour.	Cost exclusive of RangerLabour	Total Cost.
	Miles.		$ cts.	$ cts.	$ cts.
Roads	7¼	..	119 60	912 53	1,032 13
Trails (standard) ...	112	....	792 82	3,294 05	4,086 87
Trails (secondary)	215	...	1,481 84	1,680 13	3,161 97
Telephone Lines	51	....	440 10	4,927 37	5,367 47
District Ranger Stations	....	2	458 54	1,854 55	2,313 09
Ranger Cabins.	.....	13	1,500 14	3,391 28	3,891 42
Barns	.....	8	813 87	819 61	1,633 48
Bridges	.....	6	253 75	820 59	1,074 34
Lookouts	.....	1	26 96	1 35	28 31
Fire-guards	330·5	....	.....	304 11	304 11
Totals	....	....	5,887 62	17,006 57	22,893 19

TABLE 16.

CROWSNEST FOREST.

Project.	Length.	No.	Cost.	Ranger Labour	Total.
	Miles.		$ cts.	$ cts.	$ cts.
Trail Maintenance	168	....	397 02	264 64	661 66
Cabins	.....	2	271 06	101 04	372 10
Fire-line Maintenance	3	....	29 00	.....	29 00
Boundary Marking.	17	....	50 50	.....	50 50
Purchase of Fire Tools	.....	...	177 18	.....	177 18
Telephone Supplies	12	....	197 00	.....	197 00
Repairs to Cache	....	1	14 20	.....	14 20
Miscellaneous	....	....	50 13	.....	50 13
Total	.....	...	1,186 09	365 68	1,551 77

TABLE 17.

BOW RIVER FOREST.

Project.	Length.	No.	Cost.	Ranger Labour	Total.
	Miles.		$ cts.	$ cts.	$ cts.
Trail Maintenance	152			473 49	473 49
Cabins		5	777 04	44 00	821 04
Fences		2		54 37	54 37
Telephone Supplies	10		122 65		122 65
Miscellaneous			64 85		64 85
Total	162	7	964 54	571 86	1,536 40

TABLE 18.

BRAZEAU FOREST.

Project.	Length.	Number.	Cost.	Ranger Labour.	Total Cost.
	Miles.		$ cts.		$ cts.
Telephone supplies	40		642 37		642 37
Total	40		642 37		642 37

TABLE 19.

CLEARWATER FOREST.

Project.	Length.	Number.	Cost.	Ranger Labour.	Total Cost.
	Miles.		$ cts.		$ cts.
Cabins		2	66 50		66 50
Fences		1	45 50		45 50
Trail supplies			922 07		922 07
Miscellaneous			80 11		80 11
Total		3	1,114 18		1,114 18

TABLE 20.

CYPRESS HILLS FOREST.

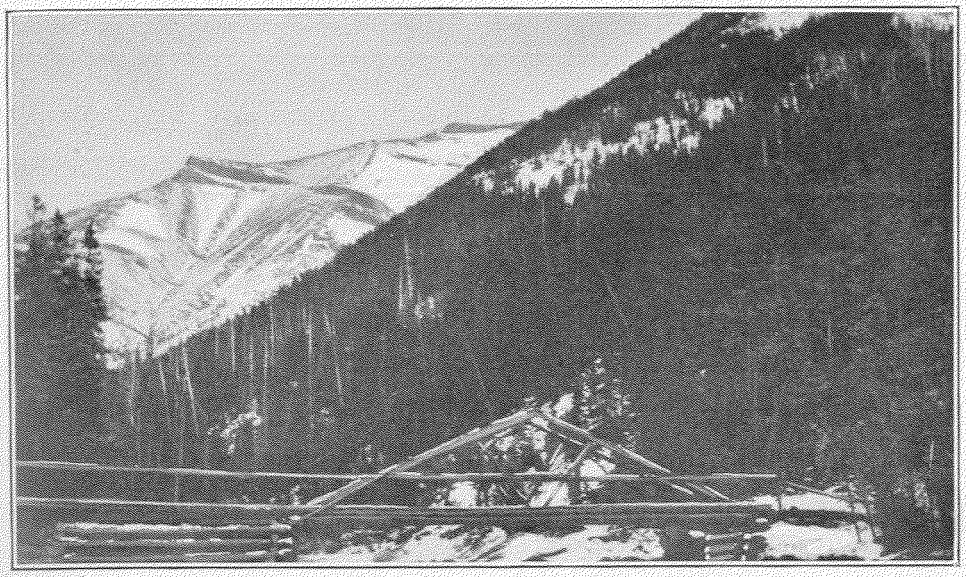
Project.	Miles.	Number.	Cost.	Ranger Labour.	Total Cost.
			$ cts.		$ cts.
Cabin		1	16 00		16 00
Total		1	16 00		16 00

TOTAL OF UNCOMPLETED IMPROVEMENT PROJECTS.

TABLE 21.

Project.	Length.	Number.	Cost.	Ranger Labour.	Total Cost.
	Miles.		$ cts.	$ cts.	$ cts.
Trail maintenance	320		397 02	738 13	1,135 15
Cabins		10	1,130 60	145 04	1,275 64
Telephone supplies	62		962 02		962 02
Fences		3	45 50	54 37	99 87
Trail supplies			922 07		922 07
Fire-line maintenance	3		29 00		29 00
Boundary marking	17		50 50		50 50
Fire-fighting tools			177 18		177 18
Repairs to cache		1	14 20		14 20
Miscellaneous			195 09		195 09
Total			4,923 18	937 54	4,860 72

The trails constructed were of two types, standard and secondary. Standard trails are intended to form the main avenues of communication within the forest reserve, and are built with the idea of making such communication as rapid and easy as possible. You will understand that practically the entire Rocky Mountains are accessible to horses by means of open land along the streams, old Indian trails or through the timber where it is not obstructed by excessive wind-falls. The rate of progress, however, along such routes of travel is exceedingly slow. The packers and other travellers in the mountains ordinarily consider from twelve to fifteen miles as a day's trip for pack and saddle horses, and their custom is to travel about six hours, making two miles or two and a half miles an hour and then stop for the day. Feed is reasonably abundant, so that it is not generally necessary to give much consideration to this point. Such slow progress, however, is not well adapted to the exigencies of fire protection. To reach a fire with a reasonable degree of promptness we should be able to travel for two or three days at the rate of twenty-five to thirty miles per day. In order to do this the main routes of travel must consist of trails that are a very great improvement over any of those existing in the mountains prior to the creation of the forest reserve. The standard trails are built according to the following specifications: All brush must be cut from six to ten feet wide, the widest cutting being in reproduction about ten to twenty feet high and the narrowest being in heavy green timber; all overhead branches must be cleared out so that they will not interfere with men on horseback; the trails are to be as straight and direct as possible between the two termini, but must be built on dry ground, avoiding muskegs, except where this is impossible. The grade is not to exceed 10 per cent, except for short pitches which will not be more than 100 feet long, not over fifteen per cent in gradient and should not occur more often than once in two miles; the trail is to have a graded tread throughout its length, this tread varying in width from sixteen inches on comparatively level land, to two feet on the steeper hillsides. On hillsides the tread is to be on the lower side of the cleared line, and all soil and rock from the grading is to be thrown in the form of a ridge on the outside edge. The tread at switch-back turns must be made on a grade of not to exceed three per cent and must be three times the width of the ordinary tread for a distance of eight feet on each side of the point of the turn. In descending steep slopes one or two long grades are to be preferred to a number of short switch-backs. Wherever necessary in crossing muskegs and swamps corduroy should be placed, laid at right angles to the trail. The material forming the corduroy must be at least six feet long and three inches in diameter at the small end. Wherever possible, larger material should be used up to



Sheep River Bridge, Bow River Forest.

Graded Trail in Clearwater Forest.

Photo W. N. Millar.

eight feet long and six inches in diameter at the small end. All corduroy should be laid on not less than three sills and should have side logs laid on top of the corduroy which should not be less than six inches in diameter at the small end. Where possible some of the corduroy sticks should be spiked to the sills. All small streams up to 25-foot spans should be crossed by bridges or culverts. Bridges are to consist of stringers running lengthwise of the trail with not less than eight-foot poles laid across the stringers. These poles must be not less than four inches in diameter at the small end and should be spiked to the stringers and held down by guard-rails laid along the side of the bridge, which guard-rails shall be not less than six inches in diameter at the small end. In crossing streams by fords care must be taken to secure a good solid gravel bottom, free from mud and quicksand. The cost of trails built according to these specifications will run from $25 to $60 per mile, but they will easily double or triple the distance that can be made through the mountains in a day.

Secondary trails will form a means of communication within the primary system of standard trails. Long journeys of more than a day would not ordinarily be necessary on secondary trails and the same standard of construction will not be needed. The total mileage of secondary trails will be many times greater than of standard trails, but the cost will ordinarily be very much less. The construction of secondary trails will in many cases consist of clearing out, straightening and widening the existing Indian and prospectors' trails, eliminating the worst grades and corduroying some of the worst muskegs. Secondary trails will not in any case be cut more than six feet wide, will not have a graded tread except on the steeper hillsides, where a tread not to exceed eighteen inches in width shall be made. The grades of such trails may run up to 20 per cent for long slopes and 35 per cent for short pitches. Corduroy on secondary trails may be made by laying long poles lengthwise of the trail to form a tread about four feet wide. Bridges, however, must be constructed similar to those provided for standard trails, but only the worst of the small streams and sloughs need be bridged. The same care in selecting fords should be followed with these trails as with standard trails, and overhead branches should be cut out just as thoroughly. The cost of such trails will run from $5 to $15 per mile, but the great majority will cost under $10 per mile.

The telephone construction work will follow the same specifications and methods of construction as have been developed by the United States Forest Service. These methods are the result of about eight years' experience during which some thousands of miles of line have beeen built, and I do not feel that we are in a position to make any improvements or alterations.

For ranger cabins we are adopting three general styles of building. For use of permanent district rangers who are employed the year round and reside practically throughout the year at the same stations, we intend to erect houses of five to seven rooms, two storeys in height, built, in most cases, of lumber. These will be erected only at the most important stations where there is important timber sale, grazing or permit business which requires the presence of a year-long ranger. Such districts at the present time are confined to the forest reserve south of the Red Deer river. These buildings will ordinarily cost about $1,000, and along with them it will be necessary to construct a barn with a capacity of six to eight horses which will cost about $350 to $500. A pasture at each station will also have to be fenced and a water supply developed either by digging a well or improving a spring or other natural source of supply. Two such stations were constructed during the year and plans are being made for two or three more during the next fiscal year.

In the northern portion of the reserve, from the Red Deer river to the Athabaska, the main headquarters will consist of log buildings from 16 feet by 22 feet to 18 feet by 24 feet, inside dimensions. In most cases these buildings will be floored and roofed with lumber and will be divided into two or three rooms by board partitions. A small barn in connection with each one will ordinarily be provided. These cabins will form

the main district headquarters, from which the work of protection and administration will be directed during the working season, but in all that portion of the reserve north of the Red Deer river the working season corresponds only to the fire season, and during the rest of the season the force is very greatly reduced and the winter force is concentrated by the supervisor on such lines of improvement and development work as can be carried on during the winter. The third class of buildings are those known as caches. These are small log buildings from 10 feet by 12 feet to 14 feet by 16 feet inside dimensions. They are being erected throughout the Forest Reserve at all of the main trail-intersections and points where it is necessary to station temporary forest rangers during the fire season. The object of these cabins is to enable forest officers to range their districts without the necessity of packing with them a large amount of equipment in the form of tent, stove, food supplies, &c. This will greatly increase the mobility and, therefore, the effectiveness of the fire-ranging force. These cabins will ordinarily be constructed at from $50 to $125.

It will be readily apparent that, in order to provide adequate facilities for communication within the Forest Reserve, to insure a reasonable degree of fire protection, it will be necessary to construct several thousand miles of trail, some hundred or more cabins and a considerable mileage of telephone lines. We have not yet secured sufficient information in regard to the entire reserve to give a reliable estimate of the probable cost of the permanent improvements. Enough information has been secured, however, to indicate that this will be a considerable sum and the question naturally arises whether or not the risk justifies the expense. This would be a question of very considerable importance, were it not evident that by proper organization a very large portion of the permanent improvements can be constructed incidental to the fire protection. It has already been pointed out that to secure adequate fire protection a small, but efficient and well trained, permanent staff must be maintained, this staff forming the nucleus for a larger temporary force hired only for the dangerous season. It should further be understood that on the Rocky Mountains Forest Reserve the season of fire danger is divided into two seasons of extreme drought, between which there is a period when the abundance of green vegetation and occasional showers or snows makes the danger less acute. This has already been commented upon in connection with Table VIII. During the intermediate period it is scarcely possible to figure on reducing the force to any material extent for the reason that more or less danger of fire is always present and for the further reason that it is not practicable to secure men for short periods in the early summer and late fall and distribute them over such a wide area of mountain country. For these reasons the temporary summer force will have to be employed both during the two extremely dry periods and throughout the intermediate period covering the months of July and August. It is evident that much of the time of this temporary force throughout the summer, as well as a fair proportion of the time of the permanent force during the entire year, will not be required either for fire-patrol or for administrative work. The organization must be so perfected that all of the time not needed for fire-patrol or administration work can be utilized for permanent improvements or other permanent development work. The amount of such time available will, of course, depend upon the character of the season, but on the average it should be fairly large and through the proper utilization of this time a very large amount of the permanent improvements should be constructed.

In order to put the improvement work upon a clear-cut and well organized basis and to provide every facility for taking advantage of opportunities to utilize spare time on permanent improvements, thereby increasing the efficiency of the force, it has been found desirable to require the supervisors to make up a carefully drawn plan of all the improvements necessary on the reserves. These plans are still in the course of preparation but will be completed within the year. Supervisors are now required to submit detailed estimates of the improvements which they wish to have constructed during the fiscal year and to secure authorization for such work by projects. A detailed record of the cost of each project is maintained and monthly reports of the

expenditure and progress made are submitted to the inspector. At the end of the year an annual improvement report showing the work accomplished during the fiscal year is required of each supervisor, and in this report the projects are described in great detail and the itemized cost of all are shown. This improvement plan will form an important part of the working plans for the entire reserve and is largely supplemental to the fire plan which has previously been described, since the success of the fire plan depends very largely upon the construction of the improvements provided for in the improvement plan.

SILVICULTURE.

It has previously been pointed out in your reports that the great bulk of the merchantable timber in the Rocky Mountains Forest Reserve has already passed out of the ownership of the government into the hands of owners of timber licenses. It has also been pointed out that in spite of the vast area of the Rocky Mountains Forest Reserve the actual amount of standing merchantable timber within the reserve is comparatively small, although the amount of young growth and reproduction is enormous. The question naturally arises as to what policy the Forestry Branch should follow in disposing of the merchantable timber which still remains in the hands of the government. It must be realized at once that this reserve will not for many years constitute a source of lumber supply for the adjacent agricultural community. Lumber, except in limited quantities from the existing timber berths and in very small quantities for local consumption, cannot be secured from the Rocky Mountains Forest Reserve until the immature timber which occupies from 75 per cent to 90 per cent of the forest reserve at the present time grows to saw-log size. Aside from an insignificant amount of saw-log material which may be produced on the reserves at the present time, the great bulk of the reserve products will consist of such material as house-logs, fence-poles and fence-rails, railway ties, mining timbers and cordwood. It is apparent that the reserve will serve three rather distinct purposes. It will constitute an almost inexhaustible source of supply of such timbers as fencing material, house-logs, roof-poles and a limited supply of saw-logs valuable for consumption by small local mills of a portable character.

The second class of products will be ties and mining timbers. This is a product of great importance throughout the Rocky Mountains Forest Reserve because of the great development of coal mines that is taking place in all parts of the reserve. The mining of coal, as is well known, requires the use of enormous quantities of timber and the cost of production and, naturally, the cost of the final product is to a considerable extent dependent upon the price at which the necessary mine timbers can be secured. It will undoubtedly be better business policy to retain the timber within reach of coal mines for use in mining, thereby influencing the price of coal to the ultimate consumer, than to encourage the cutting of this timber for direct consumption and thereby force the importation of mine timbers from a distance.

The third purpose which the reserve will serve is in the production of cordwood. So enormous are the quantities of dry cordwood which are annually going to waste on the Rocky Mountains Forest Reserve that there seems no reason whatever for placing any restrictions upon the utilization of this product or its distribution over as wide a territory as possible.

The disposal of timber on the forest reserves is still being handled under the existing regulations through the Dominion Land offices.

The following tables show the timber disposed of on the forest reserves in the Alberta inspection district during the fiscal year ending March 31, 1913:—

TABLE 22.

TIMBER CUT UNDER SETTLERS' PERMITS.

Forest.	No. of Permits.	Lumber.	Logs.	Cordwood	Fence-Posts.	Fence-Rails.	Roof-Poles.	Receipts.
		F.B.M.	Lin. Ft.	Cords.				$ cts.
Crowsnest	176	15,250	142,568	1,651	26,390	25,135	17,045	318 13
Cooking Lake	5	14,250	200	25	420	3,800	700	1 25
Bow River	17	.....	11,000	123	2,214	5,300	1,040	22 45
Cypress Hills	317	.....	603,655	3,747	89,315	109,940	92,612	103 05
Total	515	29,500	757,423	5,546	118,339	144,175	111,397	444 88

TABLE 23.

TIMBER CUT ON PERMIT BERTHS.

Forest.	No. of Permits.	Lumber.	Logs.	Ties.	Cordwood	Fence-Posts.	Fence-Rails.	Mine Timbers.	Receipts.
		F.B.M.	Lin. Ft.		Cords.			Lin. Ft.	$ cts.
Crowsnest	11	3,197,577	40,250	6,686	25	400	400	74,689	3,499 68
Bow River	3	753,607	.....	.....	.....	.....	.....	.....	530 33
Brazeau	3	.....	.....	60,000	.....	.....	.....	21	1,436 50
Cypress Hills	1	103,660	.....	.....	.....	.....	.....	.....	29 80
Total	18	4,054,844	40,250	66,686	25	400	400	74,710	5,496 31

TABLE 24.

TIMBER CUT ON LICENSE BERTHS.

Forest.	Number of Berths.	Area.	Lumber.	Mine Timber.	Lath.	Cordwood	Posts.	Receipts.
		Sq. Miles.	F.B.M.	Lin. Ft.		Cords.	Lin. Ft.	$ cts.
Crowsnest	12	309,31	3,676,415	565	.....	59	6,517	5,144 33
Bow River	16	465,66	18,167,683	.....	1,904,100	.....	21,670	13,292 00
Total	28	774,97	21,744,098	565	1,904,100	59	28,187	18,436 00

NOTE.—None of the berths on the Clearwater, Brazeau or Athabaska Forests are operating.

TABLE 25.

TIMBER SEIZURES.

Forest.	No.	Saw Logs.	Bld. Logs	Cordwood	Fence-Posts.	Roof-Poles.	Dues.
		No.	Lin. Ft.	Cords.			$ cts.
Crowsnest	5			2		406	17 25
Bow River	2	37,427	10,018				6,572 00
Cypress Hills	8			1	402	46	28 33
Total	15	37,427	10,018	3	402	452	6,617 58

HAY PERMITS.

The land offices are also handling the issuing of permits to cut hay, and the volume of this business is indicated in the following table.

TABLE 26.

HAY PERMITS.

Forest.	No.	Tons Cut.	Receipts.
			$ cts.
Cooking Lake	9	277	27 20
Cypress Hills	54	1,837	187 20
Bow River	6	395	11 50
Crowsnest	5	2,556	238 65

TABLE 27.

TOTAL OF TIMBER AND HAY RECEIPTS.

Forest.	Amount.
	$ cts.
Crowsnest	8,979 39
Bow River	20,428 28
Brazeau	1,436 50
Cooking Lake	28 45
Cypress Hills	348 38
Total	31,221 00

NOTE—There was a small revenue from permits for stores which were issued by head office. No record of this is available nor is the record of the revenue derived from mineral resources at hand.

It is almost superfluous to draw attention to the anomalous character of the situation which now exists in the Department in connection with the disposal of timber, particularly in connection with forest reserves. It is specifically provided in section 11 of the Reserves Act that 'Nothing in this Act shall affect or prejudice any right or interest for cutting timber or for any other purpose in respect of any lands within a reserve.' The Act then goes on to provide that when land so licensed is denuded of merchantable standing timber that such land may thereupon be withdrawn from the lease or license. The result of the interpretation which has been placed upon this section is that all of the timber licenses within the forest reserves, which in this district include practically all of the merchantable timber within the reserve, are entirely beyond the control of the Forestry Branch and are administered by the Timber Branch in the Land Office. However, while being deprived of any control of the operations on the berths, the Forestry Branch is made responsible for the protection from fire, not only of the timber adjacent to the berth, but also of all standing timber on the berth itself. The Forestry Branch is also made responsible for keeping licensees from committing trespass by cutting outside of the limits of the berth and it is further given an interest in the land by the provision of the Act which makes possible the elimination of lands from the berth when denuded of merchantable standing timber. It will be readily apparent that this condition of divided authority contains some very clear-cut elements of weakness. Many operations carried on within the limits of timber berths have a very close relationship to the kind of fire protection which may be secured, not alone of that timber located within the berth, but also of all the timber in the immediate vicinity. It is true that the licenses under which these berths are operated provide that 'The licensees.....shall dispose of the tops and branches and other debris of lumbering operations in such a way as to prevent as far as possible the danger of fire in accordance with directions of the proper officers of the Department of the Interior.' This would seem to be a fairly comprehensive provision, but the matter is not quite so simple as it appears upon the surface. The practical result of this provision is that no disposal of debris whatever is made upon the licensed berths, and there can be no doubt that these berths upon which logging operations are going on constitute an ever increasing menace to the fire protection of the timber in their vicinity. One radical obstacle to the only completely effective form of disposing of logging slash lies in a further provision of the licenses which provides that no timber less than ten inches in diameter at the stump shall be cut except that which is actually needed for road construction and other purposes of operation. It is the evident intention of this provision, which contains a further clause that the licensee 'shall not have the right to cut any trees that may be designated by the proper officer of the Department of the Interior as required to provide a supply of seed for the reproduction of the forest,' to provide for reproduction and the securing of a second cut or the maintainance of the crop of timber upon licensed land after the first utilization. The futility of trying to practise forestry by means of blanket regulations which are made to apply to all species, types and conditions of timber over an area which is practically continental in extent is only too clearly illustrated by the results obtained under this clause. However, this opens up a question of considerable magnitude and one which I do not feel properly comes within the limits of this report.

GRAZING.

Under existing Forest Reserve Regulations grazing of live stock within the Forest Reserve is prohibited. There seem to be no reasonable arguments in favour of this absolute prohibition, while there are several reasons why grazing within the forest reserves should be permitted, providing it is done under regulations that will make the grazing subordinate to the primary purpose of forest reserves, which is, naturally, the production of timber. There can be no question that the allowing of unrestricted

grazing within the forest reserves would not only be wholly antagonistic to the extension of the existing timber-bearing areas, but would very likely cause a diminution in the already established tree-growth. Furthermore, these results will take place even under a system of grazing which thoroughly conserved the forage itself and from a stockman's standpoint alone might be considered perfectly satisfactory.

The advantages of permitting grazing within the forest reserve are that, in the first place, we thereby provide for the utilization of a valuable natural resource in the form of grass and other forage plants which otherwise not only goes to waste but actually constitutes a serious fire danger and, in the second place, by having this grass eaten off we do not only reduce the fire danger but the stock in wandering over the reserve cut it up by trails which serve as fire lines, should a fire happen to get out. Furthermore, we secure the friendly interest of a large number of people because of the fact that fires in the reserve endanger the forage upon which their stock is dependent.

In considering grazing within the Rocky Mountains Forest Reserve the one point which must always be kept in mind is that grazing is purely incidental to the larger work of timber administration. It is incidental to this if only because of the fact that the grazing land within the reserve constitutes a very small proportion of the total area of the forest reserve. Grazing lands within the Rocky Mountains Forest Reserve are confined to two very limited classes of land. One of these consists of narrow strips of meadow land lying along the main stream-valleys and seldom exceeding half a mile in width. The other class of grazing land consists of high mountain slopes which for the most part, are in grass because they have been denuded by fire. There is practically no grazing land in the Rocky Mountains Forest Reserve which is devoid of tree-growth because it is above the tree line, since the limit of tree-growth in most instances in these mountains is determined more by the lack of soil than by climatic factors. It is doubtful if more than one per cent of the Rocky Mountains Forest Reserve has any value for grazing purposes and a very large portion of this, lying in the Clearwater Forest Reserve, has an extremely small carrying capacity.

Another factor in connection with the grazing possibilities within the Rocky Mountains Forest Reserve is the shortness of the grazing season. There is only one considerable body of grazing land within the reserve which affords range for stock the year round, and, unfortunately, this is, perhaps, the poorest body of grazing land in the reserve. The great bulk of the remainder is available for grazing only during a three-to-five-months summer season and is divided up into many small bodies of grass lying in narrow strips along the numerous streams which flow out of the mountains into the adjacent foothills and prairies. It appears, therefore, that the grazing land within the Rocky Mountains Forest Reserve, while it constitutes in the aggregate a fair-sized body of land, yet is very widely scattered in small, irregularly shaped areas, interspersed through, and intimately associated with, timber-bearing lands, and that, furthermore, much of it lies at extremely high elevations and is subject to excessive snow-fall, which limits the period of its usefulness to a comparatively short summer season.

If it is admitted that the permitting of grazing within the forest reserves, under suitable regulations, would be beneficial to the reserves, in order to be in a position to draw up suitable regulations, we must keep in mind not only the primary object of the Forest Reserve administration, which is the production of timber, but we must also, after safeguarding this interest, decide upon the fundamental policy in the administration of the incidental resources, which in this case is the forage crop.

Three primary objects suggest themselves in connection with this work. The first is the conservation of the existing range within the reserve. Without doubt it is the duty of the Forestry Branch to handle this resource in a way that will maintain it unimpaired for continuous use in the future. In the second place the

Forestry Branch should have in mind the improvement of the existing range by careful, scientific study of range conditions and methods of handling stock on the range. It has been shown on the national forests of the United States, where there were over 12,000,000 head of range stock grazed within the forests, that a great deal can be accomplished in the improvement of existing range areas when the matter is given the proper expert study. This, however, is a subject which almost of necessity must be dealt with by the Government rather than by private individuals. The third purpose which our grazing administration should serve should be the encouragement of mixed farming in the region adjacent to the reserve. The necessity of bringing about a change in the methods of agriculture in many parts of the western provinces has been before the public for a long time and is very generally understood and appreciated, and any provision whereby small farmers could obtain summer range for stock during the period when their land was under crop would, in my opinion, assist very materially in bringing about the change from straight grain production to mixed farming, which is generally recognized to be so desirable.

There are two systems of administering grazing lands, both of which are used extensively in the United States and in Canada. One of these is the acreage-lease system, which is used by the Dominion Government in the administration of its grazing lands outside the Forest Reserve, and by the State of Texas, by the Northern Pacific and Southern Pacific Railways and the United States Indian Department. The other system is the permit system, which is used exclusively in the national forests of the United States, where more than 12,000,000 head of stock graze annually under permit, and also by certain lumber companies who are owners of timber land in the States on which grazing of stock is carried on.

