PART VII

FORESTRY AND IRRIGATION

FORESTRY AND IRRIGATION

REPORT OF THE SUPERINTENDENT OF FORESTRY AND IRRIGATION.

DEPARTMENT OF THE INTERIOR,
FORESTRY BRANCH,
OTTAWA, May 9, 1910.

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 and Irrigation Branch for the year 1909-10, and also the reports of the officials in charge of the different divisions.

CONVENTIONS.

On August 5 and 6 last I attended the meeting of the Western Canada Irrigation Association held at Lethbridge. The discussion by this association of the problems affecting irrigation development in the west is exceedingly useful. Resolutions were passed by this convention urging the establishment of a forest reserve on the eastern slope of the Rocky mountains, the issue of bulletins to instruct the public in the principles and practice of irrigation, and in regard to other matters of local interest.

I also attended the International Irrigation Congress held at Spokane, Washington, from August 9 to 14 last. The convention was attended by over 2,000 delegates, and the full programme of papers and discussions by leading men interested in irrigation in the western states was very interesting and instructive. There was considerable difference of view as to whether construction of irrigation works by government or private enterprise was most beneficial. Some supported the Federal Reclamation Service projects, while others considered that better development had been secured under the Carey Act. A serious difficulty with the government enterprises seemed to be that, in response to public demand, too many schemes had been inaugurated so that it had been impossible to carry them all to completion with the appropriation available. As a result there was considerable disappointment to proposed irrigators, and further the moneys to be returned from the sale of the lands benefitted by the works were not returned quickly enough to make it possible to complete the works. A new bond issue seemed the only solution of the difficulty.

STATISTICS.

In the early part of the year 1909 the Forestry Branch began the collection of statistics of the forest products of Canada. The interest of the Canadian Lumbermen's Association and of the various provincial associations was enlisted in this effort. The method of gathering the necessary data was by sending circular letters with forms of statistical statements to all manufacturers of lumber and wood goods throughout the Dominion, asking for reports in regard to their production. The first difficulty was to get an accurate and complete list of such firms, and it took most of the year to get such a list compiled. The responses to the requests for information were as good as could be expected for a first attempt, and the figures compiled therefrom are a fair approximation to the timber production of the Dominion.

The output of the forest products was found to be as follows:—

Material.	Quantity.	Value.
Lumber	3,348,176 M. b.f.	$54,338,036
Shingles	1,499,396 M.	3,101,996
Lath	671,562 M.	1,487,125
Cross-ties	13,978,416 pieces.	5,281,685
Poles	185,807 pieces.	284,549
Pulpwood	482,777 cords.	2,931,653
Total		$67,425,044

One significant feature of the figures is the extent to which the inferior species of trees are now being manufactured, as will be seen by the following figures of the lumber products by species:—

	Feet B.M.
Spruce	962,430,000
White pine	945,420,000
Douglas fir	371,845,000
Hemlock	247,240,000
Western cedar	80,303,000
Western spruce	65,537,000
Balsam	48,488,000
Birch	45,833,000
White cedar	42,533,000
Maple	30,684,000
Bullpine	30,592,000
Jackpine	28,382,000
Elm	26,308,000
Western larch	23,410,000
Red pine	16,028,000
Basswood	14,778,000
Western hemlock	11,856,000
Ash	11,191,000
Tamarack	9,452,000
Western white pine	7,630,000
Poplar	6,401,000
Oak	5,755,000
Beech	5,083,000
Lodgepole pine	2,050,000
Hickory	1,164,000
Walnut	28,000
Butternut	15,000

SALES OF TIMBER.

The sales by auction of licenses for timber under the new regulations covered 32·99 square miles. In British Columbia 2·2 square miles were sold for $24,000, an average of $10,954.49 per square mile. No sales had previously been made since 1907, and the average sale prices per square mile of timber for the three previous years were: 1905, $214.82; 1906, $444.19; 1907, $2,091.84. In the provinces of Manitoba, Saskatchewan and Alberta 30·79 square miles were sold for $15,010, an average of $487.46 per square mile. The average prices for previous years were: 1905, $95.46; 1906, $197.04; 1907, $251.44. It is gratifying to note the increase in the returns from the sale of timber, especially in the province of British Columbia.

FOREST RESERVES.

The organization of the administration of the forest reserves has been further developed by the placing of permanent forest rangers on the Beaver Hills and Cooking Lake forest reserves.

The cutting of roads to mark the boundaries of the reserves and serve as fire lines has been continued. One hundred and ninety-nine miles of road were cut and the boundaries marked by iron stakes.