A brief consideration of the question from the standpoint of the forester will show that there are several important objections to the application of the acreage lease system for the handling of grazing within a Forest Reserve, especially under the conditions which exist throughout the Rocky Mountains. The principal objection arises from the fact that any lease, no matter how carefully worded, must of necessity grant in the lease certain property rights in the land which the Government is bound to respect. Unfortunately, these rights would in many instances be antagonistic to certain lines of forest administration. For instance, under a lease system it would be impossible to close an area to grazing if it was found, subsequent to the issuance of the lease, that grazing was bringing about the destruction of an established reproduction. It would also be impossible to consider the artificial establishment of forests upon land held under a grazing lease, either by seeding or planting, during the term of the lease. It would, furthermore, be impossible to secure reproduction on burns or cut-over land indicated within a lease during the term of this lease, because to secure such reproduction would of necessity involve the closing of the area to grazing stock.

Another very important objection along a different line is in the relation of grazing to water conservation. Next to production of timber perhaps the most important function of the Rocky Mountains Forest Reserve is the conservation of water for irrigation, power and municipal water supply. It is well known that the grazing of stock, particularly sheep, unless very carefully regulated, can have an extremely detrimental effect on the forest as a conservator of water and regulator of run-off. This is particularly true where a watershed is used for a municipal water-supply. For instance, any system of grazing administration which could not be readily adjusted to the requirements of the city of Calgary, which draws its municipal water supply almost entirely from the Rocky Mountains Forest Reserve, would be almost unwise.

From the standpoint of the stockman, also, the permit system has certain advantages over the lease system. For instance, it not infrequently happens that forage is destroyed by fire, insects or other causes. Under the lease system the stock would

have to be removed from the reserve to find forage elsewhere. Under the permit system it frequently happens that allotments may be so readjusted that such removal is rendered unnecessary.

Viewing the subject from another angle, that of the small users of forest reserve range, who, it must be remembered, are very greatly in the majority, it is apparent that the permit system has some very decided advantages. For one thing, under a lease system, small holders would be almost entirely barred from the use of the range which, as stated before, is of necessity only available for a three or four months' period, for the reason that they would not be able to stand the expense of holding their stock upon the extremely small allotments that would fall to their share. This could only be remedied by requiring the fencing of the leases and thereby precluding all possibility of recognizing new applicants who might justly demand some consideration in the use of the range, and it would also very greatly interfere with the administration of the forest reserve by cutting it up with numerous interior fences in a very undesirable way.

The permit system entirely avoids all of these objections. Under this system annual permits are granted to graze a fixed number of stock upon an area whose boundaries are described in a rather general way according to natural features or the limits imposed by drift-fences. This system is extremely flexible and interposes no barrier to readjustments that are rendered necessary to accomplish the objects of forest management above specified. It is of course apparent that to administer a system of this sort there must be a classification of applicants for grazing privileges which will determine the consideration or preference which they will have in obtaining these privileges. Various methods of so classifying applicants have been suggested, but to my mind certain factors appear to have primary importance. In the first place, it will be generally agreed that preference should be given to persons who own improved ranch or farm property over persons who merely run stock as a speculative venture without having a fixed location in the country. Again, among owners of improved ranch and farm property it seems reasonable to give preference to resident owners as against non-resident. Moreover those residents who are in the near vicinity of the forest reserve would naturally have a somewhat greater claim upon the reserve range than those who live at a distance. Furthermore, there seems ample justification for giving preference to the small ranch and farm owner, the home-builder, who in many cases will be greatly handicapped, if not absolutely barred from properly establishing himself and making a living, unless he can secure summer range for the stock which he can carry through the rest of the season upon the products of his land holdings. Keeping these factors in mind, I do not think that any insurmountable difficulty will be encountered in administering regulations that will secure the accomplishment of these objects. Priority in the use of the range has by some been urged as the logical dominating factor in determining preference, but I do not think this is a factor of primary importance. For one thing, a very large part of the range has never been used at all, so that no priority has been established. For another thing, the use of the range which has thus been made has been wholly unauthorized and illegal, and the Government would not be justified in recognizing it as a primary factor in the determination of a preference. Where it is a question as between two owners who are equally qualified in all other respects, I should say that the prior user should secure the preference, but not under any other conditions.

There are, of course, numerous minor details in connection with a system of grazing regulations, based upon such principals as I have outlined, which must be taken into consideration. A number of these were suggested in your report for the year 1912. Much information of value can be secured from the experience of other Governments or large land-owners with a system of this sort. Many other details will have to be settled as cases arise in the field. The most essential factor to be considered is the absolute necessity of having certain fundamental principles care-

fully determined which will guide us in adjusting our regulations and rendering our decisions to meet the varied conditions which arise in the field.

In preparation for the inauguration of a system of grazing regulations within the Rocky Mountains Forest Reserve a very detailed examination of the reserve boundary is being made in order to determine the location and extent of grazing lands adjacent to the boundary, both inside and outside the forest reserve. This is a matter of particular importance for the reason that the forest reserve boundary in a general way shows the limit between the true grazing lands of the foothills country and the absolute forest land of the mountains. It may occasionally happen that small areas are included within the forest reserve which are chiefly valuable for grazing. I have had a number of specific cases cited to me in which it was urged that such lands along the boundary of the reserve were valuable only for grazing purposes and that these lands could be handled much more satisfactorily under a lease system than under a permit system. I have almost invariably found on field examination that the most desirable way of handling these cases was not by modifying the general system, as proposed, but by eliminating these lands from the forest reserve because of unsuitability. The total area, however, of such lands is wholly insignificant, and can very readily be determined by the present boundary examination.

A grazing problem with which the Forestry Branch will probably be called upon to deal is that of furnishing summer range for sheep. At the present time there is no portion of the Rocky Mountains Forest Reserve which is being grazed by sheep, the stock on the reserve being exclusively cattle and horses. I have already pointed out, however, that there are large areas of grazing land within the reserve which have never been utilized for pasture for any kind of stock. Certain of these areas are particularly adapted for sheep range. Aside from the objection to sheep which is made by most cattle-owners, the only objection I have ever heard urged to the running of sheep on the Rocky Mountains Forest Reserve was the presence of wolves and coyotes in dangerously large numbers. Undoubtedly some arrangement would have to be made for the extermination of these animals before sheep grazing in the forest reserve would be very attractive. This could be accomplished either by offering a bounty, or by employing hunters for the special purpose of hunting down wolves and coyotes. In opening the reserve to sheep it would, of course, be necessary to consider the prior claims of owners of cattle and horses who are established along the forest reserve boundary and who in many places will have first preference for the forest reserve range. I do not believe that the Department would be justified in considering the admitting of sheep to any portion of the forest reserve which is now occupied by cattle or which has adjacent to it sufficient cattle to stock the reserve. There are, however, certain valleys which would make excellent sheep range which do not have any cattle running on them at the present time, and which do not have in the vicinity a sufficient number of stock to require all of the forest reserve range, should it be opened to grazing. In such places where access can be had to the range without conflict arising between owners of cattle and sheep, I believe that it it the duty of the Department to make provision for summer grazing of sheep. Three areas of range land which satisfy these conditions are the valley of the Livingston river between the first and second ranges of mountains, the valley of the Kanaskis river, and an area of high mountain-range between the Sheep river and Jumpingpound lying at the foot of the first range of mountains well behind the range, which is now occupied by cattle and horses adjacent to the eastern boundary of the reserve.

TRESPASS.

The subject of timber trespass is something to which I have given particular attention during the past season, because of the fact that such a large expenditure is being made on the forest reserves for the purpose of preventing trespass without

apparently accomplishing any material results. For instance, on the Cypress Hills Forest Reserve, which was created July 13, 1906, the Land Office's records show that last year a total of only $28.33 was collected as the result of eight seizures made of timber cut in trespass on this reserve, while our own records show that $1,089, which is 26·2 per cent of the entire expenditure on the Cypress Hills Forest Reserve was expended for the purpose of preventing trespass. It must be perfectly evident that there is something radically at fault when, on a forest reserve which has been under administration for seven years, it is still necessary to expend over 25 per cent of the total appropriation to prevent the stealing of timber. In striking contrast to this condition is the report of the District Forester of District No. 1 of the United States Forest Service, which adjoins the Alberta Inspection District on the south, covering the thirty forest reserves of that district and extending from Michigan to Washington, and from the International boundary to Utah and Wyoming. The total acreage of forest reserve in this district is in the neighbourhood of 33,000,000 acres, while the total acreage of the Cypress Hills Forest Reserve is only 99,840 acres, and yet in District No. 1 no expenditure was made specifically for the prevention of trespass during the fiscal year 1912, as against 26·2 per cent of the entire allotment to the Cypress Hills Forest Reserve alone.

In the Alberta Inspection District the fundamental defect in our system of handling this matter lies in the fact that the penalty for stealing timber from Dominion lands is so light as to constitute no deterrent whatever. The only penalty which can be imposed, or, at least, which has ever been imposed, on persons cutting timber in trespass is to seize the timber and release it upon the payment of double dues. The dues, however, upon this timber are not fixed at the market value of the timber, but in many cases are as low as one-quarter of the actual commercial value. A very great number of people are perfectly ready to take the risk of cutting timber upon Dominion lands and forest reserves under these circumstances, knowing that even if detected the fine imposed will still allow them to secure the timber at less than one-half its actual market value. The result is that, instead of decreasing, timber trespass appears to be actually on the increase. The only way in which this matter can be successfully dealt with is to make the penalty for the unlawful cutting of timber from forest reserves so severe that persons will think twice before committing such a trespass. In connection with this a vigorous effort must be made to detect and convict in every case where trespass has occurred. This is the system which was followed in the adjacent reserves in district No. 1 of the United States Service and the result is that timber trespass has practically ceased to exist. Unless the matter is handled in this way our annual expenditure for the purpose of detecting unlawful cutting will continue to increase without the slightest improvement in the condition which gives rise to the necessity for this expenditure.

A particularly flagrant trespass which occurred last year was that of the Great West Lumber Company within the Bow River Forest Reserve. This trespass, which occurred in connection with the operations of the Great West Lumber Company on Berth No. 1,100, involved $6,572 worth of timber. It appears that this company operated for two entire seasons wholly outside the limits of its berth. The difficulty, to my mind, is due to the division of authority as regards timber trespass between the Dominion Lands Office and the Forestry Branch. The timber berths inside the forest reserves are specifically exempted from the operation of the Forest Reserves Act, and this has been interpreted to place the control of the operations on these berths in the hands of the Timber Branch of the Land Office. While the Crown Timber Agents have entire control of all operations within the berths, the Forestry Branch is responsible for their protection from fire and it has also lately been ruled that the control of the Land Office does not extend to the requiring of timber berth operators to confine their operations within the limits of the berth. In other words, while the Crown Timber Agent has entire jurisdiction within the lines of the berth, the Forestry Branch is charged with seeing that the operator does not cut outside of these

lines. The practical difficulty arises from the fact that many of the berths are so old that the lines are overgrown and almost completely obliterated. Since the Crown Timber Agents control only the operations within the berths, it therefore devolves upon the Forestry Branch to delineate in some way the limits of these timber berths. This will, of necessity, involve a very large expenditure for surveys unless, as I feel can be reasonably required, the owners of timber berths be required to reblaze and restore such boundary lines as have become obliterated or obscured so that they may readily be located on the ground.

ACCOUNTS.

Next to the improvement of the personnel, one of the lines of the forest administration which called for the most radical reorganization was the system of accounts. Previous to the fiscal year just ended it does not appear that any serious effort was made to ascertain the distribution of expenditures upon the forest reserves nor to keep a cost record of the forest reserve activities according to modern methods of accounting. The permanent staff was paid directly from Ottawa and the officer in charge of each reserve was given an advance of funds from which he settled all charges for temporary emergency labour and for the purchase of supplies. No books were kept which would enable the supervisory officers to determine currently the condition of the appropriation for any one reserve, nor was there any uniform system of keeping books in connection with the cash disbursements of the supervisory officers from the advance made for this purpose. The government was protected only by the requirement that receipts in duplicate for all expenditures above $1 should be submitted, and no other check upon expenditures other than this simple requirement existed. The principal defect in the system, however, arose from the fact that there was practically no record obtained as to the cost of any of the forest reserve activities, so that it was wholly impossible to determine what degree of efficiency was being secured or to fix in any accurate way the responsibility for inefficient service.

One of the first steps taken by my office was an entire reorganization of the accounting system which is as yet not entirely completed. It was not thought desirable to undertake to establish an extremely elaborate accounting system at once for the reason that most of our officers were unacquainted with modern systems of accounting, and had up until the present year not been required to handle work of this sort at all. For this reason it was thought best to employ, at first, an extremely simple method which could later be elaborated to any degree which might be felt to be desirable. The first step was to establish a uniform system of book-keeping throughout the district. By this system a continuous record is kept available at all times for the supervisor's information showing the total expenditure from his appropriation and the balance available. Supplementary to this he has a set of accounts which show the distribution of his expenditure among seven main sub-heads and each sub-head is suitably classified according to its character. For instance, each supervisor is required to keep a separate record of the cost of each improvement project, such as a building, trail, road, etc., and the expenditure for such a project is further classified so that he knows, for each such project, the cost of temporary labour, ranger labour, material, tools, subsistence, freight and miscellaneous charges. The one major defect in the system as in effect during the past year is the fact that no record is kept showing the cost of forest activities in ranger labour aside from the labour which is expended upon permanent improvements. In view of the fact that a total of $47,557.59, or considerably more than 50 per cent of the expenditure in the district, went for salaries during the past year, it is evident that we should have detailed information as to the cost of the various lines of work which were covered by this large expenditure. This omission in the cost-keeping system was deliberate because it was known that any procedure which would secure reliable figures on this subject must of necessity be rather complex and it was desired to introduce no greater

complexity into the system at the start than could be avoided. For the next fiscal year, however, a system of accounting which will give us this information has been devised and will be put into effect.

A very radical change in the method of paying accounts was made in the district. Instead of distributing advances to be deposited to the personal accounts of the forest supervisors and disbursed by them on personal cheque, the disbursements were all concentrated in the office of the district inspector and the supervisors were required to submit their certificates of expenditure to this central disbursing office for payment. The locating of this office at Calgary greatly facilitates the handling of a system of this sort and has worked out to the entire satisfaction of all concerned. It occasionally happens that emergency labour accounts, such as for fire or improvement work, have to be settled in cash at the supervisor's headquarters. In these cases, which have thus far been limited in number, advances of the necessary cash have been made to the supervisor by the disbursing officer at Calgary, and payments have been made with all necessary promptness.

While the organization of the disbursing end of our fiscal system has progressed satisfactorily the subject of receipts has still to be dealt with. The revenue from the forest reserves in this district is as yet small, but it is increasing, and there is no doubt that in a short time it will assume fair proportions. At the present time all the revenue from the forest reserves is received and accounted for by the Dominion Land Agents in whose districts the reserves are located. There is a very decided objection to this method of handling receipts for the reason that under the method of procedure followed in the department the officer who receives the payment must also be the officer who issues the permit or grants the privilege for which the payment is made. While the land offices are equipped to receive and account for payments for privileges granted upon the forest reserves, which is merely a matter of routine, they are not equipped to handle the issuing of the permits for these privileges. The reason for this lies in fundamental differences in the objects aimed at by the administration of the Dominion lands and timber in the Land Office and in the Forestry Branch. So radically different are these objects that a system of procedure and regulations which are admirably adapted to accomplish the purpose of the Land Office administration of timber is absolutely antagonistic to the accomplishment of the Forestry Branch administration of timber. The Forestry Branch is charged not only with the disposal of timber at a reasonable rate, but it is further charged with the disposal of timber under such form of regulations as will accomplish the object for which the reserves were created, namely, the perpetuating of the timber-supply. When timber stands upon agricultural land which it is desired to clear and open for settlement, as is the case with much of the timber outside the reserves handled by the land offices in this district, it is sufficient to provide a procedure which will secure to the government a reasonable price for this timber, insure public competition, and provide that it shall be utilized with a reasonable degree of intensity. When, on the other hand, it is desired, as on the forest reserve, not alone to dispose of the mature standing timber but to do so in such a manner that the land from which this timber is cut will be left in a condition to continue indefinitely to produce merchantable timber, it is obvious that a radically different method of procedure must be adopted.

The same condition exists in regard to the subject of grazing. It is readily possible to handle grazing on the forest reserves through the Land Office in accordance with the system of procedure which has been developed in the land office and with which Land Office officials are familiar. To do so, however, would be radically opposed to the object for which the forest reserves were created, since grazing in the forest reserves is wholly incidental and must be, of necessity, subordinated to the primary purpose of the reserve, which is the production of timber. A system of grazing administration which gives satisfactory results upon land that is valuable and in many cases available only for grazing will not necessarily, or even probably, give

satisfactory results upon land which is intimately associated with timber-bearing areas, as is the case within the forest reserve. Practically the same condition exists in connection with all other privileges which may be secured upon reserved and unreserved Dominion lands, except perhaps as regards mining operations. In practically every line of work the regulations which are adapted to accomplishing the objects aimed at in the Dominion Land offices are either poorly adapted, or in many cases are antagonistic, to the regulations which are required in order to accomplish the objects of the administration of land in forest reserves. For this reason it is obvious that where, as in most land offices, the forest reserve business is simply incidental to their larger work of administering the unreserved public lands, the reserves work must, almost of necessity, be very imperfectly understood and inadequately handled. This leads to continuous misunderstandings between the two branches and to delays for which neither is wholly responsible but which create an extremely bad impression among forest-users. It would seem to be very much simpler to provide a receiving office, to handle exclusively the forest reserve receipts than to endeavour to educate the very large number of Dominion Land Offices which have dealings with forest reserve matters to the objects of the forest reserve administration and the details of field procedure. In fact, as this administration becomes more developed, this difficulty will become very much intensified, and it would appear that it would be more satisfactory to all parties concerned to relieve the land offices of the necessity of receiving and accounting for forest reserve revenue and issuing permits for forest reserve privileges, as has already been done in the case of the Dominion parks.

This work could very readily be handled for the entire district in the office of the district inspector without any very material increase in staff or expenditure and would thereby relieve, in this district alone, five separate land agencies of this class of work, and four separate agencies in the Manitoba district. By adopting this procedure throughout the branch the work which is now distributed between ten separate land agencies could be concentrated in three district inspectors' offices, much to the advantage both of the Forestry Branch and the Dominion Land Offices.

SURVEYS.

One of the most important and fundamental requirements in the organization of a forest reserve is an accurate survey and map. The Rocky Mountains Forest Reserve, since it contains no land of agricultural value, has not been subdivided into sections according to the system of the Dominion Lands Survey. The only sectionized portions of the reserve are in the vicinity of coal mining claims and these surveys, although scattered very widely throughout the reserve, cover a comparatively small total area. Three lines of survey work appeared to be urgently necessary. One of these was the establishment of the eastern reserve boundary. A preliminary line was run at the time the reserve was created, but this line was not marked up on the ground with sufficient prominence to serve the requirements of forest reserve administration. It needs no discussion to show the absolute necessity of having such an arbitrary line prominently marked on the ground in order to guard against timber, grazing and other forms of trespass and to give the public proper notice of the limits of the forest reserve. This boundary marking is being carried on and will be completed by the end of the next year. Throughout those portions of the reserve which border upon a settled community, the line will be marked up in such a way that no reasonable excuse for trespass can be offered.

A second line of survey work is considered to be necessary especially in the large reserves north of the Red Deer river. The maps available in much of this country are hopelessly inaccurate, and before a start at proper organization can be made it will be necessary to correct the more obvious errors. For this purpose a system of

rather extensive topographic mapping will be employed, by which the main stream-valleys will be located with considerable accuracy and the minor features of the country sketched in as time permits. A complete topographic survey based upon a system of triangulation will not be attempted, but reliance for the primary control will be placed upon the base-lines and other lines of the rectangular surveys which have been projected into the mountains. In connection with this work the co-operation of the Topographical Surveys Branch has been secured, and this branch is undertaking to make a photo-topographic map of the entire Crowsnest Forest Reserve during the next year.

The third line of surveys which has been found to be necessary is the accurate location of the sites for ranger stations and cabins, which are ordinarily referred to as administrative sites. It was found that failure to have these sites located by an accurate survey was resulting in the construction of numerous buildings on land which did not belong to the government, or which was encumbered by various forms of leases that interfered with its use for administrative purposes. In some cases, even, cabins were constructed outside the borders of the forest reserve because of inaccurate determination of the location of the building sites. To guard against such errors, supervisors have been required to survey with a reasonable degree of accuracy all sites where it is proposed to construct cabins or other permanent improvements and to submit these surveys together with evidence that the land is owned by the government without encumbrance before receiving authority to proceed with the construction work. The proper location of administrative sites is a very essential part both of the fire plan and the improvement plan, and too much emphasis can scarcely be placed upon getting these sites carefully located and properly co-ordinated with the entire plan for improvements and the plan for fire protection.

FISH AND GAME.

The relation of fish and game protection to forest administration is a subject upon which a great deal of misunderstanding exists. Under the existing laws the fish within the forest reserves are entirely under the control of the Dominion Government, while the game is entirely under the control of the Provincial Governments. In this district the fish situation has been very carefully studied by the Fish Commission, and regulations were drawn up and put in force under date of April 1, 1912. The forest reserves were specifically exempted from the operation of these regulations, but after giving the matter some attention I feel that the situation within the reserve can best be handled by extending the regulations existing outside the reserves to apply to reserved land, with the important modification that all fishing of a commercial nature be prohibited. I do not think that there is any necessity for providing for a specific set of regulations or licenses within the forest reserves, but believe that every purpose of fish protection can be served by allowing fishing within the reserves under the license issued in accordance with the Dominion Fisheries Regulations for the province of Alberta.

Supplementary to this, however, the Forestry Branch should give special attention to the condition of the fish within the forest reserve and should provide closed seasons and special restrictions upon specific streams from time to time as the conditions warrant. It should be readily possible to enforce fishery regulations with the existing force of rangers and patrolmen within the reserves, since of necessity fishing is confined to a comparatively small and closely defined area.

The subject of game protection is radically different from that of fish protection. Hunting differs very materially from fishing in that the operation is not confined to any well defined locality and thereby the chances of detecting illegal operations are very greatly reduced. Suggestions have been made from various sources advocating the creation of the entire Forest Reserve into a game preserve. Any such action to my mind, would be highly undesirable and would lead to very strong and justifi-

able objections from the local population. It must be recognized that the Rocky Mountains Forest Reserve constitutes the only available big-game hunting ground of any importance in the prairie provinces, and that it affords an opportunity for hunting of certain big-game animals which are not found anywhere else east of the province of British Columbia. A very large and growing packing and guiding industry has grown up in the mountains, which is to a considerable extent dependent upon the possibility of securing big-game animals. During the past season I gathered statistics which indicate that the value of the big-game hunting in the Rocky Mountains Forest Reserve to the province of Alberta in the matter of licenses and revenue derived from hunting parties last year amounted to not less than $25,000. It must be further recognized that this industry is as yet in its infancy and that a very material increase can be looked for in a few years. The creation of the Forest Reserve into a game preserve would absolutely ruin this business without serving any good purpose that cannot be readily accomplished by other means. Moreover, the practical administrative difficulties which would be introduced by such an action are, I believe, very poorly understood by the persons who advocate such measures. To accomplish adequate protection within such a game preserve it would be necessary to increase very greatly the force of rangers and the expenditure for forest administration. I have already explained how it is possible, by taking advantage of weather conditions, to reduce very greatly the cost of placing the reserves in a first-class condition for administration and protection and to maintain them in such a condition. This, however, arises from the fact that the fire season is itself limited to a comparatively small portion of the year and that within the fire season the times of extreme danger are further reduced by the local weather changes. In game protection there is no such distinction between periods of great danger and periods of immunity. The game laws may be violated any time of year that a man can get into the mountains, regardless of weather conditions or any other factors, and a game guardian must be continuously on the lookout to prevent such a violation. In this he differs radically from the fire guardian, who can adjust his watchfulness entirely to the conditions of the season and weather. In the popular mind the duties of fire and game warden are generally considered to be very much the same thing. As an actual matter of fact there are certain radical differences which are of considerable importance in forest administration. These differences, however, are not so great that it is not feasible to combine the two duties in the one man, but, unfortunately, the distinction between a forest ranger and a game and fire guardian is likewise not appreciated by most people and this is a far more important one. I have already described the duties of a forest ranger in some detail and from this description it will readily be understood that the combination of forest ranger, game guardian and fire guardian in one and the same person is a practical impossibility. Should the Forestry Branch undertake to administer the Rocky Mountains Forest Reserve as a game preserve, it would be absolutely necessary to provide a complete staff of game wardens distinct from the staff of forest rangers. Furthermore, I am convinced that even such a system would not insure adequate protection, and that the only way in which to secure adequate protection of the Rocky Mountains Forest Reserve as a game preserve would be to place the use of the reserve under the extremly close restrictions which are applied to the Dominion parks. Such restrictions would of necessity prevent the grazing of stock, the cutting of timber and the establishment of camps or summer resorts except under very strict and costly supervision, would interfere in a most undesirable manner with the prospecting of the reserve for minerals, with the development of coal mines, oil prospects, etc., and would involve the establishment of a system of espionage upon travellers and tourists within the reserve that, in my opinion, would be very generally and very justifiably resented. I believe that the object of game protection, about the value of which there can be no question, can be adequately served without disturbing any legitimate interests by the establishment of a series of game refuges

distributed throughout the Forest Reserve, which shall be limited in area and so located as to interfere in the least possible manner with the full enjoyment and utilization of the Forest Reserve for the purposes for which it was created. Close study of the entire reserve should be made in order to fix upon areas which are natural breeding-grounds for game, which can be described by natural boundaries so as to facilitate administration and which do not contain timber, grazing or mineral resources that are valuable public assets. These areas should then be established as game preserves by Forest Reserve regulations, which can be done under the provisions of the existing Forest Reserves Act without requiring any amendment or other parliamentary action. These game refuges would then act as breeding-grounds, from which the surplus would overflow into the adjacent Forest Reserve areas and afford ample opportunities for hunting, both to the local population and to non-resident big-game hunters, who contribute very much to the prosperity of the province both directly and indirectly. One such game refuge lying in the extreme southern portion of the Crowsnest Forest Reserve along the international boundary has already been tentatively suggested. I have also made examinations in many other parts of the Forest Reserve from the International boundary to the Athabaska river with this object in view and will complete this work during the next season.

SUPPLIES AND EQUIPMENT.

The subject of supplies and equipment, although relatively small in comparison with such subjects as organization, improvements, fires, etc., has not infrequently caused considerable loss of time and money. Working as we do under a requirement that practically all office supplies must be secured on requisition from Ottawa, it has not infrequently happened that delays in receipt of necessary supplies have caused delays in field-work, the cost of which many times exceeded the value of the supplies themselves. Similar losses of time and money can be traced to the unsuitability of some of the equipment furnished. The system of procedure now in use is to submit semi-annual requisitions to the supply clerk at Ottawa for routine supplies and to secure emergency supplies from a stock maintained by the district inspector at Calgary. This is working satisfactorily, but the troubles at present experienced are due to the entire lack of standardization in the supplies furnished. This gives rise to great difficulty and expense in making up a proper requisition, to innumerable mistakes and misunderstandings, to the furnishing of much unsuitable equipment, to many unnecessary delays and to a loss of time and money wholly out of proportion to the magnitude of the question involved. The whole matter could be easily and quickly placed upon a systematic and economical basis by adopting a standard list of supplies and equipment, including in this list those articles which experience has shown to be necessary for the office and field work of the Branch, and having all supplies conform to detailed specifications, which, determined after a conference between the head office and the inspectors' field officers, should then be confined to the use of these standard supplies, and not only would the process of making up requisitions be greatly simplified, but a vast amount of correspondence which is now necessary to adjust misunderstandings would be wholly eliminated. Periodic revision of this standard list and the specifications for the equipment by a committee of field-officers working in co-operation with the clerk of supplies would insure the adjustment of the list to any changes in conditions that might occur.

EDUCATION AND PUBLICITY.

Bringing before the public the work being carried on by the Forestry Branch has not been lost sight of in the district, although there has not been any great opportunity to follow up such work aggressively. The fact that most of the work done by the branch lies in very remote portions of the mountains, often as far as two

or three weeks by pack train from the nearest railway point, has a tendency to keep the work of the Branch more or less out of the public eye, which does not occur with those departments whose officers are in constant touch with the public. During the past year the inspector has attended a number of conventions, at most of which he delivered addresses on the work being done in the Alberta Inspection District. The most important of these were the annual convention of the Canadian Forestry Association at Victoria in September, the annual meeting of the Western Forestry and Conservation Association at Seattle in December, a meeting of the forest supervisors and district officers of District No. 1 of the United States Forest Service at Boulder, Montana, in March, and a meeting of the Forestry Club at the University of Toronto during January.

A number of requests for lectures on forestry subjects and the work of the Branch have been received, practically all of which had to be declined because of lack of time and lack of facilities for illustrating such addresses which in most cases was felt to be necessary. It is believed that facilities for giving illustrated lectures at High schools and normal schools, colleges, clubs and other organizations of a similar character would be extremely useful and would be very much appreciated in the district. In order to provide such facilities, several lectures are being prepared, and lantern slides secured, together with a projecting lantern and other necessary apparatus.

The great extent of the forest reserves made it desirable that some method be devised to keep the forest officers throughout the reserves informed as to the progress of development work. To accomplish this object a quarterly publication, or newsletter, has been established known as the 'Rocky Mountain Review.' This paper is edited and printed in the office of the district inspector and contains a statement of the progress of the work on each of the reserves for the quarter, together with other items of interest to the officers of the Branch. It is also distributed to numerous forestry and lumber journals and to institutions which desire to keep informed of the progress of forestry work in the district.

A work which is thought to be of considerable importance, particularly to the employees of the Branch, is the establishment of a forestry library somewhere in the western portion of the Dominion. The inspector's head-quarters at Calgary would seem to be best fitted as a site for this library, because of the fact that such a large proportion of the employees in the outside service of the Branch are located in the Alberta district. There are, unfortunately, no facilities whatever for securing books on this subject in Western Canada, since there is no forest school or other institution provided with such a library, and the public libraries naturally do not stock more than a very small number of such publications. The Forestry Branch Library at Ottawa, while very complete, is too far away to be of much use to field-officers. For these reasons it is felt that a forestry library in Calgary would not only be of immense value to the officers of the Branch, but might be so organized that, with the co-operation of the Carnegie Library in Calgary or the Calgary University, it could be made available under suitable regulations and restrictions for use by the public.

Much interest has been shown by the local newspapers in the work of the Branch, especially in the Rocky Mountains, and every effort has been made to supply these papers with timely news of interest and to prevent the publication of exaggerated accounts of forest fires which frequently find their way into the newspapers unless facilities are provided for furnishing reliable and accurate information.

APPENDIX No. 3.

REPORT OF DISTRICT INSPECTOR OF FOREST RESERVES FOR MANITOBA.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
WINNIPEG, MANITOBA, March 31, 1913.

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

SIR,—I have the honour to submit the following report on the several forest reserves in Manitoba and Saskatchewan, for that portion of the year ending the 31st instant, during which I have been the inspector, namely, since June 1 last.

RESERVES.

There are nine forest reserves in my district, namely, the Riding Mountain, Duck Mountain, Porcupine Mountain, Turtle Mountain, Spruce Woods in Manitoba, with the Moose Mountain, Beaver Hills, Pines and Nisbett in Saskatchewan.

STAFF.

On the above reserves 34 officers were employed as per Table No. 1.

WORK.

The work in which these officers were engaged was providing for the protection and management of the reserves by erecting houses for supervisors and forest rangers, cabins, stables, caches, telephone lines, cutting fire-lines, boundaries and trails, ploughing fire-guards, cutting out and constructing telephone lines, cruising for timber, locating tracts where settlers could obtain supplies of timber, patrolling for and fighting fire, watching timber-cutting operations, seeing that persons cutting timber left the debris in piles for burning, burning old slashes, taking requisitions and settlers for timber and hay permits, checking the cut and returns of cuts, collecting dues, taking up expired permits, making seizures of illegally cut timber or hay, and collecting dues where required.

BUILDINGS.

Some thirty buildings have been erected, one house commenced and two previously in use improved. Other buildings are provided for, to be taken in hand when the weather permits. The class and distribution of these buildings on the several forest reserves is shown in the attached Table No. 2.

It is the intention to have all rangers, and some of the supervisors reside permanently on the reserves, as soon as accommodation can be provided, and it is hoped that this will be in the near future, as it has been found that their residence away from the work causes considerable loss of time.

BOUNDARIES AND FIRE-LINES.

The boundary lines of the reserves are being cut out and marked as fast as circumstances will permit, and a very considerable proportion of some of the older

reserves has already been finished. So far, no general practice has been established nor is it thought possible to do so, owing to the different conditions prevailing. Various plans have been tried, such as (1) cutting wide lines through the bush country, piling the debris in the centre and burning it; (2) cutting lines of similar width, piling the debris in the centre and ploughing the full width of the cleared space; (3) ploughing two to four furrows on either side of the wide line and burning between (with the intention of later on ploughing the full width of the strip). The relative advantages of these different plans have yet to be established.

Owing to the broken nature of the land in many districts ploughing cannot be done, and the best method of protecting such areas has not been ascertained, but it is hoped that a burning machine, now being developed, may prove successful.

A scrub-cutting machine of recent invention, which has proved its usefulness and practicability, is to be tried this season on the Turtle Mountain Forest Reserve, where conditions are thought to be most favourable, and if it proves a success this machine can be moved to other localities or additional machines can be secured.

The trails through many of the forest reserves are expected to prove of great assistance in reducing fire risks, and these will be further improved as circumstances will permit.

FIRES AND FIRE-FIGHTING.

Owing to the very favourable conditions of last summer, I am able to report that practically no fire damage was done. In the Duck Mountain Forest Reserve one fire covered some 145 acres, did estimated damage of $100 and cost $79.50 to extinguish; another in the Riding Mountain forest reserve, was more of a prairie than a bush fire, covered some 400 acres, but did not destroy any timber of value and cost $3 to check.

Such favourable conditions can hardly be looked for again during the coming season, and the matter of establishing and maintaining efficient fire-guards should be one of the chief objects of the officers of the Branch; the public should also be fully instructed to be most careful in lighting fires when clearing land, and compelled to watch such fires closely at all times.

Fire-fighting equipment has been furnished to the forest rangers, in the way of tools, and on the Duck Mountain Forest Reserve, twenty strongly built boxes have been distributed, some among the forest rangers, others with responsible settlers residing close to the range. Those boxes are well painted and fitted with locks, and each contain six round-mouthed shovels, three grub-hoes, two axes, three canvas water-buckets, and file for sharpening tools. The settlers with whom these have been placed have arranged to act as foremen in case of an outbreak of fire, to secure immediately such assistance as may be necessary and to notify the supervisor or nearest forest ranger, without delay. They are to receive slightly higher pay, while engaged, than the ordinary men.

Lookout towers on commanding hills are to be erected, some sites have already been selected and a portion of the required material placed. Where possible these will be connected by telephone with the rangers' houses and headquarters, and outside points, so that assistance may be secured without delay. The lower portion of these towers will be arranged as shelters for camping in, store rooms for tools and provisions as well as telephone booths.

ROADS AND TRAILS.

The roads and trails given in the table cover, as far as shown, are all existing, both new and old. These latter will be improved as speedily as possible, by widening, clearing, bridging, etc., and they, in conjunction with the new ones, will furnish easy access to the interior and enable fire-fighters to reach seats of danger, settlers to take out timber, and the reserve officers to traverse the reserves much more quickly

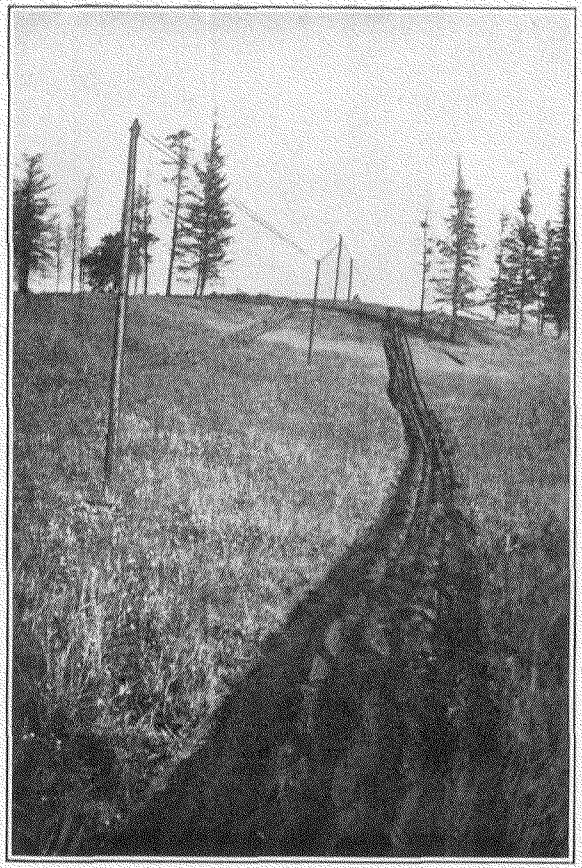


Photo E. C. Wellman.

Fire-guard and Telephone Line on Duck Mountain Forest Reserve.

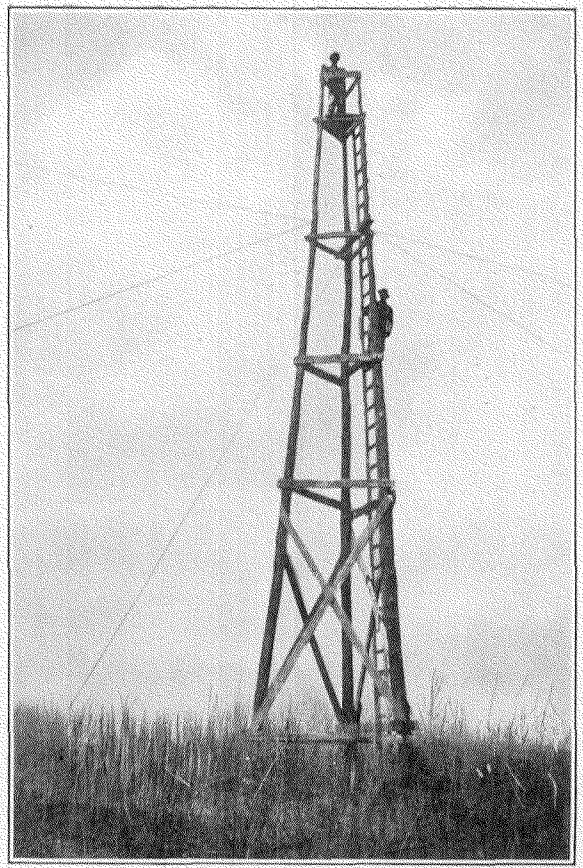


Photo E. C. Wellman

Deepdale Lookout Tower, Duck Mountain Forest Reserve.

than is now possible, many long detours being at present necessary. Some of this work will entail considerable expense, especially is this the case with an old colonization road originally built by the provincial government in the Riding Mountain reserve, connecting the Dauphin and the Gilbert Plains country with the south at Elphinstone, on which there are several muskegs requiring bridges or substantial corduroy. This, however, has been in general use by the public while passable, and it is hoped that the provincial authorities may render some financial assistance, as also, perhaps, in the case of other roads similarly used.

The forest rangers will be called on to locate and plot on maps such trails as exist in their several districts.

One very important road is that which was commenced this winter, starting at the northwest corner of the Riding Mountain Reserve, running southeast to connect with one from near Norgate opened to Clear lake. It will have connections with the ranger stations, to two of which it is already connected, and some sixty-five miles of the main road and offshoots have been completed. The deep snow prevented further work this spring. All streams met were bridged, soft places conduroyed, and telephone poles distributed as far as the supply found adjacent would permit.

When completed this road will enable forest officers to traverse the reserve from one end to the other, touching at all ranger stations, and will obviate the long detours on roads outside of the reserve that are now necessary.

TIMBER-CUTTING OPERATIONS.

The establishment of forest reserves and enforcement of the regulations being of comparatively recent date, prior to which settlers could cut and slash with great freedom, considerable difficulty has been found in securing compliance with the regulations, but it is hoped that ere long the public will awaken to the fact that it is imperative for the welfare of the country as a whole that all possible precautions be taken to protect the rapidly diminishing supply of merchantable timber, and to secure a new stand, by guarding the growing trees, manufacturing in the most economical way, and replanting as rapidly as the appropriations and conditions will allow.

Three small new berths were disposed of in the Riding Mountain reserve and a renewal granted for one other in a certain burned district. These were granted to the successful tenderers after public competition had been invited, and carried the right to locate a saw-mill on the berths secured and dispose of the product on the open market; the stumpage dues offered were $2.10 and $2.25 per M feet, board measure. The successful tenderers made deposit of $100 each furnishing bonds of $200 by themselves and two securities, guaranteeing that they would operate in accordance with the regulations governing such berths. Further, each holder takes out a permit for such amount of lumber as he considers he can manufacture during the season paying twenty per cent of the dues down, and the balance from time to time as his returns of manufacture, made each three months, show how he is indebted.

PERMITS TO LOCATE MILLS TO OPERATE IN GREEN TIMBER.

Permits to locate mills in the reserves were granted to two individuals and a renewal of one from last year was issued. These provided that the operator might locate where directed by the supervisor of the reserve, and cut such timber as is mature and advisable to have taken out, the product to be disposed of only to settlers under permit. The mill may be located as soon as the application has been accepted by the Department, and cutting may be done to the extent of 100,000 feet board measure, in advance of the securing of settlers' permits, thus enabling the operator to do his work before the snow gets too deep, and have a supply on hand with which to fill such permits as may be presented to him. The right to so locate was secured by public competition, a deposit of $100 was made, and bonds of $200 by the owner and two

securities given for the carrying out of the conditions governing the contract. The chief consideration taken into account in accepting such tenders as were offered were the class and equipment of the mill, the prices at which the tenderer agreed to deliver lumber to the settler, and the general standing of the applicant as a mill and bush man. This plan is thought to be of great benefit to the settlers in saving delay and to the Department in the reduction of waste, and the logging being done by one person who has a vested interest, the forest officers find it less difficult to enforce the regulations.

The prices at which the several operators agreed to deliver timber to settlers at the mill are given in the attached table. These figures do not, however, include the Government dues.

REVENUE.

Attached is a table giving returns of timber taken from the several reserves during the fiscal year, with revenue from same.

SUMMER RESORTS.

Two summer resorts are in existence, one at Max Lake in the Turtle Mountain Forest Reserve, where a number of houses have been erected, some for several years; new ones, moreover, will be put up this season. It is largely patronized by the residents of the towns in the vicinity, and persons from a distance are expected to build in the near future. Efforts have been made to induce someone to establish a refreshment booth and stable for the accommodation of campers, but so far without success. A site for a recreation ground will be selected and improved, but as yet no area sufficiently level has been found.

The resort at Fish Lake in the Moose Mountain reserve has attracted a number of people. A road has been built to it, and this will be further improved and it is expected that more lots will be taken up and houses built during the coming summer. This is an ideal spot, the bathing, boating and fishing being excellent.

Madge Lake in the Duck Mountains, within easy reach of Kamsask, is a favourite camping ground. So far no houses have been built, but a road has been made and this season more people are expected to take advantage of this charming spot.

Clear Lake, in the Riding Mountain, will, it is thought, be largely used by the inhabitants of the towns and villages to the south, as soon as a survey can be made of a portion of the shore to be set apart for lots, and it is the intention to improve the road leading to it, so that automobiles can travel on it.

I would suggest that every possible endeavour be made to open up any suitable locations for such resorts, as being a means of securing the interest of the public in the preservation of the forest reserves in general.

GRAZING.

In the tract on the Turtle Mountain (some 27,000 acres, fenced for this purpose), 94 head of stock only were taken in, the fees being $92.75. The stock is the property of eleven owners. The results were so good that it is expected that many more settlers will this year avail themselves of the privilege. This work will no doubt be extended to other reserves, where pasturage facilities exist, and requests have already been made by stock-owners for similar enclosures to be made on the Spruce Woods and Riding Mountain reserves.

Respectfully submitted,

F. K. HERCHMER,
District Inspector of Forest Reserves for Manitoba

Schedule of Officers attached to Reserves.

Reserve.	Supervisors.	Forest Assistants.	Forest Rangers.	Assistant Rangers in Winter.	Herders.	Game Guardians.
Riding Mountain	1	1	7	2		
Duck Mountain		1	7			
Porcupine Mountain	1					
Moose Mountain	1		1			1
Turtle Mountain	1		1		1	
The Pines	1		2			
Nisbet						
Spruce Woods	1		1			1
Beaver Hills	1					
Total	7	2	19	2	1	2

Settler's Permits issued by Manitoba Agencies.

Reserve.	No. of Permits.	Lumber.	Logs.	Cordwood	Fence-posts.	Fence-rails.	Roof-poles.	Receipts.
		Ft. B. M.	Lin. Ft.	Cords.	No.	No.	No	$ cts.
Dauphin Agency :—								
Riding Mtn	411	1,174,781	8,660	3,329	11,685	2,840	800	2,145 70
Duck Mtn.	240	778,147	12,214	1,138	12,959	15,000	3,143	1,235 12
Porcupine								
Total	651	1,952,928	20,874	4,467	25,270	17,840	3,943	3,380 82
Brandon Agency :—								
Riding Mtn	1	10.000						30 25
Turtle Mtn.	190	36,200	1,400	4,267				161 50
Spruce Woods	57		1,000	1,113				40 00
Moose Mtn.								
Total	248	46,200	2,400	5,380				231 75
Summary	899	1,999,128	23,400	9,847	25,270	17,840	3,943	$3,612 57

Settlers' Permits issued by Saskatchewan Agencies.

Regina Agency :—								
Moose Mtn.								
Estevan Agency :—								
Moose Mtn.	16			156				21 25
Saskatoon Agency:—								
The Pines	2		200	4				2 50
Prince Albert Agcy :—								
The Pines	53	64,070	9,500	1,110	4,600	10,060	3,000	212 75
Yorkton Agency :—								
Beaver Hills	83			1,156				20 75
Duck Mtn	17	106,759						25 25
Summary	171	170,829	9,700	2,426	4,600	10,000	3,000	$282 50

Grazing Permits.

Reserve.	No.	Head.	Receipts.
Turtle Mtn	11	115	$92 75
Total	11	115	$92 75

Lease of Camping Lots.

Reserve.	No.	Lots.	Receipts.
Turtle Mtn	42	42	$122 75
Total	42	42	$122 75

Schedule of Trails—Old and New.

Reserve.	Length in miles.
Duck Mountain	90
Riding Mountain	150
Spruce Woods	30
Turtle Mountain	50
Moose Mountain	20
The Pines	50
Beaver Hills	12
Total	402

Schedule of Enclosures.

Reserve.	Area enclosed.
	Acres.
Duck Mountain	15
Riding Mountain	50
Spruce Woods	1
Turtle Mountain	27,000
Total	27,066

Schedule of Telephone Lines.

Reserve.	Miles in Reserve.	Miles out of Reserves.	Total Miles.	Instruments installed.
Duck Mountain	22½	1½	24	3
Riding Mountain	21	4	25	2
Spruce Woods	3	2½	5½	1
Turtle Mountain	2½	1½	4	1
Total	49	9½	58½	7

Schedule of prices charged by Millowners operating in Forest Reserves on Timber under Settlers' permits per M ft., board measure.

Location.	Spruce, Jack Pine Tamarack, Balsam Fir.	Poplar.
	$ c.	$ c.
Riding Mountain No. 1	14.00	12.00
" " No. 2	15.00	14.00
Duck Mountain	12.00	.....

Sawing only.

Location.	Spruce, Jack Pine Tamarack, Balsam Fir.	Poplar.
	$ c.	$ c.
Riding Mountain No. 1	5.00	5.00
" " No. 2	6.00	5.00
Duck Mountain	.....	.....

Schedule of Nursery.

Reserve.	No. Beds.	In Good Order.	Estimated No. Trees per Bed.	Two Years in Bed.	Total Seedlings.	Transplants Set Out.	Species of Trees.
Spruce Woods	40	31	3,500	3,150	108,500	4.665	White Spruce, Jack Pine, Scotch Pine, Bull Pine, Lodgepole Pine, Douglas Fir, European Fir, Tamarack.

Schedule of Buildings.

Reserve.	Houses Complete.	Houses in course of Erection.	Cabins.	Stables.	Storehouses.	Telephone Booths.
Duck Mtn	2	1	2	3	2	
Riding Mtn	3		2	3	1	1
Spruce Woods	1		2	2		
Turtle Mtn	1		2	1	1	
The Pines	1			1		
Moose Mtn	1			1		

Timber seized.

Reserve.	No. of Permits.	Lumber.	Logs.	Cordwood	Fence-posts.	Fence-rails.	Roofpoles.	Receipts.
	No.	Ft. B.M.	Lin. ft.	Cords.	No.	No.	No.	$ cts.
Riding Mtn	12	1,318,482	540	12				1,333 10
Duck Mtn	3	6,870		10				97 60
Spruce Woods								
Turtle Mtn								
Porcupine								
Total	15	1,325,352	540	22				$1,430 70

Excess paid on Timber Permits.

Reserve.	No. of Permits.	Receipts.
Riding Mtn	20	$50 30
Duck Mtn	26	42 55
Total	46	92 85

Hay Permits issued.

Reserve.	No. Permits.	Tons.	Receipts
			$ cts.
Dauphin Agency—			
Riding Mtn	53	977	108 70
Duck Mtn	4	25	4 50
Porcupine			
Total	57	1,002	113 25
Brandon Agency—			
Turtle Mtn	52	821	110 1
Spruce Woods	14	230	34 50
Total	66	1,066	144 60
Summary for Manitoba	123	2,062	257 85
Regina Agency—			
Moose Mtn	22	350	67 00
Estevan Agency—			
Moose Mtn	9	207	18 25
Saskatoon Agency—			
The Pines			
Yorkton Agency—			
Beaver Hills			
Duck Mtn			
Prince Albert Agency			
Summary	31	557	$85 25

Dead Timber Berths.

Reserve.	No.	Receipts.
		$ cts.
Riding Mtn	4	705 75
Total	4	$705 75

Green Timber Berths.

Duck Mtn	1	100 00
Riding Mtn	1	100 00
Total	2	$200 00

APPENDIX No. 4.

REPORT OF DISTRICT INSPECTOR OF FOREST RESERVES FOR BRITISH COLUMBIA.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
KAMLOOPS, March 31, 1913.

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

SIR,—I have the honour to submit herewith an annual report of the work done under my supervision in the Kamloops District of the Railway Belt of British Columbia during the year ending March 31st, 1913. The Kamloops District includes that part of the Railway Belt lying between the boundary line between Township Tiers 10 and 11, west of the 6th Meridian, easterly to the Alberta boundary.

The activities of the Forestry Branch in this district can be divided under three main heads, viz., forest reserves, fire ranging and Railway Commission co-operation, and will be dealt with separately.

FOREST RESERVES.

The forest reserves in the Railway Belt comprise a total area of some 523,000 acres, consisting of isolated plateaux or table-lands of from 3,500 to 6,000 feet, with occasional peaks rising considerably higher in some localities. These plateaux are clothed almost entirely with lodgepole pine. Douglas fir and yellow pine occupy some of the lower slopes on the outer edges, and form the only tracts of really merchantable timber on these forest reserves.

These forest reserves all form the headwaters of numerous small streams and creeks which descend from them to the main drainage levels in all directions. Situated as they are in the 'Dry Belt' these waters are very valuable for irrigation purposes. Indeed, watershed protection rather than timber conservation was the main reason for establishing these reserves.

Personnel.—The administration staff during the summer season of 1912 consisted of five forest rangers, three of whom are permanent appointees. These rangers worked directly under the direction of the inspector's office at Kamloops. The appointment of a forest supervisor was made during the winter. To this officer will henceforth be delegated the actual administrative work on forest reserves.

From the above statements it will be seen that the average area under the charge of each forest ranger is about 104,500 acres. On this area he is supposed, not only to prevent fires, but also to handle the timber and grazing business, and locate and construct trails, lookouts and other improvements. Under an efficient administration the fire patrol should be merely a side-line in a ranger's duties. The size of these districts precludes this possibility under present conditions, but it is hoped by the employment of temporary guards and establishment of lookout patrols to reach this stage of development in the near future.

Improvements.—Owing to the inadequacy of the appropriations available no extensive improvement work was undertaken last year. The only improvements important enough to be put on a project basis were the opening up of some 22 miles of

trail in the Long Lake Forest Reserve at a cost of about $275, and the beginning of the construction of a stable for the ranger station at Trout Lake in the same reserve.

The total amount spent on improvements on forest reserves amounts to some $522, or approximately one-tenth of a cent per acre.

In addition to this cash expenditure the rangers spent a proportion of their time in building corrals, opening trails and similar work. Ranger labour on improvements amounted to $630, or approximately eleven-hundredths of a cent per acre.

Timber.—The demand for forest reserve timber in this district was practically nil last year, only two applications for settler's permits being received. This condition of affairs is due to two main factors, first, that there is a surplus of timber in this country, and, secondly, that these reserves being as above stated, namely, watershed-protection reserves, are situated in remote and fairly inaccessible spots, so that it is much easier for settlers to obtain timber from vacant Dominion lands outside of the forest reserves and nearer the settlements.

As settlement gets farther back sone timber will doubtless be required. Another source of demand will come from irrigation projects and summer resorts. The extensions proposed to the reserves also, being along the borders, approach now nearly to the settlements, and, containing as they do, from their lower elevation, timber of rather superior quality, will doubtless give rise in time to a quite active demand for timber.

Grazing.—The grazing business on the forest reserves already established in the railway belt is destined to become of much greater importance than the timber. The great increase in the world markets and consequent permanent high price of beef is a great stimulus to the cattle industry in this country.

The rapid settlement of the district and consequent depletion of leased grazing land of 50 per cent or over of the best areas and nearly all the watering places under homestead has necessitated the cattlemen depending more and more on forest reserve land for grazing. At the present time the use of leased land is practically confined to winter feed and spring calving, the forest reserve being used throughout the summer.

It will be seen, therefore, that the forest reserves are of paramount value to the cattle business. A computation of the acreage available for grazing outside the reserves shows that total holdings of leased and freehold do not amount to more than forty per cent of the pasturage necessary to support the stock already owned. The forest reserves supply the other sixty per cent and can supply in addition, without overstocking, range for over twice the number of stock now owned in the country adjacent, provided that proper regulations were enforced.

Up to the present time there has been absolutely no administration of grazing in the forest reserves, and the cattle have ranged free throughout them since their establishment. The result is that the more accessible ranges have been much overgrazed, are being trampled out, and are in danger of permanent deterioration, while at the same time tens of thousands of acres of first-class grazing land are absolutely untouched.

The time has come for a rational administration of this resource. The new regulations recently drawn up provide the vehicle necessary and it is hoped that they will be put into force soon.

Table 1 shows the range area available in the grazing reserves, the number of stock using the range and the approximate range-capacity of each reserve:

TABLE 1.

DETAILS OF GRAZING ON BRITISH COLUMBIA RESERVES.

Forest Reserve.	Range Area.	Altitude.	Present Use.	Range Capacity.
	Acres.	Feet above sea-level.	Head of stock.	Head of stock.
Long Lake	75,000	3,500 to 4,500	1,500	5,000
Tranquille and Extensions	80,000	3,500 to 5,500	4,000	10,000
Hat Creek and Extensions	150,000	4,000 to 6,000	6,000	10,000
Niskonlith	50,000	3,000 to 5,000	2,000	5,000
Totals	355,000		13,500	30,000

Under the schedule proposed in the new regulations a net income of from $6,000 to $7,000 would accrue to the Department without imposing any hardship on the owners.

Boundaries.—The boundaries of existing forest reserves in the Railway Belt were delineated more or less arbitrarily, being agreed upon in the office rather than examined in the field. This was sufficient at the time of their creation, inasmuch as the sole idea was watershed protection. Only the headwaters country being important, it was sufficient to take a good safe boundary.

The rapid settlement of the country and increasing scarcity of timber led many people into homesteading lands for their timber. This soon made it necessary that examinations be made of the country lying adjacent to the forest reserves for the purpose of delineating properly the boundary of the absolute forest land, in order that it might be reserved for forest purposes rather than homesteaded for the timber growing on it.

The spread of information regarding the value of irrigation led to requests being made to the Department that other watersheds be included in forest reserves.

As early as 1908 examinations were made of the present forest reserves and new boundaries were suggested. This work was done by A. O. Wheeler, then of the Topographical Surveys Branch of the Department of the Interior. In 1909 surveys under the direction of J. R. Dickson, a forest engineer in the employ of the Forestry Branch, were made of other watersheds. He recommended that reserves be established in the Mount Ida and Fly Hills countries adjacent to Salmon Arm, and in the country lying east of the Thompson river between Ashcroft and the Nicola river over to the west boundary of the Long Lake Forest Reserve. No action, however, was taken on any of these reports until April, 1911, when the lands included were withdrawn from disposition by the Lands Office.

During the interval many entries had been granted by the Lands Office for lands within these proposed additions. This necessitated further corrections which were made jointly by the Superintendent of British Columbia lands, the Dominion Lands Agent at Kamloops and the District Inspector of Forest Reserves for British Columbia. The revised schedule was authorized in January, 1913. This schedule also included proposed reserves delineated during the season of 1912 by a forest survey in charge of H. S. Irwin and his successor, Bruce Robertson. This survey was the first placed in the field susequent to the organization of the British Columbia Inspection District.

It is the intention of the Forestry Branch to define the boundaries of all tracts of non-agricultural lands within the Railway Belt for the purpose of having them created into forest reserves. Lands within the 'Dry Belt' are being examined first, as the necessity for watershed protection is of the greatest importance. The additions proposed by this survey will, if passed, add some 540,120 acres to the forest reserve area in British Columbia.

A winter-reconnaissance party was put in the field on the Long Lake Reserve last December in charge of Forest Assistant K. G. Wallensteen. The object of this survey was to find out whether a fairly intensive reconnaissance could be carried out in winter as economically as in summer. If the experiment proved successful, it was thought a solution would be found for utilizing the time of permanent employees in the winter when the ordinary reserve work slackens off considerably owing to the depth of snow and general impassibility of the country. The experiment was not altogether a success from the point of economy, owing to the lack of experience in handling the problem of transportation of supplies and outfit. During the winter, however, methods were developed for solving this problem, so that it is expected that next winter a party can be operated with comparatively little extra cost over summer work. These methods include the packing in of the supplies and caching at convenient points in the district to be surveyed before the snow comes in the fall. The actual work of surveying is done on skis and snowshoes, depending on the character of the country. Where the former can be used they are much more efficient than the latter. The fact that the men are urgently needed in other work during the summer, and are not available for this work justifies their use in winter reconnaissance even at an increased cost of 10 to 25 per cent.

Interesting data were obtained by this survey in connection with silvical types in the forest. The lodge-pole pine, which is at present practically in complete possession, is only a temporary fire-type. It will be replaced under natural conditions by Douglas fir on the lower levels and Englemann spruce on the higher. Both of these species are of much greater commercial importance than the lodge-pole, so that the future of the reserve from an economic point of view is very bright.

In accordance with the policy of the Department to encourage public use of forest reserves a summer-resort town-site was recently surveyed at Trout Lake, a famous fishing resort in the Long Lake Forest Reserve. This resort, being at an altitude of 4,100 feet. has a magnificent summer climate, moderate days being succeeded by cool nights, in delightful contrast to the oppressive heat of the lower levels. Lots of two kinds are available to the public, viz., building lots, leased for a term of years and camping lots leased for the season, both at a nominal rental. Many applications for leases have been received, so that the success of this project is assured.

An interesting fact showing how the public appreciate this locality may be cited in the request from certain ladies of Kamloops to be allowed to construct a house to accommodate poor mothers with children during the hot weather when the infant mortality in town is very serious. This request received favourable consideration. and the building is well under way at the time of writing. Instances of this sort will go far to educate the public into the correct idea of the reservation of these areas of the public domain, viz., that they are for the use and enjoyment of the citizens of this country for all time.

FIRE-RANGING.

The Kamloops division of the Railway Belt was divided in 1912 into two fire-ranging districts, viz.:—

1. *Revelstoke District,* including that part of the belt lying east of Three Valley.
2. *Salmon Arm District,* including that part of the belt between Three Valley and North Bend.

Revelstoke District.—This district includes the western slopes of the Rockies, the whole of the Selkirks and the eastern slopes of the gold range within the railway belt boundaries, consequently the country is of a very mountainous and inaccessible nature.

The climate varies from a region of fairly heavy precipitation in the Columbia valley at Revelstoke to a fairly dry climate around Golden. Unfortunately, the rainy seasons occur so as to give comparatively dry periods in the spring and fall, times when the fire hazard is naturally greatest owing to the accumulation of vegetable matter. These conditions, while they may be described as average, are by no means of invariable occurrence. Extreme irregularity and uncertainty of precipitation is a noticeable meteorological feature of the country.

The timber of the country varies with the climate. On the Revelstoke side the heavy western cedar-hemlock type is found in the river-flat and lower benches, with Englemann spruce, Douglas fir, Alpine fir, Mountain balsam, and Western larch, in addition, on the mountains. On the Golden side the flats and benches bear principally spruce, lodge-pole pine and Douglas fir and, the mountain slopes have Alpine fir (Mountain balsam) in addition.

The fire hazard throughout these regions is abnormally high; indeed it might well be described as the highest in Canada. This is due to the climatic conditions mentioned above and to the nature of the forest itself. The latter factor may be subdivided into two, viz.: (1) natural conditions, and (2) artificial conditions. Natural conditions include the debris piled on the forest floor through windfall, natural decay, etc., which, especially in the cedar-hemlock type is very great. The interior of hollow cedar logs is very retentive of fire, which has been known to smoulder all winter under the snow and break out again on the coming of the dry weather in the spring. Another noticeable condition increasing the fire hazard, especially in the Golden district, is the presence of mosses and lichens of various kinds hanging from the lower dead limbs of the timber. These, being very inflammable, aid a ground fire to become a crown fire in a very short time.

Artificial conditions include the slash left after logging and clearing operations. This factor is by far the most important of any affecting the fire hazard in this part of British Columbia. Being artificial, it is, unlike the natural conditions mentioned above, capable of alleviation. The solution of this problem is the great question before the fire-protective resources of British Columbia at the present time. It is expected that during 1913 experiments will be instituted to secure data on this subject, which can be presented to the lumbermen as proof that it is to their own interests in the cause of true economy to burn their slash after each logging operation. Over 90 per cent of the disastrous fires which have done such incalculable damage to the timber of this country have owed their origin to a fire starting in slash. Every lumberman knows that it is inevitable that every slash will burn sooner or later. He is, in most cases, simply gambling on getting through with the locality before the catastrophe happens.

Sections (*e*) and (*f*) of the license under which timber berths are granted by the Department read as follows:—

> (*e*) That the licensee shall take from every tree he cuts down all the timber fit for use and manufacture the same into sawn lumber or some such saleable product and shall dispose of the tops and branches and other debris of lumbering operations in such a way as to prevent, as far as possible, the danger of fire in accordance with the directions of the proper officer of the Department of the Interior.
>
> (*f*) That the licensee shall prevent all unnecessary destruction of growing timber on the part of his men and exercise strict and constant supervision to prevent the origin or spread of fires.

These sections contain ample provisions to enable the Department to compel the lumbermen to adopt logging methods which would adequately safeguard the

future of the forest. Up to the present, however, no consistent effort has been put forth to enforce these regulations. Things have now gone so far, and some of the berths have changed hands so often, that it is probable the present owners might be presumed to have a right in equity to cut timber as they liked. It would appear a good investment, however, from an economical point of view, on the part of the Department, to remit a part of the dues or the royalty on the logs, when the logging is done in a careful and conservative way with some consideration for the succeeding, as well as the present, crop.

Comprising, as it does, a succession of mountain ranges, the Revelstoke district is for the most part of a very inaccessible nature. This makes the work of fire patrol and fire fighting particularly arduous. A fire ranger may discover a fire from some lookout point and have to travel a couple of days through trackless forest before even reaching the spot. If he decided or finds that assistance is necessary he may have to journey two or three days to the nearest settlement for men and supplies. In order to help to alleviate the situation, caches of tools have been put in throughout the region, and arrangements have been made with the railway company and with lumber camps, where found, for men available on call for fire fighting. Improvement work on a comprehensive scale is being planned to open up this country for fire-protective purposes. Such improvements include the construction of trails, tool caches, lookout stations and telephone lines. It is expected that a start will be made on this work during 1913.

The Revelstoke district is divided into twelve ranger districts. These men cover some 265,000,000 acres, or approximately 221,000 acres per man. They are supervised by a chief ranger, who is supposed to spend his time travelling from district to district and in being at every large fire to superintend operations and pay off the men. Nine of the fire rangers were newly appointed last year and in nearly every instance gave very efficient service. Considerable credit is due to the chief ranger, also a new appointee, for the able way in which he handled a very trying and difficult fire situation.

Last year a new Forest Act was passed by the Provincial Legislature which prescribed a close season for burning, during which permits have to be obtained for setting out fire. Under an agreement entered into by the Director of Forestry and the provincial Minister of Lands and Forests, the Dominion fire rangers took over the issuing of these permits within the limits of the railway belt. This co-operation led to much increased efficiency in the control of the settler's fire problem, and resulted in a great saving in trouble and expense to both parties.

On the conclusion of the fire season last fall a ranger's meeting was held at Revelstoke, at which the experiences of the different men were related and methods of patrol and fire fighting were discussed. The rangers were unanimous in asserting the importance of the question of slash disposal, and a large proportion of the time was spent on this subject.

The following resolutions passed are of interest:—

1. WHEREAS the question of slash disposal is the most important from a fire-preventive standpoint of any in this province,

RESOLVED, that in the opinion of this Conference, steps should be taken by the Dominion and Provincial governments to institute experiments to determine the safest, most efficient and most economical method of disposing of such slash. Carried.

2. WHEREAS it is not consistent or just that private corporations and individuals should be compelled to take certain steps in regard to the clearing of the rights of way and logged-over areas while the government roads are left in a dangerous condition through carelessness in leaving brush and debris undisposed of, and whereas numerous fires have already occurred and been fought by members of this conference, resulting from the leaving of such debris,

RESOLVED, that in the opinion of this Conference, steps should be taken immediately by the provincial Department of Public Works towards having debris and brush along the rights of way of provincial roads, both those now completed and those in course of construction, disposed of in a safe and efficient manner. Carried.

3. WHEREAS there can be no adequate fire protection in this part of the country until a comprehensive system of trails, lookouts, tool caches and telephone lines is constructed,

RESOLVED, that in the opinion of this Conference, the Dominion and Provincial governments should push forward the work of concentrating such improvements as fast as possible. Carried.

This ranger meeting was the first held in the interior of British Columbia. It resulted in the clearing up of many misunderstandings among the men and led to a considerable increase of interest and the rise of enthusiasm for the work on their part.

The fire season of 1912 in the Revelstoke district was characterized by two very distinct meteorological periods, a very dry spring, followed by a very wet summer. Practically no precipitation occurred from April till about June 13, when the rains started and lasted throughout the summer. During the dry season many bad fires broke out, some of which did a great deal of damage, both to property and to standing timber.

The most disastrous of these occurred in timber berths 15 and 16 near Golden, where operations were being carried on by the Columbia River Lumber Co. The origin of this fire is doubtful, but it was probably started either intentionally by one of the discharged employees, of whom a number were released the day or so before, or by a spark from a logging locomotive. This fire started on June 8, and, fanned by a strong wind, got out of control and burned up and down the Columbia river for five days, extending a distance of eight or ten miles. The company lost a set of camp buildings with supplies and a large quantity of logs. A very large area of valuable merchantable timber was fire-killed. A conservative estimate of the amount would be 100,000,000 feet, most of which, however, will be saved by immediate cutting. Fighting this fire cost the Department some $4,550.

Another bad fire occurred about two miles east of Donald on May 12. This fire started through the carelessness of sectionmen burning brush on the right of way. Carried broadcast through second-growth lodgepole by strong dry winds, this fire burned some ten square miles of country, mostly on the slopes of Donald mountain. It was fought in a desultory fashion by the Canadian Pacific railway for a while, and then left to burn itself out. The Dominion ranger, being occupied with other fires threatening heavy timber, was not able to spare much time for this one. This fire cost the Department some $120.

Another fire, presumably started by tramps, along the Beaver river at Sixmile creek burned over a large area of the mountain side and did extensive damage to young growth. This fire cost $800. All three of these fires were burning at the same time. They were finally extinguished by the heavy rains in the latter part of June.

During the rainy season an unusual number of severe electric storms crossed the country, starting innumerable lightning fires, most of which, however, were extinguished almost immediately by the rains. Many such fires, however, survived the storm and had to be fought. The most serious of these occurred up the Beaverfoot river from Leanchoil in the Yoho park. This fire was fought for over a month and cost some $1,800 to put out.

Altogether 23 fires occurred during the season which required special measures to extinguish. Of these 17 occurred before June 15. The total cost of fighting these fires was $10,950.53.

The causes were as follows:—

1. Unknown	8
2. Lightning	4
3. Settlers	4
4. Locomotive sparks	3
5. Clearing right of way	2
6. Camp-fires	2
Total	23

Excepting by the Golden fire, not much damage was done to standing timber. Owing to the large areas burned no definite data are available as to acreage concerned.

Salmon Arm District.—This district includes the western slopes of the Gold range, the Shuswap Lake country, the interior plateau and the eastern slopes of the Cascade range as far as North Bend. The country as a whole is much less mountainous and rugged. Mountain ranges are replaced by plateaux with comparatively wide valleys or reaches of agricultural land between. Settlements are to be found in all these places with good roads between, so that the district as a whole is very accessible.

The climate varies from the heavy precipitation characteristic of the Columbia valley at Revelstoke through successive dry stages until it is almost arid at Ashcroft and Spences Bridge. Between Lytton and North Bend precipitation increases again as the influence of the coast conditions become prominent. The presence of large bodies of water, such as Shuswap lake, give more regularity to precipitation in that region. Prolonged droughts in spring and fall are of rare occurrence, but there is a tendency to hot dry spells in midsummer.

The timber varies from the cedar, hemlock and white spruce of the Gold ranges to Douglas fir around Shuswap lake, with spruce and Alpine fir (balsam) on the higher plateaux. Farther west in the 'Dry Belt,' is yellow pine on the plateau. Douglas fir, hemlock and white pine begin to appear again around North Bend. The timber in the Gold range and around Shuswap lake is very good and is mostly taken up in timber berths. Farther west it becomes sparser and smaller, until in the heart of the 'Dry Belt' practically the only use it serves is for watershed protection.

The timber plateaux in the dry belt being mostly incorporated into forest reserves, the principal activities of the fire-ranging staff in this district are concentrated in the eastern part. The fire hazard here and also in the drier belt in the West is greatest in midsummer, and not in spring and fall. It is, however, at this time often very severe. Shuswap lake is peculiarly susceptible to electric storms, with the result that lightning fires are of common occurrence. The lake is, however, very efficiently patrolled, by a government launch so that these fires are kept under control. As in the Revelstoke district, the slash problem is of prime importance from a fire-protection standpoint. The slash here results principally from settlers clearing land, provincial roads, railway right of way, etc. Improvements have been planned in this district also, designed to facilitate more efficient protection; some of these will be undertaken during 1913.

The Salmon Arm district is divided into thirteen ranger districts. The total area of the districts being approximately 5,865,000 acres, an average of 451,000 acres per man is thus indicated. A chief ranger with headquarters at Salmon Arm directs these men. The agreement made with the provincial Government in regard to issuing permits for burning covered this district also. On account of the large number of settlers in this country a considerable portion of the rangers' time was occupied with this work.

A rangers' meeting was held at Salmon Arm at the close of the fire season at which matters of general interest to the rangers were discussed.

The fire season of 1912 in the Salmon Arm district was very favourable, there being well distributed precipitation all through the season. As a result fires were few and did little damage. Forty-two fires were reported during the season. Following is a list of the causes:—

1. Lightning	18
2. Unknown	12
3. Locomotives	8
4. Campers	4
Total	42

The total cost of these fires was $873.43.

RAILWAY COMMISSION CO-OPERATION IN FIRE PATROL ALONG RAILWAY LINES.

Following requests from the Dominion and Provincial Forest Branches, the Board of Railway Commissioners for Canada gave a hearing on the question of fires along railway lines, and as a result issued Order 16,570, in which are incorporated regulations governing the operation of railways with respect to fires. This order left the carrying out of the regulations to the chief fire inspector. The method pursued by this official was to co-operate, wherever possible, with forest officials. At a conference held by him with the district inspector in Victoria early in June, the requirements of the main line of the Canadian Pacific railway in British Columbia were taken up. These were later incorporated in a letter to the Canadian Pacific railway requiring certain patrols to be established which should cover the entire right of way at least twice each day.

The details of these patrols varied according to the nature of the country and the condition of the right of way. Where the fire hazard was high, a speeder patrol was put on, and where the danger appeared less the work was allowed to be done by the regular force of track-walkers, bridge and snow-shed watchmen and sectionmen.

These patrols were put on within a reasonable time by the railway company. Fortunately, owing to the favourable fire season, their efficiency was not put to any great test, but at any rate no fires occurred starting fro mthe right of way after the establishment of these patrols.

In accordance with the new policy decided upon last season, viz., the burning of oil as fuel on the British Columbia division, the Canadian Pacific railway commenced the conversion of coal-burners into oil-burners.

This was effected completely on locomotives operating between Kamloops and Revelstoke and partially on those between Revelstoke and Field.

This change, eliminating, as it does, locomotives as a source of fire will mater ially reduce the fire hazard. Another factor which operates as a source of fire from railway lines is the throwing of cigar or cigarette stubs and lighted matches from trains. People using the observation platforms are special offenders in this regard.

If the railway company could be induced to take steps to educate the travelling public to the consequences of their thoughtlessness, great saving would result to the railway company, to the Department, and to the public at large.

The district inspector at Kamloops was appointed by the Board of Railway Commissioners as fire inspector for the railway belt to enforce the order and the requirements of the chief fire inspector on lines of the Canadian Pacific railway within the railway belt of British Columbia.

To assist in this work the board also appointed two other officers of the Forestry Branch to act as divisional fire inspectors under the direction of the fire inspectors for the railway belt. These two men spent their entire time going over the line, getting in touch with the railway officials and the patrol force, and reporting on the efficiency of the work performed.

These officers also submitted reports covering the right of way, which was in many cases in a very unsatisfactory condition. As a result of action taken on these reports, considerable improvement has been made in the condition of the right of way, and in two cases at least special contracts have been let by the company in the spring of 1913 to clear up the worst places. It is hoped that by consistent efforts on the part of the inspectors and the board, the company will decide to put the whole right of way in first-class shape.

Respectfully submitted,

D. ROY CAMERON,
District Inspector.

APPENDIX No. 5.

REPORT OF INSPECTOR OF FIRE RANGING.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
OTTAWA, February 18, 1913.

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

SIR,—I beg to submit the following report on matters pertinent to fire protection in the provinces of Manitoba, Saskatchewan and Alberta, on such timbered portions of the public domain as have not as yet been included in forest reserves.

In the matter of fires the Branch has been exceedingly fortunate during the past summer; this to a great extent has been due to the wet weather conditions which prevailed pretty generally over the three provinces. With the exception of Northern Alberta, in the Peace River district and to the north of it, there was abundant precipitation from the first week in July until well on into the autumn; but the fact that even under such conditions a great deal of vigilance is required is exemplified by the table of fires recorded later on in this report. The comparative immunity from fires is due also to the fact that there is now excellent legislation for the protection from fires along railway lines.

As my work fell into two distinct classes I shall use these subdivisions as a basis for my report.

FIRE PROTECTION ALONG RAILWAY LINES.

Through the recent order (No. 16570) of the Board of Railway Commissioners, the various railways under the jurisdiction of the Board are now compelled to take certain precautionary measures for the prevention and extinction of fires along railway lines. These measures may be briefly enumerated as follows:—

1. Use of fire-protective appliances.
2. Non-use of lignite coal.
3. Proper supervision of tie-burning.
4. Clearing right of way.
5. Ploughing fire-guards.
6. Establishing of a special patrol force.

With all but the fifth of these measures the Branch is deeply concerned, and a few words with regard to them might appropriately find place here.

1. *Appliances.*—This section provides for efficient spark-arresters and ash-pan screens. Formerly a great many fires were caused because such devices were either very inefficient or entirely lacking, and as a result many fires were started by live sparks and ashes. Although the devices now prescribed cannot be said to be an absolute safeguard against fires, certain it is that fires from this source have greatly decreased in number, and, owing to a competent inspection through the officers of the operation department of the Board, the tendency of the engineer to destroy the screen, to allow for greater draft, has greatly decreased.

2. *Lignite Coal.*—The various companies have issued strict instructions forbidding the use of lignite coal, and, although an occasional load does find its way into the tender, such occurrences are comparatively rare. The district inspectors are constantly on the lookout for such coal being used, and one or two good instances detected and penalized should create an absolute observance of this section.

3. *Tie burning.*—The companies are still somewhat lax in the matter of disposing of old ties, and in one or two instances I have observed indication which would lead me to suspect that fires have started from this source, although such imputation was strongly repudiated by the sectionmen concerned. There is, however, a great improvement over the carelessness which was formerly exhibited in this respect.

4. *Right-of-way clearing.*—Early in the season, when I went over the various lines, I found that in many places the right of way was in a most deplorable condition, there being in many places large quantities of inflammable weeds, brush and woody debris. I took this matter up with the companies concerned, but, presumably on the plea of scarcity of labour, little was done till late in the season, when a hearing before the board accelerated matters considerably. There is still much to be done, however, and it is hoped to get all the lines in good condition before the coming season progresses very far.

5. *Construction of Fire-guards.*—This section is designed largely for the prevention of prairie fires, and, inasmuch as fire-guards are more or less impracticable in a wooded country, it does not apply to timbered land, except, perhaps, in places where a prairie fire might enter into and destroy timber.

6. *Establishment of a patrol force.*—In this section the officers of the Branch are particularly interested, for herein lies the real solution of fire protection along railways using coal fuel. Owing to the large number of fires which have occurred along railway lines, it was formerly necessary for the Branch to provide its own rangers to contend with this fire evil; but now, with the compulsory establishment of a patrol force by the company itself, operated and maintained by the company, the Branch is not only relieved of a financial outlay which is not rightly its own, but has a body of men working under the supervision of the railway officials, and perhaps there is no organization so well fitted to efficiently handle such a staff of men as a railway company.

Practically speaking, but two companies in the territory under my administration are required to establish special patrols; these are the Canadian Northern and the Grand Trunk Pacific Railway Companies.

On lines under operation, the Canadian Northern railway had some 21 men exclusively engaged in patrolling such parts of the companies lines as traversed timbered land. Of these, four were in southeastern Manitoba; three between Dauphin and Swan river, to the east of the Duck Mountain Forest Reserve; seven between Swan river and Crooked river; two on the Hudson Bay line from Hudson Bay Junction to Pas; and five were in the vicinity of Prince Albert. All of these men patrolled the line by means of velocipedes and each man had approximately twenty miles of line over which he was obliged to make a return trip each day.

Photo E. H. Finlayson.

Railway Right of Way, Well Cleared.

Photo E. H. Finlayson

Railway Right of Way, very Poorly Cleared.

In addition to the men prescribed for lines under operation, a patrol was prescribed on those portions of the lines under construction along which patrols were considered necessary. West of Edmonton, beyond the Pembina river, a patrol of one man was prescribed for each ten miles of line.

The Canadian Northern patrol service was very satisfactory indeed, and many fires were prevented in their incipiency. The experience of the past summer is certainly such as would warrant a continuation of the patrol service, and it has been found that, for average conditions on a track where there are no excessive grades, one man can, with a velocipede, quite satisfactorily patrol twenty miles of line.

On the Grand Trunk Pacific railway west of Edmonton, from Wabamun to the summit of the Yellowhead Pass, some men were prescribed, but this company was very dilatory, and, in fact, did not comply with the order of the chief fire inspector at all, until, in October, a very modified patrol of two men on motor-speeders, from Gainford to Prairie Creek was established. On the Grand Trunk Pacific line from Winnipeg east to the Ontario boundary the country was so wet that I relieved them from patrol over that line.

So much for lines subject to the jurisdiction of the Board and affected by Order 16570. Along the line of the Hudson Bay railway, now under construction from Le Pas northeastward toward Hudson Bay, we had men working under the direction of Mr. A. McLean, our chief fire ranger at Pas. These men patrolled the line on foot and aided by the prevailing wet conditions no serious fires are reported.

INSPECTION WORK.

To provide for adequate inspection of the actual work done by the railways in compliance with the order, I was appointed an officer of the Board (fire inspector), with the powers delegated by that body to its officers. As the territory under my jurisdiction is a very large one, and as I have, moreover, my work away from railway lines, I appointed three of our best fire rangers to act as district inspectors for me, Messrs. Thos McNaughton, E. Tennant and A. C. Smith, located at Prince Albert and Hudson Bay Junction in Saskatchewan, and at Wabamun, Alberta, respectively. I may say that these men carried on a very efficient inspection, and it was due largely to their efforts that I was able to keep thoroughly in touch with the work all over the country, Mr. McNaughton, in particular, showed marked capabilities in this inspection work which will doubtless be recognized by his being given greater responsibility.

The following table summarizes the number and causes of fires along the railways during the season:—

FIRES ALONG RAILWAY LINES.

District.	Causes.			
	Locomotives.	Sectionmen.	Clearing Right of Way.	Travellers, Tramps, &c.
S.E. Manitoba	18	2	1	1
Dauphin	7			
Hudson Bay Jct. and Pas	11	1	2	1
Prince Albert	24			2
Edmonton	26	4		4
Totals	86	7	3	8

FIRE PROTECTION OUTSIDE OF RESERVES.

For the administration of fire protection on licensed and other forest lands not included within forest reserves, the whole territory under the Branch's administration is divided into eight large districts, designated as follows:—

1. Southern Manitoba.
2. Northern Manitoba.
3. Pas.
4. Prince Albert East.
5. Prince Albert West.
6. Battleford.
7. Edmonton.
8. Great Slave.

Each of these districts is under the supervision of a chief fire ranger. In some cases the sole work of the chief fire ranger is in administration of the fire-protective service, while in others the work has been combined with the duties of timber inspection. The time has come when there should be in every district a man whose whole time shall be devoted to the fire-protective work alone, and this step, which will doubtless result in improvement, is being effected for the coming season.

Acting under the direction of the chief fire ranger in each district there is a staff of fire-rangers, varying in number according to the size and nature of the district. These men are directly responsible to the chief ranger and all reports are submitted through him. These men patrol the country by various means, posting notices and advising people as to the dangers of, and the law concerning, fires, and put out as quickly as possible such fires as do occur.

In all, the Branch had some 130 fire rangers employed during the fire season; of these probably 100 were employed continuously from May till November.

As conditions vary so greatly I shall take up the work district by district:—

Southern Manitoba.—Included in this district is the forested land in the northern half of the peninsula between lakes Winnipeg and Manitoba, the area east of the southern portion of lake Winnipeg, and the strip of forest country stretching from the mouth of the Winnipeg river in a broad belt east to the Ontario boundary and southward to the International boundary west of the lake of the Woods. The dangerous parts of these areas were patrolled by a staff of six men.

In the southeast corner of the province are located timbered areas which are essentially valuable as a source of fuel wood; lumbering is also carried on to a limited extent. The same may be said of the northern part of the peninsula, where there is perhaps, more large timber. In view of the fact that the cordwood industry is considerably developed, and so many obtain a livelihood through such operations, it is essential that the forest be protected. The district which each ranger has to cover is a large one, but the problem here is that of keeping under control the setting of fire by settlers.

There is a vast forest area east of lake Winnipeg which is as yet practically unexplored and about which comparatively little is known; but recently there has been an influx of prospectors up the various water-courses flowing into the lake from the east. There are vague reports of the occurrence of large fires on this area and it behoves the Branch, therefore, to take steps in the immediate future for the establishment of some measure of protection.

On the areas under patrol there have been very few fires indeed, the season being very wet and the danger of fire not great. About the only fire which did any damage at all occurred on the spur line of the Canadian Northern railway near the boundary, and burned over some 500 acres of cordwood land. The cause of the fire was carelessness in right-of-way clearing.

Northern Manitoba.—This district embraces an immense stretch of lake country from the foot of lake Winnipeg down the Nelson and its affluents to Port Nelson on Hudson bay; also to the east, the valley of the Hayes river and the lakes along its course. On this great area of forested country there were some twelve men, supervised by Mr. Blackford, the chief ranger. Although I was unable to visit the district last year we may feel sure from Mr. Blackford's reports that he is keeping up his good work among the Indians and other people in that country. Mr. Blackford informs us that no serious fires have, to his knowledge, occurred in the district during the past year.

Several observation made by Mr. Blackford in one of his reports are interesting, and serve to accentuate the necessity of intensifying the patrol work in his district. Worthy of particular attention are the following:—

(1.) That the possible growth of merchantable timber in this country has not been overestimated, but rather the opposite.

(2.) That fully 70 per cent. has been burnt in comparatively recent times.

(3.) That 40 to 50 per cent is again growing up to spruce, jack pine, poplar, birch and tamarack, in the order named.

(4.) That the Indian, through thoughtlessness, not carelessness, has been the cause of a large number of fires.

(5.) Water routes leading out of Norway House, and constantly travelled on more or less, approximate 1,500 miles; and it is impossible with the present number of rangers to do more than patrol the main routes.

Pas.—This district embraces the country within a radius of a hundred miles or more, east, north, and west of Pas. Manitoba. This country, also, has been but little explored until very recent years. But now, with the construction of the Hudson Bay railway, people are pouring into the country, and the danger of former years is increased tenfold. The country is for the most part flat, and there are very extensive muskegs and spruce and tamarack swamps, in places rising up to low poplar ridges. The timber is, on the whole, of comparatively small size, such areas of good saw-timber as exist being almost wholly confined to the main water-courses and lakes. However, the timber is of sufficient importance that vigorous steps should be taken to protect it. Owing to the swift currents of the rivers the country is rather difficult to patrol. There were, however, seven men continuously engaged in this work, four of these, as previously mentioned, being on the Hudson Bay railway right of way.

The area reported by the rangers to have been burnt over in this district approximates forty square miles, almost no damage having been done to merchantable timber; indeed the damage reported is said to be slight. In all probability, however, much young growth was destroyed which (although it is hard to make people realize it) has considerable potential value. In addition to this damage there are rumours that a large fire occurred to the northwest, far beyond the reach of our outposts. This signifies that here also the Branch must extend its efforts farther north.

In order to make it more possible for the chief ranger, Mr. McLean, to make rapid inspections, a fine new 35-foot motor boat has been built and is ready for work during the coming season.

Prince Albert East District.—The district includes the country on both sides of the Canadian Northern railway from Hudson Bay junction west to Tisdale, north to the Saskatchewan river, and south for some 35 miles. It is an area of frequent muskegs, but there are many ranges of hills on which there are large amounts of splendid spruce. That it is a lumbering country is emphasized by the fact that practically every town or village along the line of railway is the centre of some lumbering industry.

The district was patrolled during the summer by a staff of rangers varying in number from eight to fourteen men, all in charge of Mr. H. Browne, Crown Timber

Inspector, at Melfort. The town of Melfort is situated well out on the prairie and it is essential for the centralization of administration that the headquarters be moved to Hudson Bay Junction.

It is reported that not more than thirty square miles of country were burnt over, the damage being for the most part confined to young growth.

Prince Albert West District.—The district embraces the country for some eighty miles north to Montreal lake, on the east, west for ninety miles and north to the Beaver river. It may be divided into three parts:—(1) The more settled portion just north of the Saskatchewan river for 20 or 25 miles, where roads offer an easy means of travel from point to point, but where, owing to the large amount of absolute forest land interspersed with good agricultural land, it is necessary to have an effective patrol to protect young growth on reserves and cordwood areas, and also to prevent, if possible, the spread of fire to the more timbered area to the north; (2) the area just to the north of this, where roads are scarce and travel difficult, a district where settlers are few and where fire is a constant menace to the forest resources; and (3) a vast lake country with large quantities of timber, where practically the only means of travel is by canoe or on foot.

On the whole of this area we had sixteen rangers, nearly all being engaged from May till November, under the supervision of Mr. Jos. Coombs, Timber Inspector.

In this district more damage was done to merchantable timber. Approximately 600 square miles of the country were burned over. One fire of unknown origin which occurred away to the north, just southwest of Lac la Plonge, is said to have run over 20 square miles and to have destroyed 60,000,000 feet, board measure, of merchantable timber. It is true that dues on this timber would amount to only $30,000, but this timber would have been worth many times this amount to the country if it could have been saved; it is a dead loss, because it is altogether improbable, if not impossible, that the burnt timber can be salvaged prior to its destruction by borers and fungi. The loss in this one fire alone is several times greater in amount than the appropriation for fire-ranging in the whole Prince Albert district. Extensive fires of this nature have occurred in the district north of Prince Albert for many years, due in part to carelessness on the part of the Indian and half-breed populace, and also to a transient population of surveyors, explorers, prospectors and trappers. Owing to the sparse population it is impossible to do much with a fire when once it is well started, and every step should be taken for the prevention of such fires, for not only does the country offer fine opportunities to the lumber industries, but also on account of the extensive poplar and spruce areas and the presence of water-powers, ventures into the pulp industry would probably meet with encouragement and success if a fair amount of stability and safety were secured.

Battleford District.—This district is very similar to that described for Prince Albert West, except, perhaps, that there is a more distinct line between the prairie and the timber belt; for this reason it is most important that a thorough patrol along the verge of the settled country should be maintained.

The northern part of the district is much broken by numerous lakes and rivers, and in it there are extensive areas of spruce saw-timber, cordwood and pulpwood. Water-powers, too, are numerous, and hence the same possibilities for pulp manufacture are presented, though perhaps to a more limited extent than in the Prince Albert West district.

A staff of only six men patrolled this district, and owing to the great extent of country it will be necessary to considerably augment these forces if good fire protection is to be secured.

Nearly 500 square miles of the country were burned over, but the fires are reported as having been confined to grass-land, muskeg and scrub, with little damage done to merchantable timber. There were 21 fires involved in this burning—9 caused by

campers, 3 as a result of careless burning, and 9 of which the causes were unknown. The rangers in this district were particularly good men, and I feel sure that had it been possible for them to arrive at the probable causes of the latter they would have done so. This merely accentuates the necessity of having more men to prevent these 'unknown' fires.

Edmonton District.—This is a very large district, embracing as it does the country from Red Deer and Rocky Mountain House north to, and including, the Peace River district. This area is, of course, by no means all timbered; in fact, the southern part is very well settled, but there are large stretches of absolute forest land on which there is a good forest-cover established. The country has in the past been repeatedly swept by large fires, but by additional patrol there is no reason why these fires could not be greatly reduced, if not almost entirely eliminated.

Patrolling over this area we had 58 rangers in all, of which only 30 were retained for the greater part of the season. This was a great improvement, in point of numbers, over the staff of previous years, an improvement which was due to the fact that Mr. R. H. Palmer, chief ranger of the district, travelled over the greater portion of this immense territory, appointing men where he thought it necessary to do so.

In spite of the fact that the fire-protective force comprised more men than in previous years, the magnitude of the country forces these men still to confine their attention to the main trails and waterways, as it is along such avenues of travel that the majority of fires are started. Owing to the great influx of settlers to the north, intent on settlement in Grande Prairie or Peace River, (the tide of settlement being far greater than that to the north of Manitoba or Saskatchewan) it will be necessary for the Branch, in the near future, to still further add to its staff if it means to have good protection.

From Athabaska Landing the only way to the north is down the Athabaska river, in summer by boat, canoe or scows, in winter by dog-train. Practically all ingoing people have to camp on the shores of the river at night, and, therefore, here lies the chief danger. To contend with this, we have a stern-wheel patrol boat continuously engaged in patrolling the river from the Landing to Grand Rapids. The boat is manned by four men, who, in addition to operating the boat, are official fire-rangers.

In the Edmonton district an area somewhat less than 300 square miles was burnt over, the damage consisting chiefly in the destruction of young growth, comparatively little merchantable timber having been destroyed.

One of the main problems to be faced here is the progress of railway construction; in nearly all directions lines of railways are projected, and several are actually under construction. Along these lines travellers are continually passing—not only railway men, but others also, intent on various pursuits. Not only are fires caused by such persons, but the actual process of clearing the line, by the use of fire, constitutes a serious menace, and as a result the fire-protective force has to concentrate its attention along, and in the neighbourhood of, such lines.

Great Slave District.—This embraces the Athabaska River for over a hundred miles below Grand Rapids, the Clearwater river east to the fourth meridian, and the Lac la Biche trails. In this district the patrol was organized and has since been supervised by Mr. Conroy, of the Indian Department. During the past year seven men were employed as rangers, plying up and down the rivers above named. With regard to fires in this district an area of altogether 85 square miles was burnt over, entailing a loss of 20,000 feet, board measure. In addition to this a considerable number of fires were extinguished in their incipiency; these fires were for the most part, attributable to neglected camp-fires of travellers or wandering Indians.

Speaking generally for the whole country above referred to, approximately 1,000

Photo A. Knechtel.

Post-box Used by Forest Rangers on Nelson River.

Photo A. Knechtel.

Forest Rangers of Norway House District.

square miles were burned over as a result of some 480 fires. The causes to which they are attributable, in numerical order, were as follows:—

Causes.	Number.
Campers, surveyors, prospectors, &c.	138
Careless clearing of land	108
Locomotives	86
Sectionmen	7
Deliberately lighted	5
Clearing railway right of way	3
Lightning	2
Causes unknown	131
	480

An analysis of this table is almost superfluous; it is easily seen that, though a change of attitude on the part of the general public is coming about, campers, prospectors and surveyors still persist in carelessness with regard to fire, that settlers are, by the careless use of fire in clearing land, still responsible for a very large number of fires. In 1911 the greatest number of fires was attributed to railways, while in 1912 they stand third in the list of known offenders.

The experience of the season also shows that in spite of abnormally wet weather conditions it is quite possible for fires to occur, and that, therefore, we must be constantly vigilant in order to arrest the progress of serious fires. As a matter of fact, there were actually more fires reported during 1913 than in the previous year, although the damage is considerably less. This greater number is probably due to a more efficient reporting of small fires, rather than to the actual occurrence of more fires.

One of the greatest difficulties in promoting a proper regard for the law is the deficiency in the fire laws of the three provinces; under these laws it is almost an impossibility to get an offender convicted and properly punished, owing to the loose interpretation of the law by rural judiciaries. It is hoped, however, that the legal departments of the provinces will awake to the necessity of efficient, up-to-date legislation, so that the forestry officials will not be so handicapped in their campaign to reach an ideal, to secure a proper observance of the intentions behind all fire laws, viz., *prevention of fires.*

Another direction in which there ought to be a great improvement is in the work carried on by the provincial governments in the construction of roads. Nearly every provincial road through forested land constitutes a veritable fire-trap; brush and slash are piled at the side of the clearing and left to rot, solely to avoid the expense of removal by careful burning. Not only is such slashing unsightly, but it forms more or less of a magazine into which some unwary traveller may throw a cigar or cigarette stub and give rise thereby to a serious fire. This neglect by its example also weakens the effect which it is intended that the law should have on the people. How can a settler be expected to cheerfully obey the law in regard to exercising due care when before him may be a monument of carelessness and neglect in the construction of roads?

In carrying on my work of inspection I visited each district, meeting as many of the individual rangers as it was possible for me to do. A great deal of my time was taken up in getting things running smoothly along railways, and I firmly believe that the experience of 1912 (when we were favoured by Providence with an easy season in which to start) in work along railway lines will pave the way to efficient fire-protection along the various lines of railway operating through timbered lands.

In the protection of licensed lands I fully believe that the lumbermen concerned should be called upon to recommend men to act as fire-rangers. The lumbermen have the most at stake, and would see to it that such men would be recommended by them as could be implicitly relied upon to carry on such work. The lumberman in the three western provinces hire their men for the winter only; the men are real woodsmen.

and would be glad to officiate as rangers for a remuneration considerably less than is paid at the present time by the Branch.

In Ontario and Quebec this system has been worked out on licensed lands with the result that a most efficient fire-protective service has been developed.

Respectfully submitted,

E. H. FINLAYSON,
Inspector of Fire Ranging.

APPENDIX No. 6.

REPORT OF RECONNAISSANCE SURVEY IN COAST DISTRICT OF BRITISH COLUMBIA.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
OTTAWA, October 22, 1912.

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

SIR,—I beg to submit herewith my report on the work which I have carried on during this season with the object of determining the boundaries of a forest reserve to be situated north and west of the Fraser river in the Coast district of the Dominion railway belt.

Accompanying this report is a general map showing the location of the boundary lines, and also a number of township maps on which has been roughly sketched the topography of the country surrounding the line. The Coast District, as considered in this report, is the part of the railway belt that lies between Keefer's (on the Canadian Pacific railway) and the Pacific Coast—a territory approximately 40 miles wide and 130 miles in length.

TOPOGRAPHY.

The Coast District is very mountainous, the only low land being found in the southwestern part of the railway belt in the lower Fraser valley. The mountains usually reach an altitude of from 4,000 to 6,000 feet, but peaks from 7,000 to 9,000 feet high are not uncommon. The many large lakes and the numerous rivers and creeks which cut across the ranges give to the country a very broken appearance.

Through the centre of the Coast district flows the Fraser river. Between Keefer's and Hope the Fraser valley is quite narrow with steep, rocky, often precipitous mountain slopes, either breaking abruptly into the river, or at best forming a narrow bench before taking the final plunge into the river. At Hope the valley begins to widen and the river changes from a raging torrent to a swift, wide river, which at Harrison becomes navigable for large river-steamers. At Agassiz the river enters the flat or slightly rolling, fertile, alluvial lands of the lower Fraser valley, a territory containing approximately 700 to 800 square miles of arable land and constituting the only compact stretch of agricultural soil in the Coast District.

Practically all of the many rivers and creeks which drain the Coast District contribute directly or indirectly to the supply of water in the Fraser river. They could appropriately be divided into three classes:—

1. Navigable rivers.—Pitt river, Harrison river.

2. Non-navigable rivers.—(100 feet wide or more, with an average fall of less than 100 feet to the mile):—Coquitlam, Lillooet, Stave, Chehalis, Coquihalla and Nahatlatch (or Salmon) rivers.
3. Creeks.—(less than 100 feet wide and generally with a fall of more than 100 feet to the mile):—
   All other water-courses in the Coast District.

The valleys of these rivers and creeks are comparatively deep and narrow, the forces of stream erosion and weathering not yet having had time to develop the broad open valleys found in regions of more ancient formation and softer rocks.

Many of the river valleys in the Coast District have, through glacial action or other accidents, been in part transformed to lakes. These lakes, of which the largest are the Harrison, the Pitt and the Stave, are surrounded by high mountains generally sloping steeply down to the water, forming very few flats or benches.

AGRICULTURAL RESOURCES.

As can be gathered from the above, there is comparatively little land susceptible of tillage in the Coast District. We have:

(1.) The above-mentioned fertile lower Fraser valley;

(2.) The lower moderate slopes of the mountains bounding this valley on the north between the Coast and Dewdney (48 miles east of Vancouver), and

(3.) Narrow strips along some of the rivers or on benches.

Most of this land has already been thrown open for settlement.

The portion of the railway belt which lies north and west of the proposed forest reserve line, and which is bounded on the west side by the North arm of Burrard inlet, is at present more valuable for the growing of timber than for farming of any kind. There are no compact bodies of agricultural land of large extent. A few acres of level or fairly level land with good soil may be found along streams, on benches, on lake shores or at the confluence of streams, but rarely of sufficient area to raise enough produce to support a family in decency.

And, further, good soil and suitable topography are not the only factors that the homesteader has to consider; climate and market conditions must also be favourable to secure the success of the farmer.

To exclude from the proposed forest reserve at the present time a few acres here and a few acres there of agricultural land—now covered with timber—would hardly be practicable. In the future, however, when a thorough examination has been made of the forest reserve and the exact boundaries of any agricultural area that may have been included in the reserve have been located, would it not then be advisable to permit bona-fide settlement on this land after the timber has been removed? This has been done in European countries and in the United States. Mr. H. S. Graves, Chief Forester of the United States Forest Service, says in a recent article:—

> 'Bringing settlers into the mountains makes forest administration and protection easier. The Forest Service needs the help of settlers in fire protection. It is obtaining their assistance in many localities through co-operative and administrative force and in the construction of trails and other improvements. Every home-builder in a national forest is an immediate asset in its present administration and future development.'

TIMBER RESOURCES.

The Coast district is chiefly a timber-producing country. I estimate that of its total area, approximately 20 per cent to 25 per cent is under cultivation, or else capable of agricultural development; approximately 15 per cent consists of water, barren

mountain or is land otherwise unsuitable for forest growth; and approximately 60 per cent to 65 per cent is fit only for the production of timber.

It is, of course, not possible to give an accurate estimate of the timber in the Coast district, as only a comparatively small portion has so far been examined. I believe, however, that approximately 25,000,000,000 to 30,000,000,000 board feet would be a fairly conservative estimate; of this 15,000,000,000 to 20,000,000,000 feet could probably be found in the proposed forest reserve.

Douglas fir is the most abundant and commercially most important tree of this region. It is sometimes found in pure stands, but generally in mixture with red cedar (*Thuja plicata*) and Western hemlock (*Tsuga heterophylla*). Other coniferous species sometimes found in groups or scattered are Sitka spruce (*Picea sitchensis*), Western white pine (*Pinus monticola*), lodgepole pine (*Pinus Murrayana*), yellow cypress (*Chamaecyparis nootkatensis*), and Amabillis fir (*Abies amabilis*). At high elevation considerable mountain hemlock (*Tsuga Mertensiana*) and balsam fir (or 'balsam') (*Abies lasiocarpa*) are found.

I estimate that the timber in the Coast district consists of approximately 65 per cent Douglas fir, 18 per cent red cedar, 15 per cent Western hemlock, and 2 per cent of other species.

Douglas fir requires for its best growth a long growing season, considerable atmospheric humidity and well watered soil. The climatic conditions on the Coast are most favourable in this respect. Compare the slow-growing, often crooked or stunted Douglas fir of the interior or eastern British Columbia with the magnificent Douglas fir of the Coast. I have seen lately at a logging operation a timber stick that was 58 inches at breast-height (inside bark), 212 feet long, 17 inches at the top and perfectly sound. I have measured Douglas fir that were only from 150 to 165 years old and 220 to 240 feet in length with a diameter at breast-height of from 50 to 60 inches.

Below is a table showing the average rate of growth for Douglas fir growing in fairly even-aged, well stocked, mixed conifer stands in the Coast district, based on measurements of several hundred trees:—

GROWTH TABLE FOR DOUGLAS FIR ON SOILS OF FIRST QUALITY IN COAST REGION.

Age.	Diameter at Breast-height.	Total Height.
	Inches.	Feet.
10	1·6	7
20	5·6	30
30	10·7	59
40	15·0	82
50	18·9	101
60	22·0	118
70	24·8	134
80	27·5	146
90	30·0	157
100	32·4	166
110	34·6	174
120	36·8	181
130	39·0	187
140	41·2	193
150	43·2	198
160	45·2	203
170	47·0	207

The trees measured were growing on bench-land or moderately steep slopes. The figures given are too high for trees growing at high altitudes or on very steep, rough ground. My purpose with this table is only to show how short a time really is required in many instances to produce fir timber of large size.

Even other species, especially red cedar and Sitka spruce, attain a very respectable size, but there is no doubt that Douglas fir is, on account of its abundance, its hardiness, its rapid growth, its power to resist disease and injury from fire, and its many other excellent qualities, the tree *par excellence* of this region.

Douglas fir has the ability to form dense stands and the yield per acre is, under favourable conditions, immense. Some time ago a lumberman pointed out to me a little flat of three acres which he had logged off. 'I got a million feet there,' he said, and the density of the large stumps vouched for the truth of his statement. Timber cutting 300,000 feet per acre is, of course, far from being an ordinary occurrence, but whole stands that will average from 50,000 to 100,000 per acre are not uncommon.

I am afraid, however, that it will not be very long before the best timber is logged off. The lumberman will then have to make use of the more remote forests and the second growth.

There are at present large areas in the Coast district which have been logged off or burnt over and which are now covered with a reproduction or advanced second growth. The ground is not always stocked to its full capacity with seedlings or young trees; neither are the re-stocking species always the most desirable ones. To allow such conditions to continue might have rather serious consequences on the future timber supply. The time when our timber was considered to be inexhaustible is past and it is generally acknowledged that the forests need proper care and protection.

It would, of course, not be practicable at the present time to begin to improve the second-growth stands in the Coast district, but what can and should be done is to see that satisfactory reproduction is established after logging and that the re-stocked areas, as well as the virgin forests, are protected from fires.

Douglas fir is a hardy, vigorous tree; it is a good seed producer and it is a comparatively easy problem to obtain good reproduction after logging. It will be necessary to clear-cut, in some instances, leaving a few seed trees on the cutting, and burn the slashing. This will, of course, involve expense. There is no question, however, that this cost will not be outweighed by the increase in annual growth which, no doubt, will be the result of systematic management.

I have not as yet prepared any yield tables with reference to Douglas fir stands in various soils in the coast district. I have, however, studied the growth of the species on the coast rather closely, and from the knowledge I have gained, I feel justified in using the yield table given below for even-aged stands of Douglas fir in the western foothills of the Cascades as an example of what can be done in the way of growth on the best soils in the coast district. This table is borrowed from 'The growth and management of Douglas Fir in the Pacific Northwest,' (United States Forest Service Circular No. 175, by T. T. Munger). The climatic and topographical conditions of the British Columbia Coast District are very similar to those of Western Oregon and Washington. It must be remembered, however, that Mr. Munger's yield-table refers only to stands growing on first-quality soils.

YIELD FOR EVEN-AGED STANDS OF DOUGLAS FIR ON FIRST-QUALITY SOILS, WESTERN FOOTHILLS OF THE CASCADE MOUNTAINS IN WASHINGTON AND OREGON, READ FROM CURVES.

(Based on 252 5/16 acres, 361 sample plots.)

Age.	Number of trees per acre.	Total basal area.	Diameter of average tree.	Height of average tree.	Yield per acre.*	Average annual growth per ac. in each decade.	Yield per acre*	Average annual growth per ac. in each decade.
Years		Sq. Ft.	Inches.	Feet.	Cu. Ft.	Cu. Ft.	Feet B. M.	Feet B. M.
10					1,000			
20	990	116	4.6	32.0	2,150	115		
30	580	147	6.9	46.0	3,550	140		
40	410	177	8.9	59.0	5,400	185	12,400	
50	340	199	10.4	69.5	7,550	215	28,000	1,560
60	265	218	12.3	82.0	9,650	210	41,000	1,300
70	208	234	14.4	95.0	11,500	185	51,700	1,070
80	167	247	16.5	107.5	13,100	160	61,100	940
90	137	261	18.7	120.5	14,400	130	70,300	920
100	115	275	20.9	134.5	15,600	120	79,800	950
110	100	288	23.0	147.0	16,750	115	90,300	1,050
120	92	301	24.5	156.5	17,800	105	101,500	1,120
130	90	312	25.2	161.0	18,850	105	113,000	1,150
140	88	323	25.9	166.0	19,900	105	122,600	960

Note—Including only Douglas fir, western hemlock, grand fir, and Sitka spruce; over 95 per cent of the trees are Douglas fir.

*The yield in cubic feet includes the contents of the whole stem of all the trees; that in board feet includes only the merchantable contents of trees 12 inches and more in diameter at breast height, taken to a top diameter of 8 inches inside the bark.

GRAZING.

Owing to the dense undergrowth in the coast forests there is little or no land suitable for grazing purposes to be found inside the proposed forest reserve.

WATER-POWER RESOURCES.

British Columbia is immensely rich in rivers and streams capable of producing water-power. Especially has the coast district been well favoured. It is very probable that at least 250,000 horse-power can be produced in the Coast district alone. Of this approximate total, about seventy or eighty thousand horse-power already are being utilized by the Vancouver Power Company at Lake Buntzen and the Western Canada Power Company at Stave Falls.

Everyone knows, without discussing the subject, the relationship between water-powers and forests, and all know that a stable water-flow in streams and rivers is largely dependent on the maintenance of a permanent forest-cover on the watersheds.

In conclusion, I most urgently recommend that a forest reserve be established north of the Fraser river as proposed. The creating of a forest reserve would mean, first and foremost, better fire protection. Better fire protection means the conservation of timber resources, conservation of water resources, and maintenance of a stable water-flow in the rivers and streams . All this combined means more money to the government and more money to the public.

Respectfully submitted,

H. CLAUGHTON-WALLIN.

APPENDIX No. 7.

REPORT OF RECONNAISSANCE SURVEY IN VICINITY OF PORCUPINE RESERVES.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
OTTAWA, Dec. 5, 1912.

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

SIR,—I beg to submit the following report of work carried on by me during the past season in surveying reserve boundaries in Northern Manitoba and Saskatchewan.

In accordance with instructions received May 18, I left Ottawa on May 22 for Swan River, Manitoba, being joined *en route* by Mr. W. J. Boyd, my assistant. On arrival at Swan river it was found that Pelly, Sask., would be the most suitable point from which to begin work, and on Tuesday, June 11, after a number of delays due to bad weather, the party left Pelly.

OBJECT OF THE SURVEY.

The object of the survey was to locate the boundary of an addition to the present Porcupine Forest Reserve and to collect any information possible regarding the interior of the proposed addition.

The season was one of the wettest on record and the party lost a great deal of time on account of rain. The country also was so saturated with water that trails were often impassable and travelling was consequently much impeded. The following table shows the number of rainy days per month from the time the party reached Pelly:—

June	4
July	24
August	13
September	17

The season was decidedly one of extremes, very high temperatures were noticed in June while frost nights occurred every month the party was out.

On September 16, Mr. Boyd left for college and from that time till October first I worked alone. From October 7th until the completion of the work (October 25) I was assisted by Mr. E. Tennant, the Hudson Bay Junction fire-ranger.

During the earlier part of the season the party travelled by means of a pack-train, the daily work being done on foot. Later on, however, owing to the open nature of the country, we were able to substitute a wagon for the pack-horses and did most of the work from the saddle. The northern boundary was traversed by means of a track velocipede kindly loaned by one of the fire-rangers.

The reserve as now outlined covers an area of about 4,076 square miles, being surrounded by a boundary line over 360 miles in length. The whole stretch of country embraced by this line may be considered as of no agricultural value, being best suited to the purpose of growing timber and conserving the water-supply of the surrounding country.

DESCRIPTION OF RESERVE BOUNDARY.

In locating the boundary line of the new addition to the Porcupine Forest Reserve I took into consideration the soil, the topography, the forest growth and the water conditions with their relation to the surrounding country.

In proceeding north from the Thunder Hill branch of the Canadian Northern railway, it is noticeable that between townships 36 and 38 in ranges 1 to 10, west of the second meridian, a distinct change takes place. The tree-cover, formerly very scattered or altogether lacking, becomes very dense, both poplar and spruce; the surface gets rougher and the percentage of swamp becomes very great, as much as sixty or seventy in some townships. The character of the soil also undergoes a change, the usual soil along the south boundary of the reserve being a cold, grey, stony clay.

Along the west side of the proposed area the line of change from good to non-agricultural land is also clearly marked in most places, while along the north line of the Prince Albert branch of the Canadian Northern railway the poor country extends unbroken on both sides of the track.

In discussing the country bounding the new reserve I will start at the southeast corner, mentioning first the area described by Mr. Van Dusen in his report as 'Area B'. This area slopes slightly to the south and contains a large percentage of muskeg. It rises in township 36, range 32, west of the principal meridian, and then slopes gradually to the south again. The part of the area which is close to the newly located boundary is burned over, and the surface is rough, and cut up by ravines, pot-holes, &c. The soil is brown clay, full of boulders. Farther north towards the old reserve the country is much the same, uneven and badly drained with stony clay soil. I agree entirely with Mr. Van Dusen in his recommendation that this country be set aside. As you will see from my map I have extended my bounds considerably below the point suggested by him, but I am certain that the whole of this area will never be claimed for agriculture.

Below the reserve boundary the country rapidly changes to undulating prairie and scrub land, which is being rapidly settled up. From the second meridian the line is carried west to the Swan river through a heavy bush country badly cut up with spruce and tamarack muskegs and deep sloughs.

With the exception of the South Etomami river, which has sand prairies along its banks, the country from the upper Swan river to the head of the Assiniboine river is all the same. It appears to have been burned over between twenty and thirty years ago, and poplar is established wherever possible. The area is 60 to 70 per cent sloughs, lakes and muskegs, while the narrow ridges are extremely stony, with cold, grey soil. As one goes north from the boundary selected, he finds larger poplar, but otherwise the country is the same with great muskegs and narrow stony ridges.

Along the upper end of the Assiniboine river some prairie land has been included in the reserve, but this was done after considering the small areas of these patches of open land and the fact that they were surrounded by useless country.

In township 38, range 9, a large muskeg occurs, and as the country to the west of this is of good quality, though covered with scrub, it was deemed advisable to turn north here. A large strip of prairie and scrub land was encountered in township 40, ranges 9, 10 and 11, so the line was brought back east to the edge of the poor country in order to leave out of the reserve this area, which has a light sandy-loam soil and is sure to be taken up soon.

In township 41, ranges 10 and 11, the Greenwater hills are met with. These hills are very rough and stony, with a number of lakes scattered among them. They slope westward towards an area of valuable land on the Barrier and Red Deer rivers.

From the Greenwater hills to Björk lake the characteristic soil is almost pure sand or sand and gravel. The surface of the country is rough, and cut up with large muskegs and tamarack swamps. North of Björk lake lies a large stretch of spruce country partially cut and burned over. Owing to the roughness of the country and

the large percentage of muskeg existing, this area is much more suited for the growth of timber than for field crops. South of Björk lake the soil soon becomes good, light, well drained, sandy loam and were it not for the awkwardness of access it would all be under cultivation. The remaining stretch of country between Björk lake and the northwest corner of the reserve is almost all muskeg and lake. Where it is dry enough to sustain tree growth there is a heavy stand of large aspen (white poplar), balsam (black) poplar, spruce and tamarack on cold grey clay.

During the summer I gathered as much data as possible concerning the land south of the Prince Albert line of the Canadian Northern railway between Peesane and Roscoe, and it was agreed by all whom I questioned that this country is fit only for the production of timber. However, I was fortuante enough near the end of the season to secure the assistance of Mr. Enoch Tennant, the fire ranger at Hudson Bay Junction, and with him covered nearly the whole of the north boundary line, so that I am able personally to corroborate all the reports I heard concerning this stretch of land. Mr. Tennant is personally acquainted with practically the whole of the new reserve, having lumbered and travelled through it for many years, so that he enabled me to get an accurate idea of the country at a much smaller expense of time than I would have required to accomplish the same work alone.

From Peesane to Hudson Bay Junction the country is fairly uniform, mostly covered with heavy bush, aspen (white poplar), balsam (black) poplar, surpce and tamarack. There is a large amount of spruce and tamarack muskeg and a great many sloughs. The soil is irregular, being of good clay loam in places and elsewhere sandy or gravelly. Although this country was surveyed some time ago, there are practically no settlers on it. A few quarters were entered, but have been mostly abandoned, the only remaining homesteaders being close to the saw-mills.

At Hudson Bay Junction the soil is pure sand surrounded by muskeg. A considerable portion of this sand is entered, though not for agricultural purposes. In anticipation of the entrance of a railway, a number of speculators have filed on homesteads in order to profit by a rise in prices. Most of those who tried farming in this vicinity have abandoned their attempts.

From Hudson Bay Junction to Roscoe the usual type of the country prevails—timber, muskeg and slough; while from Roscoe to Powell the land, with the exception of one small area two miles east of Roscoe, though higher than that to the west, is impossible for agriculture on account of the poor quality of the soil. Bordering the railway track not far from Roscoe, however, there is an area of about six square miles of semi-prairie land having a rich clay-loam soil.

INTERIOR OF THE RESERVE.

It was very difficult during the past season to make many excursions into the interior of the proposed reserve, although I believe I was able to get a fairly accurate idea of it from the Indians and trappers. As far as is known, the tract is nearly all bush and very badly cut up by sloughs and muskegs. Even on foot, devious routes must be taken in getting from place to place and over large parts of the country horses cannot be used at all during the summer.

To illustrate the difficulty of finding dry footing it may be mentioned that the Red Deer Lumber Company, wishing to put a 'tote-road' into their limits some 35 miles south of the Prince Albert line of the Canadian Northern railway, have tried three different routes. The first two they abandoned in despair, while the third one was impassable all last summer and cannot be used until winter sets in.

In the neighbourhood of the Red Deer river, near the proposed west boundary of the reserve, there is some fairly open land. This is nearly all pure sand, best fitted for jack pine, and there is no likelihood of settlers demanding it for homesteading purposes.

Almost in the centre of the reserve, in the top part of township 39, range 5, there is a settler who has been trying to get people to come in and take up the land around him. As far as can be ascertained, the piece of land he has homesteaded is mostly covered with scrub and has a light and stony soil. Various lumbermen consulted were of the opinion that the land was of poor quality and of no great extent.

In the neighbourhood of the south line several pieces of open land were included. The upper reaches of the Assiniboine are bordered by narrow prairies, which soon rise to ridges covered with poplar. The prairies are very small and their soil stony. The few homesteaders who have penetrated as far as the vicinity of the line are very discouraged and contemplate abandoning. The valley of the Assiniboine would provide an excellent range for cattle.

Near the head of the Swan river and situated between ten and twenty miles north of the south line of the reserve lie two open areas of land, known as the Jackfish Prairie and the Rhubarb, or Pee Paw, Plains. These areas of land were both examined, and are of no agricultural value, though suitable for grazing purposes. The soil in both cases is light and the surface nearly covered with boulders. The upper portion of the Swan river in townships 40 and 41, range 1, west of the principal meridian, is flanked by prairies similar to those on the Assiniboine river.

This above-mentioned country is well suited for ranching purposes, but it would not be advisable to permit settlers to clear the land owing to fire danger.

Within the limits of the proposed reserve there are a large number of spruce timber-berths, many of them as yet untouched. Besides these berths, there are bluffs of spruce scattered all over the country, too small in extent, however, to merit their being placed in limits. Except in the space between the Assiniboine and the Swan rivers there is pretty good spruce reproduction scattered through the poplar indicating that the stand will ultimately be largely spruce.

The great quantities of poplar within the reserve are also destined to be of use, as the country a short distance to the south and west has very little timber and soon will be in actual need of a fuel supply.

The species of commercial importance which occur in the country examined are:—

Aspen (white) poplar (*Populus tremuloides*).
Balsam (black) poplar (*Populus balsamifera*).
Tamarack (*Larix laricina*).
Black spruce (*Picea mariana*).
White spruce (*Picea canadensis*).
White birch (*Betula alba,* var. *papyrifera*).

Of these the aspen, or white, poplar is much the most abundant, covering as it does over 50 per cent of the area. The untimbered areas usually consist of slough, lake or muskeg. The former occasionally contain good hay, though more often coarse grass and horse-tails, while the latter are billowy masses of sphagnum moss, sometimes covered with black spruce or tamarack.

CLIMATE.

Mention should here be made of the fact that the whole of this district seems liable to frosts at all seasons of the year, and, consequently, the attempt to grow wheat in it would be accompanied by considerable risk. As mentioned earlier in this report, the past season was very wet and this wetness would have the effect of moderating temperatures. In spite of the dampness, however, frosts were encountered during every month of the season. Experts inform me that a stretch of country subject to slight frosts in such a season as we have had would be liable to severe ones in a normal summer.

TRAILS.

The country examined was, as a whole, badly served with trails, and much time was lost owing to the long detours required. In the neighbourhood of the south boundary there are practically no east-and-west trails, and, consequently, the traveller must come back to settled districts before he can move across country.

The western portion of the country has been for many years the hunting ground of the Indians from the Nut Lake Indian Reserve, who have put trails through all the country west of the Etomami river and south of the Red Deer river. These trails all converge on the old Nut Lake post of the Hudson Bay Company; unfortunately they are usually hard to find, being quite unknown to the white settlers, so that unless one has the services of a good Indian he is unable to take advantage of them.

The northern part of the reserve is penetrated by only a few trails, a railway belonging to the lumber firm of Shaw Brothers, an Indian trail from Greenbush up the Copeau river and Red Deer Lumber Company's 'tote-road' up the North Etomami being the only means of access to the interior of the reserve. Besides these, there is a short Indian trail from Roscoe into the Porcupine Mountain.

In establishing means of communication throughout the country it will not be so necessary to locate new trails as to clean out and repair the old ones. Most of the trails have been well placed and hold to the high ground as much as is possible in such a wet country so that little would be gained in the majority of cases through trying to relocate them. Practically the only entirely new trail which would be required would be one crossing Range 1, somewhere in the north part of Township 37.

WATER-COURSES.

The new reserve embraces the sources of a great many rivers and creeks, and for that reason, if for no other, deserves to be protected from deforestation.

The most important of these streams is the Red Deer river, which rises in the Nut lakes just west of the reserve. It has a number of large tributaries, the Fir, the Copeau, the North Etomami, the Pewei, the Little Swan and a number of unnamed rivers, all of which (except the Fir) rise and flow their entire length within the reserve. The Red Deer river leaves the reserve at Erwood, bing at that point about 150 feet wide and from four to six feet deep. At several points along its course the river is very swift and has high banks which would offer an excellent opportunity for the development of water-power.

The rivers flowing south are the Assiniboine, the Swan, the Little Woody and a number of unnamed creeks.

RANGER STATIONS.

In regard to ranger stations there are three points from which fire wardens could work advantageously. One could be placed at Hudson Bay Junction, one near Bowsman or Birch River and one in the neighbourhood of Nut Lake.

The first man would be required to penetrate the country by means of the various trails coming down from the north, the second would reach most of the old Reserve and the newly added southern part, while the third would cover the trails radiating from Nut Lake. The first two men would share the track patrol.

In the mountainous portion of the reserve suitable points for lookout stations could easily be selected, but in the western area there are no outstanding features, so we were unable to locate points upon which towers could advantageously be placed.

ADMINISTRATIVE HEADQUARTERS.

For the Supervisor's headquarters Hudson Bay Junction seems to recommend itself strongly; it is convenient by rail to a great deal of the boundary of the reserve, and the centre of the area is also easily accessible from it. It is rumored that the Canadian Northern Railway is to be built from Sturgis to Hudson Bay Junction, in the event of which the advantages of the latter as the seat of the head office, would be greatly increased.

SQUATTERS.

As far as is known, there are only two white squatters within the limits of the new reserve. One is a rancher on or near Section 35, Township 40, Range 7, and the other is a camp watchman who has a home in the neighbourhood of Section 35, Township 39, Range 6. The former appears to be seriously engaged in raising cattle for the market, but I believe that the latter is principally occupied during the summer watching the Red Deer Lumber Company's camps and engages in agriculture as a side-line.

On the Rhubarb Plains there is an Indian encampment which has been there for many years. These people have not cultivated any land, but live entirely on the proceeds of their hunting and trapping.

GAME.

Owing to the wildness and inaccessibility of the country it is the home of large quantities of big game, the moose, elk, deer and bear all being observed during the summer. Besides these, there is a great abundance of small fur-bearing animals which the Indians have hunted during a great many years. Wild fowl are also plentiful, ducks, prairie chickens and partridges being noticed in great numbers.

ADJOINING TERRITORY.

All the country to the southeast, south and southwest of the new Reserve is arable, being principally gently rolling prairie land with bluffs of poplar and light scrub. The soil for the most part is a heavy, dark, clay loam, which occasionally varies to a sandy loam. This country is penetrated by the Thunder Hill Branch of the Canadian Northern railway and will soon be entirely taken up.

On the west side of the reserve lies the Nut Lake district, one of the finest stretches of land in the province. North of this district, however, conditions are not quite so good; there is a narrow strip of land suitable for settlement just west of the proposed boundary, but west of this again there are several townships of poor land. I found it impossible to investigate this area, as I was desirous of completing the west boundary of the reserve before winter set in.

North of the Prince Albert line of the Canadian Northern railway and east of Peesane, the muskeg type predominates, although there are a number of stretches of raised country bearing valuable spruce. For the most part, however, the country is very wet and difficult to travel. The soil is, I understand, usually sandy or gravelly or even lacking altogether at times, the muskeg often lying directly upon limestone rock.

About twenty-five miles north of Hudson Bay junction are situated the Pasquia hills, a morainic deposit similar to the Porcupine mountain. If it is considered advisable to make another forest reserve in Northern Saskatchewan, the Pasquia hills would be a suitable area.

The muskeg country extends as far south as Birch river, where a change towards good agricultural land begins to take place. From what I have learned during the

past season, I should say that the area north of the line from Peesane to Birch river and east from Birch river to Lake Winnipeg should all be classed as absolute forest land.

OPINIONS REGARDING NEW RESERVE.

Throughout the season no effort was made to conceal the object of the work, and we tried on all occasions to find what people thought of the installation of another forest reserve.

Almost all the settlers questioned were of the opinion that the reserve would be most valuable in years to come. For the most part the rich country to the south is rather lacking in timber for fuel and building purposes. Every year large tracts of the small poplar are burned over, and the people know that before long they will have urgent need of fuel. The existence of the area of bad land examined during the past season was known to most of those questioned and they agreed that it would be well to have the timber on it set aside for the good of the community.

The settlers who objected to the reserve were those situated a short distance from the useless country, who hoped to see the land further back settled up in order that their own quarters might be of more value.

The lumbermen consulted were all in favour of the reserve, because they believe that if settlers are allowed to enter this country the temptation to use fire for clearing land would prove too great for the most of them with the result that the safety of the whole country would be endangered. The lumbermen also knew that there are large areas of good spruce reproduction, which, if protected, will soon be of value and they are anxious to see fire kept out of the whole area.

Respectfully submitted,

W. L. SCANDRETT,
Forest Assistant.

APPENDIX No. 8.

REPORT OF RECONNAISSANCE IN CENTRAL SASKATCHEWAN.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
OTTAWA, March 1, 1913.

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

SIR,—I beg to submit a report of reconnaissance work done during the past summer.. The district examined stretches east from the Big River branch of the Canadian Northern Railway to the third Dominion meridian, (astronomical meridian, 106 degrees) and north from the line between townships 50 and 51 to that between townships 56 and 57. The object of the survey was to determine whether any of the land was so little adapted for agricultural use that it ought to be placed in a forest reserve.

DRAINAGE AND TOPOGRAPHY.

The country is generally rolling and is dotted with lakes and sloughs. It forms the divide between two great river-systems, the Churchill on the north and the Sas-

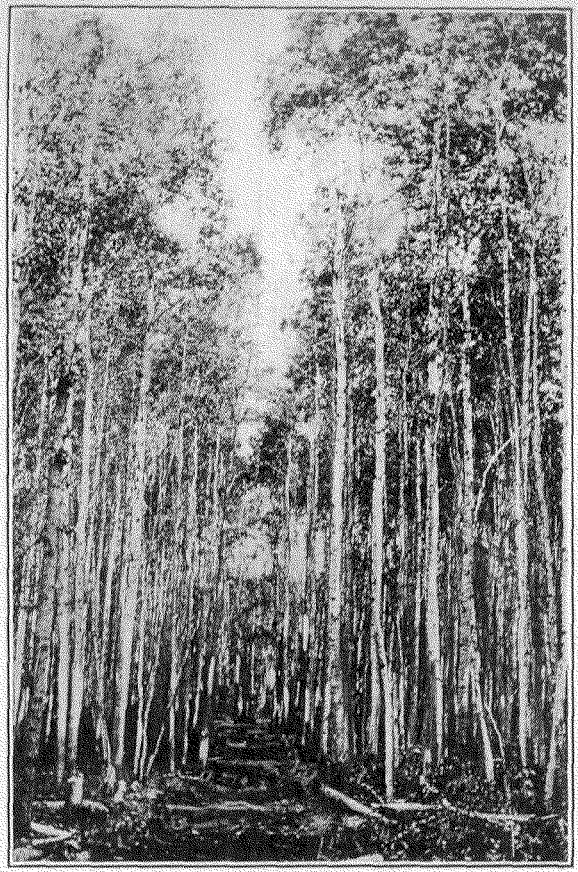


Photo C. H. Morse.

Poplar on Agricultural Soil, Sturgeon River District, Sask. (Tp. 52, Rge. 4, west of 3rd meridian).

Photo C. H. Morse.

Spruce in Sturgeon River District, Sask. (Tp. 52, Rge. 5, west of the 3rd meridian).

katchewan on the south. This watershed is drained to the north by Big River and Red Deer rivers and to the south by Sturgeon river and Little R d river. The two last-named streams are used for log-driving by the Prince Albert Lumber Company.

SOIL DESCRIPTION.

A description of the soil of this area is rather difficult on account of its wide variability. No out-croppings of rock are found. In a general way the soil west of the Sturgeon river is a rich clay loam with a clay subsoil. Patches of sandy land are found here, but they are small and few in number. One sandy area lies just south of the town of Big River, one is at Dumble and another just to the north of Karl's Lake. Land of this general type is being successfully farmed in Township 51, Ranges 4 and 5.

East of the Sturgeon river the sandy patches form a larger percentage of the land, and in many places the soil is stony. Although there are considerable areas of absolute forest soil in this district, it is very difficult to put these into a reserve on account of their purely local character, especially since the land is unsurveyed.

CLIMATE.

It is obvious from the geographical situation of the district that both mean monthly temperature and precipitation will be low. Meteorological records made at Prince Albert bear this out. The following are the averages of the monthly temperatures and the monthly precipitations for a period of twenty years (1888 to 1907 inclusive):—

—	Precipitation.	Temperature.
January	0.83 in.	3.3 deg. F.
February	0.73 "	0.4 "
March	1.03 "	12.3 "
April	0.82 "	36.6 "
May	1.54 "	49.1 "
June	2.63 "	57.6 "
July	2.42 "	62.1 "
August	2.53 "	59.4 "
September	1.44 "	49.1 "
October	0.86 "	38.8 "
November	0.97 "	18.3 "
December	0.73 "	5.5 "

Total yearly precipitation, 16·53 inches.

Average yearly temperature, 32·1 degrees F.

Average temperature for the four growing months, 57 degrees F.

Total precipitation for the four growing months, 9·12 inches.

The rather scanty precipitation is offset by the good depth of soil and by the presence of countless reservoirs in the form of lakes and sloughs. The annual range of temperature is very great. I was informed that last winter the thermometer stood for a couple of weeks at 58 degrees below zero F. I recall three days during the summer when the temperature was well over ninety degrees Fahrenheit.

FOREST TYPES.

The forest of the Prince Albert district may be described as the spruce-aspen type. These two species are found in both mixed and pure stands. Fire seems to be a more important factor in determining the species than the soil conditions of the site. After

a burn, poplar seeds-in quickly and establishes itself to the exclusion of spruce. As the poplar approaches maturity and begins to thin out, spruce seedlings appear if seed trees have been left. The original forest was probably spruce, and if protected from fire it would ultimately be re-established.

On dry sandy ridges jack pine predominates, although in many cases white spruce was found growing side by side with it in very coarse sand. The roots must get their moisture by seepage from the numerous small lakes.

On moist but fairly well drained sites balsam poplar takes the place of aspen, but this type is not extensive enough to be important.

White birch is intermixed with spruce and poplar on well-drained slopes. A type often met with in the region just east of the Sturgeon is what might be called poplar reverting to prairie. This type is found on rather dry soils. The stand is an open one of straggling poplar and scattered jack pine. The grass cover is well established.

Muskegs are very numerous everywhere in the district. They are of two types, high muskegs and low muskegs. The former are fairly dry and support a dense growth of black spruce and scattered tamaracks. The latter are covered with a mixture of sphagnum moss and grasses and are usually folded. Many transitional forms between these two types are found.

Sloughs are most abundant in the district west of the Sturgeon river, where they stretch in chains for long distances. Sloughs of the drier type are very valuable as hay meadows. Just as there are intermediate types between high and low muskegs, so there are transitions between sloughs and muskegs.

Summary of types.—

1. Spruce-aspen, plain type.
2. Jack-pine, ridge type.
3. Poplar reverting to prairie.
4. Muskeg.
5. Sloughs.

Species.—

Picea canadensis (White spruce).
Picea mariana (Black spruce).
Pinus Banksiana (Jack pine).
Larix laricina (Tamarack).
Populus tremuloides (Aspen).
Populus balsamifera (Balsam poplar).
Betula alba var. *papyrifera* (Canoe or paper birch).

FIRES AND REPRODUCTION.

A great deal of the country has been fire-swept at various times. Fires have occurred in merchantable timber within the past five years in the following places:—

At the town of Big River in the southwest corner of township 56, range 7, west of the 3rd Dominion meridian, about 1½ square miles of spruce and jack pine.

At Dumble Siding in township 54, range 7, west of the 3rd Dominion meridian, about six square miles of spruce and jack pine.

In township 54, ranges 5 and 6, about five square miles of spruce. In township 53, ranges 2 and 3, about four miles of spruce and jack pine.

Large areas of young poplar with scattered charred stubs give evidence of great fires at more remote dates. The only fire that came to my notice in the district during the summer was in the valley of the Little Red river about a mile north of Angling Lake camp. Only a small area of young jack pine was burned.

Poplar reproduction is excellent everywhere, except in the dry belt mentioned before just east of the Sturgeon river and above township 52. Here the land is reverting to prairie.

Spruce seeds under a cover of poplar, hence it is not found for some time after burns.

Jack-pine reproduction is generally satisfactory. On account of its dry site this species needs special protection. Every stand of jack pine examined during the summer showed evidences of fire.

LUMBERING OPERATIONS.

Two large lumber companies are operating in the district examined, the Prince Albert Lumber Company and the Big River Lumber Company. Spruce is the only timber cut. The limits of the Big River Lumber Company are nearly all located around Crooked lake. The mill is at Big river. Timber is driven down the streams to Crooked lake and is rafted to the mill. Large quantities of logs are brought in by rail from near Polwarth.

The limits of the Prince Albert Lumber Company are all within the district I examined. They have, in all, sixteen camps, of which fourteen were running last winter. Last season's cut was particularly high on account of fires in the previous summer. Two thousand two hundred men were employed in the woods and the cut amounted to 50,000,000 feet. The timber is driven down two meandering streams, the Sturgeon and the Little Red river. The company's mill is located at Prince Albert, on the Saskatchewan river, just opposite the mouth of the Little Red. The Sturgeon empties into the Saskatchewan above Prince Albert, and the logs are rafted down to the mill. Last summer a logging railway was built from Polwarth to Camp 'D', so that now a large portion of the cut will be transported by rail to Prince Albert, a distance of about fifty-eight miles.

The grade of lumber cut is No. 2 common without any clear or uppers. It is marketed all over the prairie district.

FISH AND GAME.

Whitefish of splendid quality are caught in the large northern lakes. In the Sturgeon and Little Red rivers no trout are found, but pike, pickerel and suckers are plentiful. Ducks and grouse are found everywhere in large numbers, and moose and deer are plentiful, as many as five moose having been seen in a single evening.

DETAILED DESCRIPTION.

Between the Canadian Northern railway and Ladder lake is a range of hills covered with spruce and jack pine of merchantable size. The western slope of this range was burned two years ago. These hills slope out into rolling land in the neighbourhood of Bodmin. East of this range the land is gently rolling and is for the most part covered with young poplar. Occasional small patches of jack pine occur.

At Dumble another sandy belt is found, covered with jack pine and a little spruce on the borders. This is a projection of a larger sandy region west of the Canadian Northern railway. The timber here was recently burned and is now being cut for cordwood. It is mostly of pole size.

South and east of this, the country is of the sloughy poplar type. A great chain of lakes and sloughs begins just south of Ladder lake, where there are great hay meadows, and runs south approaching the railway below Dumble. It extends to the bottom of township 52. Many fine hay sloughs are found in this strip.

At Polwarth there is a small patch of logged-over spruce. Starting northeast over the new Prince Albert Lumber Company's logging road, one passes through about three miles of young burned poplar. This type continues south and takes in nearly all of township 51, range 5, which is well settled. Continuing along the

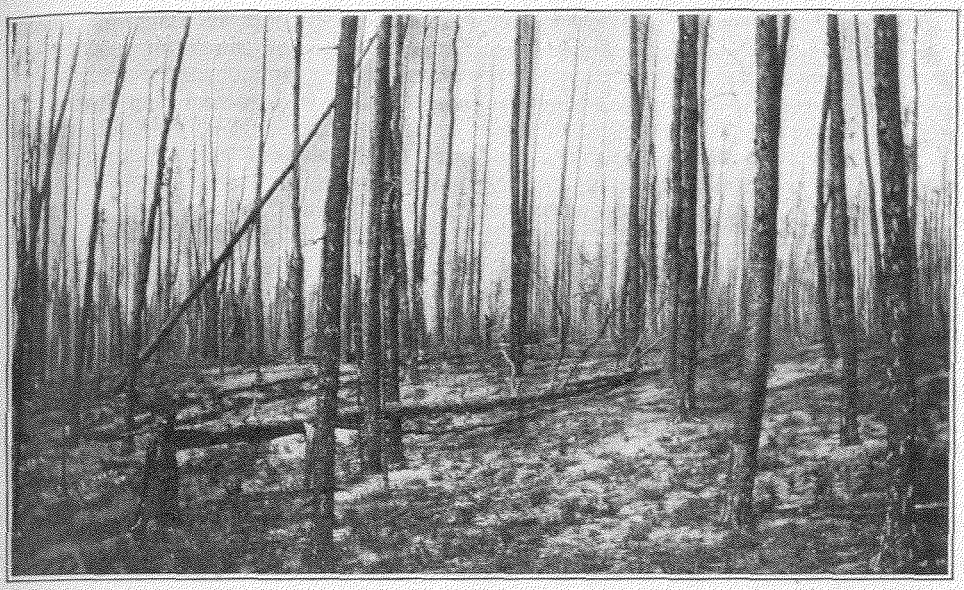


Photo C. H. Morse

Burned Jack Pine, Sturgeon River District, Sask.

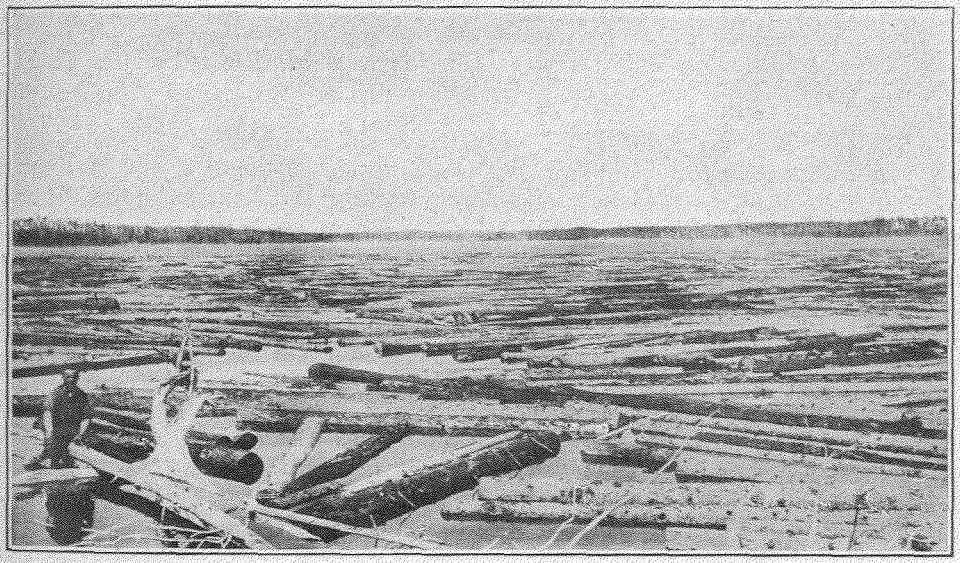


Photo C. H. Morse

A Log-pond in the Sturgeon River District, Sask.

logging road, one comes to the spruce block which originally included, in a general way, townships 52 and 53, ranges 4 and 5. Township 52, range 4, has been pretty well logged over and burned. The best timber is found on township 52, range 5.

The part of township 52, range 3, southwest of the Sturgeon is all open rolling land reverting to prairie. Much of it is covered with young burned poplar, under which a luxuriant growth of pea-vine is found. I talked with several men during the summer who have just located homesteads in the southern part of this township.

The part of township 52, range 3, northeast of the river is very rolling and considerably broken by muskegs and sloughs running parallel to the river.

Township 51, range 3, was once a timber berth but it has been denuded except for a small area at the north end of Big Sucker lake. The southwest part of the township already has a number of homesteads.

East of the Sturgeon, beginning at the base of township 53, and running north parallel to the river, is a belt of open park-like country. This is sparsely covered with poplar and occasional jack pine trees. The grass cover is well established. Here and there patches of pure jack pine occur. In the open poplar type the soil is a peculiar dark dry loam resembling that of the southern prairies, but with coarse sand particles mixed through it.

Continuing east on the 'tote-road' one arrives at another patch of spruce which takes in the central part of township 53, range 3. This is now being logged from camps 5 and 6. The land is clay loam but is hilly. Camp 4 is in the middle of a patch of rolling, sandy land covered with burned jack pine and spruce.

Township 53, range 2, is nearly all spruce but it has been pretty much logged over except in the northeast corner around camp 2. The southeast corner is poplar land. The north half of the township is hilly and in places stony. This is most noticeable around camp 1. Township 52, range 2, is nearly all poplar and is being homesteaded in the south. The eastern part was spruce-covered, but it was logged several years ago.

Township 53, range 1, is quite hilly. The only spruce on it is in the northwest corner. The rest of the township is jack pine or grassy river-bottom land.

The valley of the Little Red river is sandy throughout, but back from the stream at a distance of about half a mile on each side the soil becomes heavier.

The west half of township 54, range 1, is hilly. It has fair soil and is spruce-covered, as is also most of township 54, range 2. The timber is at present being logged.

Township 55, range 2, and a strip on the west side of township 55, range 1, has good spruce partly logged. The south half of township 55, range 3, and the north half of township 54, range 3, were of the same spruce type, but were burned several years ago.

Township 56, ranges 1, 2, 3, 4, and township 55, ranges 3 and 4, contain no timber of importance. The growth is mostly small poplar with ridges of jack pine.

To sum up, the district lying between the Sturgeon river and the third Dominion meridian, and north of a line between townships 52 and 53 contains a large percentage of non-agricultural land. Much of it is heavily timbered. It forms the divide between two large river-systems, so that its relation to stream-flow is important. For these reasons it ought to be maintained as a forest reserve. Certain areas may, however, have to be thrown open for settlement later, when a more detailed examination of the land has been made and when agriculture is sufficiently intensive to utilize inferior land.

PROPOSED RESERVE OUTLINED.

A careful study of forest and soil conditions has led to the suggestion of the following boundaries for the reserve:—

On the north, as a provisional boundary, the line between townships 56 and 57;

On the east, as a provisional boundary, the third meridian from the line between townships 52 and 53 to that between 56 and 57;

On the west, the Sturgeon river, from the line between townships 52 and 53 to the line between townships 55 and 56, thence east to the line between ranges 4 and 5 and north on this range to the base line between townships 56 and 57;

On the south, the base line between townships 52 and 53 from the Sturgeon river to section 3, township 53, range 3, thence north one mile along the west side of section 3, thence east four miles along the north side of sections 3, 2, and 1, in township 53, range 3, and section 6, township 53, range 2; thence north two miles along the west side of sections 8 and 17, thence east seven miles along the north side of sections 17, 16, 15, 14, 13, township 53, range 2, and sections 18 and 17, township 53, range 1, thence south 3 miles along the west side of sections 16, 9 and 4, to the base line between townships 52 and 53, thence east four miles on this base line to the third meridian.

MANAGEMENT.

Protection from fire must be the first step in the management of this reserve. Sites for lookout stations are numerous, and the building and equipping of these would greatly facilitate the work. Since the Canadian Northern railway now patrols its own lines, rangers will be needed only along the line of the lumber camps from Polwarth to Shoal Creek Landing and up the Montreal Lake trail. From Polwarth to Shoal Creek there are about sixty miles of trail, within the reserve and outside of it, that ought to be patrolled. These trails, however, form such a network that a satisfactory ranging system will be difficult to work out. From Shoal Creek Landing to Montreal lake there are about forty-five miles of trail to be patrolled.

All the merchantable timber in the proposed reserve is already in the hands of lumber companies. Much of the remaining timber would be valuable for cordwood if the transportation facilities were better, but at the present time the marketing of it would not be profitable. It would seem, then, that for a considerable time the work of a forester on this reserve will be confined to protection from fire

Respectfully submitted,

C. H. MORSE,
Forest Assistant.

APPENDIX No. 9.

REPORT OF RECONNAISSANCE NORTH AND EAST OF LAC LA BICHE.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
OTTAWA, February 7, 1913.

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

SIR,—I have the honour to submit herewith a report of the reconnaissance survey of the region north and east of Lac la Biche, in the northern part of the province of Alberta, made under your direction during the summer of 1913.

Developments at Lac la Biche and the call from McMurray brought to the attention of the Forestry Branch the timber possibilities in that direction and during last winter it was planned to send a reconnaissance party north of the lake.

With the idea of setting aside forest reserves are associated (*a*) the application of a more efficient fire-protection system and (*b*) the prevention of poverty which arises from homesteading on land which is unfit for crop production. To the prospective homesteader or superficial observer the latter has little weight, but experience has taught that in districts where land is likely to be impoverished in a few years, total prohibition of settlement and the poverty consequent thereon is in the best interests of the applicant.

Regarding the agricultural possibilities, few reports of the country in question have been made previous to this. These vary, depending upon whether the explorer forms his opinion while following a dog-train when the muskeg low-ridge type appears as prairies with poplar bluffs or whether he has had to portage his pack-train over the same prairies in mid-summer.

GENERAL PROCEEDING.

Instructions to examine the district north and east of Lac laBiche, outfitting as much as possible in that vicinity, were received on the fourteenth of May. With very little information regarding trails, &c., I proceeded to Edmonton arriving there on May 18.

Upon the best advice which I could obtain (thanks to Mr. Jas. Spencer, Lac la Biche) my plans were altered. Horses, if for sale at all at the Lake, were held at a premium and the supply of provisions at the country store was not substantial. Thus I was forced to outfit entirely from Edmonton.

The bad state of the roads from Athabaska Landing to Lac laBiche made it imperative that I should freight via Lamont.

On May 28th Geo. Tunstell, student assistant, reported to me. On the following morning we started, having in charge the cook, packer and seven horses, toward Heart Lake, where we were to begin work.

It required six days to freight the provisions from Lamont to Heart lake, a distance of about 180 miles. On June 7th we commenced work with the packer and guide. I hurriedly covered the main trails toward Sand River and became acquainted with the general lay of the country. In the meantime Tunstell and the cook took notes on the surveyed townships south of Heart Lake.

The first two months were spent examining the country north and east of Heart Lake. By August we had reached the McMurray trail west of Owl River. For another month our main camp was located on this trail, while the necessary side-trips east and west, and as far north as the Twentieth Base Line, finished the time-limited northern examination. Turning south we worked on either side of the McMurray trail until we arrived at Big Bay. The inaccessibility of the country west of Lac laBiche made it advisable to leave the pack-train in care of Mr. Jas. Spencer and hire his row-boat. By this means we were able to make a hurried trip down the la Biche river until we were stopped by rapids.

On September 15th we arrived again at the east end of the lake. A week's work toward Trout lake finished a short season's work of four months which was much cut up by rain. Hitching two of the pack ponies to a wagon, we loaded our survey outfit and started for Athabaska Landing. On arriving the team was sent back to where, in care of George Spencer, the pack-train was to spend the winter.

THE REGION.

The region to be described lies about the intersection of latitude 55 degrees north and longitude 112 degrees west. The examined district, of 1,650 miles in extent, includes a portion of the height of land which divides the drainages of the Athabaska

and Beaver rivers. On this height of land one is impressed with the number of loamy sand and sand ridges, which are covered with poplar and jack pine. The undrained heights of land give rise to large areas of muskeg.

GENERAL CONDITIONS.

Topography.—The greatest part of the trail examined drains into the Athabaska river via Lac laBiche. The eastern ranges drain into the Beaver via Sand river, while the northern townships drain northward into the Pembina river. Lac laBiche covers an area equal to about three townships. From tip to tip the length measures about fifteen miles and the width varies up to nine miles. Its main water-supply comes from Owl river. This stream finds its source in the large muskegs of the north. It is very winding and hence has a slow current, except near its source.

Sand river, so called because of the predominance of sand in its course, is comparatively free from rapids. For the most part it is shallow and crooked. It is mainly characterized by the omnipresence of jack pine on the low ridges, which extend on either side.

Heart lake covers about one and one-half townships. Toward the northeast it is dotted with small islands. Its chief importance rests in the fact that a tribe of Indians have camped on its shores for about twenty-five years.

In general, owing to the apparently slow change of elevation, numerous small lakes are found. These, as well as all streams, have a predominance of sand beaches and banks which are indicative of the subsoil.

Soil.—The soil varies from pure humus to pure sand and glacial drift. One is impressed by the lack of the heavier soils. The subsoil in most parts is sand, at least on the ridges.

Soils in relation to agriculture may be classified as follows:—

(*a*) Absolute forest soils.
(*b*) Temporary agricultural soils.
(*c*) Alluvial soils (agricultural).
(*d*) Probable agricultural soils.

The first include the sand soils. They are characterized by having a forest growth of jack pine, a lack of vegetable growth and almost total absence of humus content. The second require special consideration. These soils have become strengthened by the protection of humus given by the deciduous forest growth. The moister portions of these loamy sand areas cannot be said to be non-agricultural, but may be more correctly termed temporary agricultural soils, that is, on account of their shallowness and lightness they would be deprived of their nourishment by a few years of crop production. On these soils are found the heaviest stands of poplar and birch. Where sufficient moisture exists, young spruce will undoubtedly establish itself if unmolested by fire and man.

The alluvial, sedimentary and overflow soils are mostly agricultural, but exist in such small areas as to be negligible except in isolated places. Hay meadows are fairly indicative of these soils.

In the last section of the classification may be included the undrained areas. The problem of drainage of muskegs is at present being widely discussed. Owing to the diversity of conditions which influence the practicability of such a project, we are safe in placing all muskegs in the same group. In my opinion developments in the vicinity of the examined district will not have sufficient force to exclude them from the proposed reserve.

Climate.—Conclusive statements of any district cannot be justly made from one summer's observations, hence only generalities may be discussed here.

The climate of this district varies in no essential from that of Edmonton, though the average temperature for the period from May 15th to September 15th is undoubtedly farther below the optimum for farm-crop production. Vegetables have been grown in small patches around Heart lake but frosts occur frequently in August and September which often cause partial or total loss of the crop.

The general concensus of opinion indicated that the past summer was comparatively dry, so that it may be safely assumed that the precipitation and humidity are ample for agricultural crops and forest trees suited to the climate.

On the whole the climate is characterized by long winters, late frosts in spring and early fall frosts, and considerable variation of heat and cold during August and September. As the best soils are found in the low situations, which are most susceptible to the adverse conditions, it may be concluded that the district cannot claim all the climatic influences which are present in the settled districts to the south.

In connection with the climatic influences it may be noted that the flies are extremely bad, especially in June and July. In the wooded areas the moose flies, commonly called 'bull-dogs,' were sufficiently severe to kill one pack-horse and render the others unfit for work. During the dry season the bull-dogs, as well as the mosquitos and black and sand flies, make it very uncomfortable for both man and beast.

FOREST DESCRIPTION.

The divisions of the forested areas into descriptive types may be designated as follows:—

(1) Muskeg low-ridge type.
(2) Poplar loamy-sand-ridge type.
(3) Pine sand-ridge type.
(4) Muskeg.
(5) Poplar-birch-spruce lake-slope type.
(6) Spruce-slope type.

Muskeg Low-Ridge Type.—This type, comprising approximately four per cent of the total area occurred in largest proportion on the undrained height-of-land areas, especially between the drainage of Sand river and the Athabaska. Large areas are also found northwest of Lac la Biche. On this type the agricultural and timber possibilities are particularly discouraging, partly on account of their remoteness and partly because the areas which are not zerophytically dry are small and sandy. These ridges are mostly covered with aspen and jack pine of small size.

Poplar Loamy-sand-ridge Type.—The trail-followers may claim this type to be in largest proportion, because the summer trails take advantage of the higher situations. In fact the type is approximately thirty per cent. It is mainly characterized, topographically, by ranges of hills separated by strips of muskeg, the latter occupying not more than 25 per cent of the type. A predominance of this type is found between Lac laBiche and Little Heart lake, and north along the westerly part of the height of land to the nineteenth base line.

Pine Sand-ridge Type.—This type requires little description, as the presence of jack pine on light sandy ridges is proverbial. It occupies about 20 per cent of the total area, and is found mainly along Sand river, Owl river and the height of land between the Owl and Pembina rivers. Being more susceptible to fires, it does not at present exist in large sizes, though along Sand river it may be found in small areas with a diameter up to 15 inches at breast-height.

Muskeg.—This type is differentiated from the first by the absence of the low ridges. The total aggregate of small blocks, amounting to about five per cent, is found in increasing quantity toward the twentieth base line.

Poplar-birch-spruce Lake-slope Type.—The introduction of birch (*Betula alba* var. *papyrifera*) and white spruce (*Picea canadensis*) into the poplar type occurs on the moister soils, principally around lakes. This new type, which has been designated by a rather cumbersome, though descriptive, name, forms about 4 per cent of the area. The soil of this type approaches sandy loam, probably because the humification is more perfect with the improved factors of site. The tolerant spruce promises to play an important role in the development of the climax forest.

Spruce-slope Type.—The small percentage of this type, probably less than one per cent, is due in part to repeated fires. Indications show that large areas were once covered with heavy spruce, but after the fire poplar reproduced on the burned soil and the promise of another spruce stand is found only on the moister soils, A pure spruce stand of about five square miles was located in the northern part of township 68, range 11, west of the 4th meridian, and the southern part of township 69, range 11, west of the 4th meridian. This small stand loses much of its importance, on account of its remote location, at least it is not easily accessible to a practical water-route.

The maximum stand is about 15,000 feet, board measure, per acre, including only white spruce. An average stand would not exceed 5,000 feet, board measure, per acre. This spruce is over-mature and awaits development by railway.

INDIAN INHABITANTS.

For the last twenty-five years a tribe of Indians (Chipewyans) have camped around Heart lake. Their present state seems to show little advance on their early conditions. A few years ago one could have seen indications of advancement by the number of cattle in that vicinity but the authorities gave inducements for them to go to Cold Lake Reserve, and the more thrifty Indians took advantage of this. The result is that there are about a dozen families with a total census of about sixty, who are of a shiftless and indifferent nature. This is clearly indicated by their lack of industry. Their existence depends almost solely upon the hunt. They shoot and fish at all seasons of the year and pay no attention to the sex of their prey. Attempts have been made to educate the children, but the failure is mainly due to the wild state in which they are living.

GAME AND FISH.

Moose, deer and caribou have been driven into the remote parts by the Indians, but are still plentiful enough to restock the country if protected. The fur-bearing animals have also become scarce on account of the demand for furs. Rabbits are plentiful and very destructive to the spruce and pine seedlings in many localities. Partridge are very scarce. The scarcity is in part due to the Indian who has no scruples against shooting a hen from her nest.

Whitefish and jackfish are plentiful in most lakes and streams. The whitefish are easily caught in nets and provide a portion of the Indians' daily food.

FIRES.

Recent fires have been confined mostly to the jack pine sand-ridge and the muskeg low-ridge types. Reproduction shows that during the last three decades a large proportion of these types have been covered by fire. The quick-seeding jack pine and aspen have taken possession of the burned areas.

DISTRICT NOTES.

The main district is bounded on the east and north by Sand river and the ninetenth base line, and on the west and south by the townships in range 14, Lac laBiche

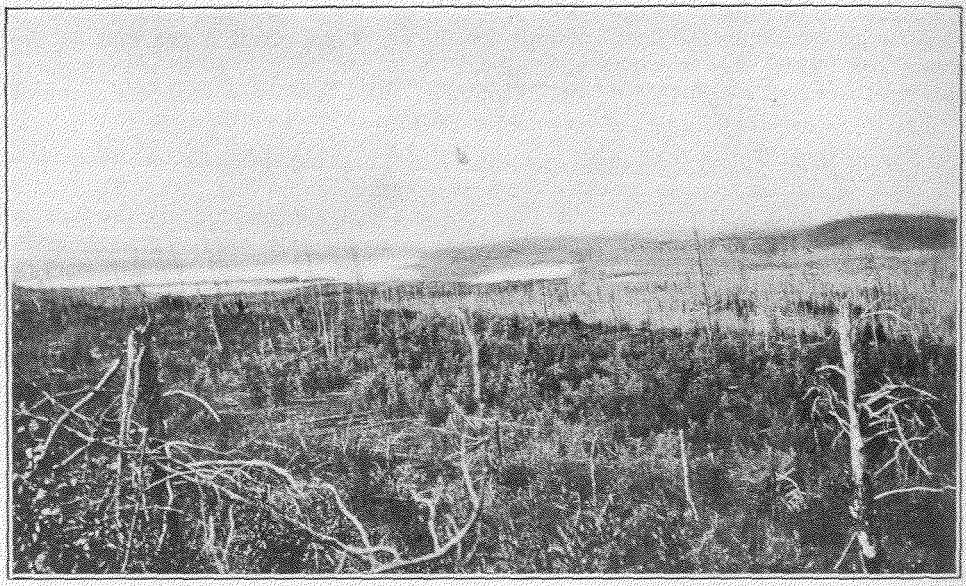


Photo S. H. Clark.

Young Jack Pine Springing up after Fire, Buffalo Lake (Lac LaBiche Region).

Photo C. H. Morse.

View on Crooked River, Lac LaBiche District.

and township tier 66. It offers a great diversity of types, with a large amount of pulpwood, and but one pure stand of merchantable spruce of importance, which has been described previously. The development of this pulpwood and timber will depend upon the extension of a railway in that direction. Sand river and Owl river are both drivable streams, but cannot carry timber into civilization. Closed stands of merchantable jack pine are worthy of note in townships 69 and 70, range 8, west of the 4th meridian.

TRAVERSE OF THE McMURRAY TRAIL BETWEEN THE 19TH AND 20TH BASE LINES.

The examination north of the nineteenth base line showed a large percentage of jack pine in townships 74 and 75, ranges 11 and 12, west of the 4th meridian. Jack pine in this district exists mostly in open stands and hence is less valuable. Township 76, ranges 11 and 12, west of the 4th meridian, are mostly muskeg. In this muskeg area the Pembina finds its source. A means of development would also put a different aspect on the value of poplar and jack pine in this district.

LA BICHE RIVER TRAVERSE.

Poplar predominates on a strip of varying widths on each side of the river. Behind the river-banks, and often extending to the water's edge, the muskeg and muskeg low-ridge types become conspicuous.

Fifteen miles of river from Lac la Biche is free from rapids but the height of the banks and the number of rapids increase toward the Athabaska river. Near the lake numerous hay meadows are at present cut by half-breeds.

GENERAL NOTES.

In so far as determining a boundary betweeen agricultural and non-agricultural land is concerned, very little was accomplished. In examining east, north and west of Heart lake no areas of agricultural land of sufficient size and importance to justify their exclusion from the proposed reserve were found.

With the exception of a few sections east of Lac la Biche the line denoting the limit of examination may be extended in any direction without intrusion on agricultural soil.

SILVICULTURAL NOTES.

It may safely be said that the climax forest on the best sites will be white spruce, for where there is a stand of poplar or poplar and birch association on a moist soil, there is found a strong reproduction of spruce. The tolerance of spruce if unmolested by fire will guarantee its establishment.

Jack pine, being susceptible to fires and a ready reproducer, seldom enters into an association with the other species, but is mostly found in even-aged stands.

FIRE PROTECTION.

The Indians at Heart lake, the half-breeds on the north shore of Lac laBiche and the travellers of the McMurray or Heart Lake trails deserve special attention. An influential man who speaks the Cree language should patrol the Heart lake trail and keep in touch with the Indians. He should also patrol the trail north of Lac laBiche as far as Owl river, warning the half-breeds camping there.

Travellers going north should be noted and warned. This for the present is sufficient patrol until development to the north demands a more efficient fire-ranging system.

RECOMMENDATIONS.

The Indians at Heart lake have made a request for a reserve there, but in view of their small numbers and the character of the country the granting of such a request hardly seems justifiable. Inducements should be made to them to attract them to settle with their kinsmen at Cold lake. Because of the dependence of their livelihood on the hunt, game laws cannot be enforced. They are also responsible for occasional fires. During the past season two were started by their negligence.

The utilization of the pulpwood should be encouraged, thus improving the possibilities of a spruce forest by natural regeneration. When the development of forestry in Canada demands regeneration by artificial means, the silviculturist will find a large field for operation, especially between Lac laBiche and Heart lake.

The framing of an extensive management and fire-protection system requires more study than I have been able to give in the short summer, but such will gradually grow as developments in that direction demand.

Respectfully submitted,

S. H. CLARK,
Forest Assistant.

APPENDIX No. 10.

REPORTS ON WOOD BISON.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
FORT SMITH, ALTA., May 31, 1912.

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

SIR,—I beg to submit the following report of work done by myself since last writing in March.

When orders came for P. McCallum to proceed to the reindeer camp near Chipewyan, it left me crippled as far as tripping was concerned. He took all our tripping outfit, as well as sled and dogs. I was somewhat disappointed, as the joint patrol with the R. N. W. M. P. was to take place in March.

However, I managed to scrape together an outfit, hiring a man and his team. The winter was almost over, but the most important part of it was to come, as I had been led to believe. The buffalo calve some time near the end of March or beginning of April, and we wanted to be in the country at that time.

I made a flying trip to Bear Creek to pick up traps and necessary articles of camping life, and when I reached Fort Smith again Inspector Fields told me that he was not going to send out a patrol. He had heard that the Little Buffalo river, which we were to cross on our trip, was completely flooded. I later discovered that the trail was perfectly sound and was so for a month after that.

I started out with the man and dog-team, following the trail we had taken in January, the one running southwest from Fort Smith and turning due west after crossing Salt Mountain.

My object was to visit a place called the 'Little Fishery,' known to many Indians up here, and which is located on an upper tributary of the Little Buffalo river. We were short of fish, and Mr. Bell thought it a good idea to ascertain the location of

the place and any other particulars that might be useful. After following some very misleading and altogether foolish directions received from, as we thought, reliable Indian information, we located the place more by the sense of smell than anything else.

This 'Little Fishery' is very interesting and important, in that it is the only place near Fort Smith where fish can be obtained during the winter with which to feed the dogs. The shortage of fish at the Fort and elsewhere seems to be chronic, no matter how big the run is in the fall. This is, of course, due only to carelessness and laziness. But the Indians know that if they run short towards the end of winter they can easily get all they want at this place.

It is at the confluence of a small shallow stream and the upper part of the Little Buffalo river, some two and a half days' travel in the winter, from Fort Smith. It is marked on the map thus ⊙. The fish are suckers, and are there during February and March in such quantities that they fill the stream from bank to bank. They keep the river open for three or four hundred yards, although two or three feet of ice cover the river below this point. They are rather small, the largest of them weighing only one third of a pound and the smallest being only minnows. However, what they lack in size is made up in quantity. What their object is in congregating there in such numbers, I have not been able to ascertain, but it is clearly not to spawn, as that comes later in the spring when the ice leaves the shallow streams and rivers.

The method of catching them is simple and primitive. They are simply scooped out with bags tied on the end of poles, and a pile is made on the snow on the bank. Here they freeze solid and will stay so until late in April. When we arrived they had nearly all gone, but we managed to get six or seven bags full without very much trouble. They must have been there in enormous quantities as huge masses of them were frozen in the ice along the shore, and piles of dead fish could be seen everywhere behind sunken logs, driftwood, and holes in the bank. Of course, this will be of prime importance to us as we can use it as a basis of supply of dog-feed when in that part of the country.

No tracks of any kind were discovered by us on the outward or the inward journey. The snow was very soft and a hard crust formed on it every night, so animals of every kind moved about as little as possible.

I spent considerable time and effort looking for a good situation for a house on Salt Mountain. You know that fresh water is very scarce there and we are fortunate in having located a good-sized fresh-water lake, one of those deep crater lakes you have heard spoken of. This situation is very strategic, I think, as you will see by the map.

My plan which I have talked over with Mr. Bell is this: The house we use as a sub-headquarters or main residence should not be more than a days' journey in winter-time from the Fort, as Mr. Bell can then keep pretty well in touch with us. It should also be centrally located, so that we would never be farther from one field of operations than from another. We want to get over as much ground as possible in the winter, and in order to do this, we must use, as much as we can, any existing trappers' (Indians') trails which have been broken and are in use.

Breaking trail is a very hard task, and two men could never hope to break trail all winter (that is, new trail), and go any distance or cover any large territory. Therefore, my plan is to make a cross trail of our own, bisecting all the other trails which radiate from the settlements on Slave river and which one and all run westward. This trail will run north from the proposed shack as far as our Bear creek hut, or, maybe, farther; and south, intersecting all the trails from Smith landing as far as Peace river, or, in any case, as far as Pere Muster's shack. I don't quite know the location of this shack. It is one built by the man whom the R. N. W. M. P. had hired before we came in here, and who, I hear, is a splendid trapper and hunter. It is centrally located on the Southern Buffalo range, and would make a splendid southern terminal for our trails.

Thus you see, we would cross the trail of everybody who went into or crossed the buffalo country, and as these trails are kept open more or less all winter, we could use any or all of them in travelling over the country.

I am very sorry and disappointed not to be able to furnish you with an estimate of the number of buffalo in each range. My information, both from observation and hearsay, is too vague and uncertain to be of any practical use. This was caused, of course, mainly by our prolonged stay around Bear creek, under McCallum's advice. However, I know this much, that there are 50 to 100 head scattered over the district just west of the proposed house; 100 to 150 head in the southern, or Peace river, herd; and 50 in the northern, or Resolution, range.

I expect to start out on a trip by myself next week. I have been travelling alone for some time and getting along very well. However, for the last three weeks I have been looking after the summer dry-fishery at Salt river. Here, with the aid of two women, I put up 1,600 fish for the dogs during the summer.

I expect McCallum will be busy with the reindeer for some time yet, so I will do as much travelling as possible by myself, and leave the erection of the house until his return, or at least until Mr. Bell returns from McMurray, where he has gone to meet the treaty party.

I have established a camp with a tent and supplies out on the mountain near the site of the house, and as soon as I can get help the house will be built. Of course there is no immediate demand for a house. As long as it is built before the winter sets in we can get along all right.

Respectfully submitted,

GEO. A. MULLOY.

II.

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
FORT SMITH, ALTA., August 20, 1912.

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

SIR,—I beg to submit the following report of work done by myself and P. McCallum since last writing in June.

During the latter part of June, as Mr. McCallum was still away in connection with the reindeer, and as Mr. Bell had gone up the river to meet the treaty party, I decided to make a horse trip by myself.

I wished to see the country north of the proposed site of our house on Salt Mountain, to determine the feasibility of running a winter trail in a northwesterly direction, connecting several of the Indians' winter trails, and also to determine whether this was a country inhabited by the buffalo.

Although the flies were very bad, I made good progress for a day and a half north of my camp. Here, however, I was stopped by a ground fire which was burning all the grass and small bushes in every direction. It had evidently come from the northwest, and, when I discovered it, had covered an enormous area. Of course, it was impossible for me to proceed, because all the feed for the horse had been burned and the fire was rapidly approaching my camp, some fifteen miles to the south.

I tried to put out the fire. I fought it for several days, beating it out with a brush, but as I could only put it out in one direction at once, it kept burning behind me and my efforts were of little or no use. At last I decided to return and burn around my camp. This was slow work, as I did not want the fire to get out of hand. However,

my difficulties were solved at last by a huge downpour of rain which put out the fire in every direction.

The country I travelled through is of much the same character as that around my camp on Salt Mountain, very hilly—mountainous, in fact—the higher hills covered with fine jack pine, and the valleys filled with a dense growth of good poplar.

I had been warned that water was scarce, that is, good water, as all the lakes were salt; but this information is far from correct, as each depression has its little lake, and every one I struck was fresh.

Old buffalo trails are very plentiful, but no fresh signs were seen. They evidently, at one time, were very plentiful here, and, I think, would still inhabit this part of the country if it were not for the fact that this is a great country for moose and hunted over by the Indians from both Fort Smith and Salt River settlement.

On the 1st of July I returned to Fort Smith and found P. McCallum waiting there for me. We immediately made preparations and started out to Salt Mountain to build the house.

The situation of this house I described to you in my last report. It is situated on a small lake two or three miles west of the eastern face of Salt mountain. Altogether it is twenty-five or twenty-six miles from Fort Smith and on one of the principal winter trails used by the Fort Smith Indians. From here it is our intention to make a trail both north and south, connecting all trails entering or crossing the buffalo country.

Although hampered for lack of tools, we put up a very presentable shack, 10 feet by 11½ feet, inside measurement. We have still some work to do on it which can can be finished in the fall before the snow comes. I have enough supplies out there for two or three months, so no time need be lost in packing on horseback. On Monday, July 15, we arrived at Fort Smith.

Mr. McCallum and Mr. Bell had been talking the situation over in my absence and had come to the conclusion that a stopping place or house at Fort Smith was absolutely necessary. Whenever we come to Fort Smith we have been stopping with the Agency Farm instructor in one of the Northern Trading Company's buildings. This has been taken over for their own use by that Company, and we have no place at all to stay when we come here to report.

An expenditure of $200 was authorized for a building on Salt Mountain, but as we have put up a building of fair dimensions without any expenditure out there, I think that the appropriation should be devoted to this building at Fort Smith. Mr. Bell will advise you in regard to this.

So for the last month we have been putting up a building at Fort Smith. We expected to have finished it long ago, but owing to the scarcity of lumber, shingles, &c., we have been very much delayed. It is nearly completed, or as near as can be until we can obtain some more lumber.

The fishing season is nearly here, and unless we can arrange to have the fishing done by someone else, we will not be able to make a trip until its completion.

In conclusion I would like to say that if the management of this work were placed in the hands of one man, that better results could be obtained.

Respectfully submitted,

GEO. A. MULLOY.

III

FORESTRY BRANCH,
DEPARTMENT OF THE INTERIOR,
FORT SMITH, ALTA., November 12, 1912.

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

SIR,—I beg to submit the following report of work done by P. McCallum and myself since last writing in August.

As I intimated at the close of my last report the fishing season was approaching; so we moved down the Slave river to our last year's fishing grounds at Bell Rock.

This year we have two trains of dogs to provide for, so we had to catch as many fish as possible during the short time that they were running. The catch this season, however, was not up to standard, the heavy run of fish lasting only three or four days. We stayed down there two weeks, from September 1 to September 14, and managed to put up five hundred or more fish. This amount, supplemented by some rabbits and what small fish we are able to get at the Little Fishery on Little Buffalo river, will keep the dogs in good working condition until the spring.

The main part of this report will be taken up with a detailed account of the long trip which we have just completed, with horses as pack animals. This trip, I will say at the start, was, in my estimation, the most successful and most satisfying to me, personally, of any which I have yet made, not only on account of our success in getting so close to the animals, whose welfare is the main object of our exertions, but also because we were able to spend a protracted period in buffalo country without being forced to return for supplies.

The fall is certainly the best time for travelling in this country. The water which in June hinders travelling to a great extent has been nearly all drained off; the flies which worry the life out of man and beast alike are all dead and the leaves have fallen, allowing one to see through the branches of the trees and get an idea of the country on either side of the line of travel. September and October were ideal months this year.

On Tuesday, September 24, we started for Salt Mountain. It was our intention to spend a few days fixing up the house which we had built there in the summer and then to strike out west from that point. Owing to a late start we were forced to camp at the government farm on Salt river. It snowed heavily at night, the first snow storm of the season, and consequently next day was very bad for travelling. We obtained another pack horse at this point. Crossing Salt river we headed across the Salt Plain for the mountain. We should have reached the shack early in the afternoon, but in making a detour to the Salt springs to get some salt, we found an old trail which we thought might take us up the mountain near the shack and thus avoid some bad crossings on the old trail which skirts the Salt Plain. But it 'petered out' very shortly, and as the day was very cloudy and the country very hilly and wooded we got lost and had to camp. This part of the country (that is, the eastern face of Salt Mountain) is very broken and precipitous in many places, sloughs and boggy places alternating with steep cut-banks and rocky slopes. Of course, it is all well wooded, the higher hills having the good timber, and the lower reaches, scrub spruce and tamarack. Altogether, it is impossible travelling for horses or nearly so, and as this condition holds good for nearly the entire length of the mountain we should have profited from our experience and avoided it in the future. Some of our later experiences will show whether we did or not.

Next day, September 26, after skirting the edge of the mountain, taking our correct course by the sun, which had come up bright and clear, we struck the trail

and arrived at the shack before noon. I would state that by taking an average of the estimates of different people I think this shack is about twenty-five or twenty-six miles from Fort Smith.

Here we stayed until Monday, September 30, working at the house. This house is made almost entirely with the axe, but it is a model of convenience and comfort. The walls had to be all caulked with a tough moss or alga, obtained from the bottom of a pond. Very tiresome work it was too, but the result justifies the trouble expended, as it will stand for six to ten years as good as new. No mud could be obtained nearer than three miles or it would have been used.

Early in the morning of September 30 we packed up and started westward. We took 50 pounds of flour and about 30 pounds of bacon. This, with what game we managed to kill, we expected to see us through until we were forced to return by the snow. This is the trail which goes to Little Fishery and on to Caribou Mountains which we were out on last January and which I described in my report then. The country, of course, slopes gradually to the westward, as this is part of the watershed of the Little Buffalo. Jack pine hills give place to big open poplar and clumps of good spruce. Then, for four or five miles a spruce muskeg and very old spruce brulé intervenes, then Flat Grass lake is encountered. The winter trails run right down the middle of this lake, but the summer trail branches off to the northwest shortly before the lake is reached, following the rolling hills and ridges, covered in places with thick small poplar and dotted here and there with open glades and meadows of thick grass. The lake itself is long and narrow, wider at its more eastern extremity. A thick growth of long rushes lines the shore and the poplar country holds good all around it. Here it was that we saw so many buffalo tracks last winter, crossing the lake, and here it was again that we found much evidence that many buffalo had been feeding in this locality all summer. This country, I think is the limit of Peace River buffalo. Although there are many good crossings on the Little Buffalo river, we found absolutely no trace where any of the animals had crossed and thus entering the country inhabited by the northern bands.

We camped in the poplar country to the north of Flat-grass lake.

Next morning, October 1st, after going two miles or more we came to the crossing on the Little Buffalo river. The river here is not very wide, thirty feet or thereabouts, but it is very deep and the steep banks render it very difficult for horses to cross. It was therefore necessary to look for a better crossing, one of us going up and the other down the river.

The fringe of spruce which lines the river is very good just here. The river is very crooked, but this fringe or bluff of good timber does not follow all its curves. Dense growths of willow and poplar clothe the bank right to the water. This is the home of the beaver. We saw about half a dozen lodges which were occupied, and everywhere along the bank, and even 100 yards from the water these animals had been at work, felling poplar for feed. One does not realize the enormous labour which they undertake until he sees a whole bluff of good-sized poplar, lying flat on the ground.

The remainder of this day we spent exploring ,and not finding any suitable crossing we decided to strike south following the river-bank.

Wednesday, October 2, was fine and we went south until noon following an old trail which skirted the river-bank. We found three good crossings, where the river was rocky and shallow, but owing to the absence of any sign of a trail and the dense appearance of the country across the river we did not cross until the last one at noon was encountered. The country on the east side of the river is rolling, covered with small poplar and spruce, with a low swampy stretch of spruce near the river.

Crossing the river we circled around to the northwest, following the hills as much as possible until we again came to the winter trail near the Little Fishery on the Buffalo river. This country to the west of the Little Buffalo, or rather enclosed in

the big bends of the river which primarily comes from the northwest, is rolling in character and covered with jack pine, spruce and poplar of good commercial size. The spruce especially is more than a little above the average. To the north and east of the Little Fishery and Old Charlie's shack run ridges of good spruce. Near here we camped for the night.

Thursday, October 3, was also fine and we followed the trail westward for a couple of hours through scrub prairie and small spruce country until we encountered the high jack pine hills. These hills are higher and steeper than any others in this district, and run in a broken line to the northeast. The crest of the hills is fine walking. No fire has yet burned off the thick carpet of needles, and the trees, while big and tall, are not thick enough to impede one's progress or prevent one from seeing where he is going. At a little lake in the midst of the hills we spelled for noon and then reconnoitred without the horses. We found the trail of a big bull buffalo heading southwest and fairly fresh, but as no others were encountered we concluded he was just a stray animal making a circle through the hills and would come back to the higher country to the east and north.

As the high country seemed to hold good to the northwest and west we headed in that direction. Thick small poplar on rolling hills were encountered. Then the travelling became very bad with old brulé on every side. This is very old, and a second growth of small poplar has sprung up, making progress very slow and the result of much arduous labour. From the top of one of the hills we described the course of the Little Buffalo river, which here makes the turn coming from the far northwest. Its course can be clearly picked out, as the dense growth of willows, which edge the bank, have a bright red fringe on top where the new growth has taken place. In this old brule, second-growth poplar country, we camped for the night. Along towards morning a moose visited the horses but cut his call too short for us to get a shot at him.

Friday, October 4 was dull. Keeping in the same direction, west to northwest, we twisted, cut and fought our way through bad going until in a short time, two hours or so, we struck the course of the Little Buffalo. As it was coming from the direction in which we wanted to go, our troubles were over for the time being. The river was now bordered by a wide strip of hay land. Long thick grass, sometimes shoulder-high, followed the bank right along, confined and separated from the big dense brulé to the east by a dense fringe of alders and willows. The walking underfoot was very lumpy and uneven, but as we were avoiding the brulé we were well satisfied. This lasted until the middle of the afternoon. Then the Little Buffalo turned away westward, and we had to strike back into the bad going. The same old brulé, thick poplar country, was met everywhere. Towards night McCallum went ahead alone to reconnoiter. The night became very dark and he got lost, or, as he puts it, the camp got lost. By use of our two rifles and strenuous vocal efforts, he reached camp late at night.

Saturday, October 5, was cloudy. Brulé—thick dense tangle, masses of it. McCallum undertook to get us out of the mess, but owing to his uncertain wanderings the night before was rather mixed up. Our travelling until noon could not be called 'going ahead'; we simply wandered—that was all. At last, shortly after noon, we struck a freshly blazed trail through this tangle. It came from the east and was heading west and north, so we followed it. Two hours' good travelling brought us to a big lake. This lake is almost as big as Moose lake and has some good-sized islands in it. The shores and islands are well covered with good spruce which seems to have escaped the numerous fires which run through here every year.

From the lake the trail headed northwest through small spruce muskeg, coming very shortly to a small muskeg lake. All about this lake a fire has run this season. It was set undoubtedly by moose hunters.

Let me interpolate a short explanation of this large amount of brulé, old and new, in this part of the country. There is an old man up here who has a great reputation as a moose hunter. In fact, this fall, he, or the members of his hunting party, killed from seventeen to twenty moose. Now it is a known fact that moose like brulé. It is rather open for the wind to drive the flies away, and it affords good feeding for them on the willows which everywhere spring up. So it seems to have been, and is still, the custom to let a fire run through a new part every season. I have been, at times up to the present, greatly puzzled to account for the absence of timber on good high ground, capable of supporting a good thick growth of timber. The very old brulé does not show very much, on account of the thick growth of saplings which everywhere covers the ground. But this, then, is the explanation. Furthermore, I have just learned that an old custom existed of setting a fire every time a moose was killed, which, I think, is more or less maintained to this day.

The country all about is becoming very swampy and low. Spruce muskeg predominates. The trail continues in a northwesterly direction, and we travel late at night in endeavour to get a good camp and feed for the horses. We camped at last in a muskeg.

Sunday, October 6, was cloudy. Early in the morning we heard a band of wolves howling, towards the north. From the howls we concluded it was a bitch wolf and some cubs. I baked bannocks while McCallum set out along the trail to see if it went in the right direction, or at least in a northwesterly direction. About noon he came back with the information that it makes a circle and turns back south. So in the afternoon we reconnoitered in the direction in which we had heard the wolves. It was impassable country for horses. There were sloughs and muskegs on all sides, and we ourselves could hardly get through. The whole country here is one big bog, where even a moose wouldn't attempt to go.

Monday, October 7, was cloudy. In the morning we tried another road, again leaving the horses. Following the trail for a mile or so we branched off to the northwest in big poplar and spruce country. The timber was very good, including large quantities of big spruce, but the bluffs were not contiguous, just scattered here and there, the intervening spaces being filled in with dense swamp. After wandering all morning, climbing tall trees and following the big timber as nearly as possible, we stopped and held a council. We decided that, as the country ahead as far as we could see was the same, that is, almost impassable for horses, we had better return on the trail until we came to the higher jackpine hills to the east. This, certainly, is no buffalo country as there was scarcely enough feed for the horses at the camp and none further on. Moreover, a buffalo could not travel at all here. He has to have a firm footing. His legs are comparatively short, and he is not able to wade through quaking bog-holes, like the moose. So, packing up, we returned to nearly the place on the trail where we first struck it, and camped in the brulé. Rain came on, and then frost.

Tuesday, October 8, was cloudy and windy. The big brulé continued east until the middle of the afternoon. Moose hunters had been busy just a few weeks before on this trail. We saw where they had made many kills and much meat had been packed on dogs. We crossed on the range of hills, and next came to where they had made a big cache of meat. Of course as the meat was all dried this cache was big enough to contain eight to ten moose. Jackpine hills were the order of the day. We camped at the cache.

Wednesday, October 9, was fine, with a southwest wind. Following the trail, which runs around the southern extremity of a good-sized lake and then heads northeast, we came to the big jackpine hill country. This is the continuation of the big range of hills which we left on October 3. All day we travelled through jackpine hills with deep valleys, containing grassy sloughs and lakes. Fine big jackpine cover all the hills, but much of the country has been burnt over. We found by experience that,

although in places the trail is very faint, it is better to spend some time in working it out than to make a road for ourselves. Our idea was to follow the ridges around to the north and east until we came to the big poplar country inhabited by the buffalo. Snow at night.

Thursday, October 10, was fine, with a southwest wind. Trail very faint. Got close to P. Squirrel's winter trail. Jack pine ridge country and old brulé. Old brulé and small poplar country later in the day. We came north and then east, northeast generally till three o'clock. We hit an old winter trail and struck northwest, making trail for ourselves. Very bad travelling. We crossed a small creek coming from the southwest (we had to make three crossings for the horses owing to its winding nature). Then we headed for the jackpine hills to the northwest, where we camped at an old moose hunter's camp. Small, thick jack pine interspersed with small poplar predominated.

Friday, October 11, was fine and windy. We followed small jack pine ridge north for a short piece, but it ran out, and we struck for big timber to the north and west. High hills were visible, and we had bad going, through old brulé. We crossed one small creek three times. We spelled for noon at the last crossing, and struck good going in small jack pine and poplar about two o'clock. High hills. There was a fine view, we could see Salt Mountain range to the east and southeast. Huge big poplar country lay to the north and west across big valley. We followed the crest of the hills around until we were able to cross to big poplars. Saw fresh buffalo track in jack pine shortly before camp, and camped in big poplar. Fine feed for horses was found here, fine thick grass growing everywhere between the poplars. It is great grazing country.

Saturday, October 12, was fine, windy and cloudy at night. McCallum and I went west along a poplar ridge following the old trail. We left horses and dogs, and saw many signs, very fresh, of buffalo, tracking one big bull who had wandered in a circle. It was a splendid country, having big open poplars with open grassy glades and numerous water-holes. We had the bad luck to scare off three buffalo. There must be many buffalo in the country, as the whole country is tracked up, but no calves' tracks are seen.

In the afternoon we baked, and mended mocassins. Although we started out with seven or eight pair of mocassins, we were completely out of footwear. Such things as moose-skin wrappers and gun-coats are requisitioned for shoe-soles. With care a pair of mocassins will last two days travelling in the woods, sometimes not even that. As mocassins cost from $1.50 to $3 per pair, travelling in the bush in summer-time is very expensive in regard to footwear. This could be greatly alleviated by having huskie boots, or muk-luks, such as the reindeer men wear, sent in from outside.

Sunday, October 13, was fine. Starting westward again without the pack animals, we made a big circle, following along the line of dry sloughs at the edge of the poplars, then wheeled north into the poplars and then struck home. Buffalo tracks were everywhere, and a band must stay here all summer. Fine feed was found all through the poplars.

Monday, October 14, was fine and warm. All things considered, we decided to head north and northeast. Big poplars lasted for a couple of hours, then big jack-pine commenced. Here in the jackpine we struck the trail which I had travelled over on my first journey into the country with an Indian called David Bigar, although I did not recognize it as such until some time later. This is the same trail as the Royal Northwest Mounted Police, accompanied by Radford, used on their trip into this country, and seems to be used every winter for dog-sleds. The peculiar thing which we remarked was that no traps of any kind had been used. This trail, however, will be inspected this winter.

Crossing a big scrub prairie I made a wrong turn and got to the winter road. It was a bad time for a spill, as it follows a line of sloughs. But McCallum went

investigating and found the old track again in the big poplars to the north. Poplar ridges and then big jackpine till we camped by a small grassy slough.

Tuesday, October 15, was fine. We continued west and northwest on the old trail. We found short pieces of muskeg and high jackpine and poplar ridge. At the crossing of double creek, we recognized the old trail. After coming to the huge poplar country, we lost the trail at an open place in the hills. We passed through fine grazing country, long fine grass but no water. Had no noon spell, and no water. We struck north through the big poplar hills in search of water, and camped at a small slough at the edge of the poplars. Muskeg or small spruce country lies to the northeast.

Wednesday, October 16, was cloudy with rain at night. I started back to see if I could find the old trail and was away most of the day, finding one old trail with very large old buffalo head running to the northeast. McCallum reconnoitered to the north and northwest, and found a creek and many fresh buffalo signs. This is the upper reaches of Bear creek. This fact I found out later from enquiring and from deduction. The creek flows into Little Buffalo river where we were trapping last winter, before Christmas. Rain fell all night.

On Thursday, October 17, soft snow and rain fell. It was too wet and miserable to travel, and snowed and rained all day. We spent the time mending mocassins and baking.

Friday, October 18, was cloudy. Following the edge of the poplars where the thick small spruce commences, we circled around northwest, then west, then southwest, following the course of the creek. We came at noon spell to a crossing, where a deep buffalo path leads in and out at either side. The crossing was stony and shallow. We spent the noon spell without crossing, and picketed our horses in a small slough near the creek bank. In the afternoon McCallum and I went back along the trail, which is the one we had lost two days before, and made a big circle to the southwest. We saw a big lake or lakes with a big stretch of hay sloughs where Bear creek has its source. It is a high poplar country all around—a fine buffalo country. There must be a big bunch of buffalo here, as there are lots of fresh signs. We followed the creek home, getting lost many times, and finally stumbled into camp long after dark.

Saturday, October 19, was cloudy with snow flurries. We crossed the creek at shallow, stony rapids. Swampy ridges were the rule. It is a very different country to that I saw when out with David. The country has all dried up. Places, on trail where at that time we had to make wide detours, sometimes lasting half a day, were dry as a bone; particularly in one place near Bear Creek where one of the horses lost an eye in plunging about in a bog hole, we were able to cross with no difficulty whatever.

Jackpine ridges and poplar country now alternate. The buffalo path through the jack pine is deep and wide, but in the poplars, where feed is plentiful, its identity is in places nearly lost. Many buffalo have used this trail very recently, as their tracks, both large and small, were clearly marked in the muddy places on the trail, which is not well marked in the small poplar country. Near nightfall we camped without water or tea. It was cold at night.

Sunday, October 29, was cloudy. We had an early morning rush for water. McCallum was unsuccessful, but I located a good spring a mile or so back of the trail. Fine water. Later McCallum went to search for the trail which had been lost again. I baked, and mended my mocassins, later McCallum came back and said he saw a big buffalo bull that ran away to the northwest.

Monday, October 21, was bright and sunny. The slight fall of snow had made it very wet and cold underfoot. We made a big circle to-day without the horses or dogs. Going northwest for a short distance, we came to a thick strip of big spruce. This is a well defined strip and is uniformly wooded. Some trees would measure three

feet across the stump and are tall and clean. Beyond, or to the northeast, in which direction we now headed, we encountered small jack pine. We struck an old, well defined buffalo trail here and followed it. It led us westward through small poplar and jack pine, then big poplar. Then about noon we came to open prairie country dotted with willows growing in clumps. In the centre of this, for we can see big timber all around, is a big open meadow covered with long grass with a big slough at the east end. The mud around this slough was all cut up with buffalo tracks, and everywhere were signs that they had been feeding there in bands. Towards nightfall we discovered where two of the animals had been a few hours before. So we followed them through the poplars and jack pine southwards. Although we used a certain amount of caution, we came close to them feeding among the willows, one lying down and the other moving around. Unfortunately, when we first saw them we were on the windward side and very close to them, not more than twenty yards away. Both of them were bulls, not very big, two or three years old, I should imagine. Their coats were thick and a rich dark brown, and they didn't look as if they were worrying much about wolves or feed for the winter. One of them smelt us at once, running his tongue over his nose and wrinkling it up to snuff the air. Then, turning his head to one side, very slowly he moved over to his companion. Then all at once with a snort and a flirt from their tails they were off like a shot from a gun. Their progress was anything but slow and could be heard for a long time after they started. It's almost incredible the speed these animals attain in dense bush. Their clumsy rolling gallop and unwieldy hump doesn't seem to impede them in the least. For them the nearest way is the shortest when galloping; trees, bushes, everything give way to them and the cracking and crashing could be heard a long way off.

With some difficulty we found the trail to camp, and late at night I took the horses to water.

Tuesday, October 22, brought mist and frost on the bushes. Now, as our grub was getting low, we had to head homewards. Knowing the trail as I did, I calculated that we could get home in five or six days at the most; that is, if after crossing the Little Buffalo river, we headed south or southeast over the top of the mountain, following the crest of the Jackpine hills until we struck the trail coming from the shack. This was what we had agreed to do. But McCallum got sick of ploughing through the deep snow and plunging in among snow-laden bushes, for a heavy snow started on Wednesday, October 23, and continued for four days, and we, with much objecting on my part, headed for the face of the mountain, intending to get on the Salt plains and follow the edge of the mountain southeast to our shack trail. I will not record our wanderings and experiences for the last four or five days. They were rather more than hardship. Suffice to say that on Wednesday, October 30, after starving for the last day and going on half rations for the preceding two or three, we managed to reach the shack and grub.

The face of the mountain is impassable and the plain is very much broken up with sloughs, bog-holes and deep creeks. Three wolves' tracks following a cow moose and calf were seen on the big plain. Although we did not see very much evidence of wolves, I have heard since I returned to the Fort that they are rather more numerous than last year.

We have been busy since we returned getting ready our winter outfit, and, as we will have two dog-teams this winter, I expect we will be able to cover very much more country. McCallum has already made a trip to the shack on Salt mountain and back, setting bait out for wolves.

Our next trip, the first with dogs, will likely be into the southern, or Peace River, country, which I think has been rather neglected. The hard frost has not arrived as yet and the muskegs and sloughs are not solid enough for travel.

Respectfully submitted,

GEORGE A. MULLOY.