Forest nurseries have been established by the forest rangers on the Riding Mountain, Spruce Woods and Turtle Mountain reserves. In spite of the forest rangers not having been trained to nursery work and their other duties interfering with their care of the nursery beds, progress has been made, and this method of reforestation will be pursued with success.

A number of additional areas of land have been temporarily reserved with the object of adding them permanently to the forest reserves, when certain questions in regard to locations within the proposed reserves and other matters are settled. There are 70,000 acres additional to the Spruce Woods reserve; 136,000 acres additional to the Duck Mountain reserve; 80,000 acres additional to the Cypress Hills reserve; 20,000 acres additional to the Beaver Hills reserve; and 5,000-acres near Spirit Lake in the province of Saskatchewan.

There has also been set apart by order in council a reservation of the eastern slope of the Rocky mountains in the province of Alberta, comprising an area of approximately 3,000,000 acres, additional to Rocky Mountains park, Jasper park and Kootenay Lakes reserve, previously reserved, and which comprise an area of 6,000,000 acres. This reservation is one of the most important in the whole of the western provinces, as it is a timbered area lying alongside of a prairie country hundreds of miles in extent which is almost devoid of trees, and, moreover, it forms the watershed for the river systems which water the great plains to the east where the water supply is practically the only limit to the development that may be attained. The forest, consisting of lodgepole pine, Englemann's spruce, Douglas fir, and a few other species, clothes the mountains to a height of 6,000 to 7,000 feet. A large part of this watershed has suffered severely by fire but in most places the natural reproduction is abundant, and proper protection from fire will go far towards re-establishing the forests. An examination will be made during the coming season to determine finally the line which should be established as the eastern boundary of the reserve.

TIMBER SURVEYS.

An examination of certain lands reported to be suitable for agricultural purposes in timber berths in the province of British Columbia along the Upper and Lower Columbia River valleys and in the vicinity of Shuswap lake was made, and as a result arrangements will be carried out to make some of the lands available for early settlement.

The ranges of land known as Mount Ida and Fly Hills, which overlook the valley in which Salmon Arm is located, were inspected at the request of citizens of that place, with the object of determining lands that should be made into a forest reserve. The Fly hills form the boundary between Salmon Arm and the dry belt, and the preservation of the forest covering on these hills is considered of great value to that district.

A timber survey of a tract of timber lands within the dry belt lying south and east of Ashcroft was made. The results of these surveys have been plotted and mapped.

TREE PLANTING ON FARMS.

In the spring of 1909 there were distributed to 2,010 applicants 2,570,000 trees, bringing the total distribution up to 13,751,825. A map has been prepared and is submitted herewith showing the distribution of these trees at the different express offices throughout the prairie provinces.

The number of applicants for trees has reached almost the capacity of the present nursery and the extension of the nursery will have to be considered if the distribution is to be continued, as the number to be supplied to each applicant cannot be much farther decreased.

The number of trees ready for distribution in the spring of 1910 is 2,600.000.

FIRE RANGING.

The number of fire-rangers employed during last year was 96, distributed as follows: British Columbia, 37; Alberta, 45; Saskatchewan, 14.

The number of fires reported was 1,134, namely: 486 on Dominion lands, including the Railway Belt in British Columbia; 489 in British Columbia outside the Railway Belt; 66 in New Brunswick; and 93 in Nova Scotia. None are reported from the provinces of Ontario and Quebec. Of the 1,134 reported the railroads are charged with causing 202; settlers, 177; campers and travellers, 145; hunters, prospectors and lumbermen, 32; lightning and natural combustion, 63; old fires and cut-over land, 24; Indians, 10; sundries, 2; causes unknown, 479. The acreage burnt over in these fires was 435,000 acres, and the value of timber destroyed, $210,400. The expense of fire protection and fire fighting, government and private, is estimated at $270,000.

But all these totals are too small, as there are immense areas of forest land, especially in British Columbia and northern Ontario and Quebec, beyond the reach of the fire-protective organizations. Moreover, the timber destroyed is valued at the arbitrary rate of $1 per thousand feet, though it is worth much more to the country. In addition an enormous amount of cordwood destroyed in districts where it now has a value, and in other districts where it will soon be needed, has been neither estimated nor valued.

The fall of 1909, so favourable for the ripening and harvesting of the wheat crop, was so dry as to make the months of September and October a period of great danger from fire and of serious anxiety to the fire-ranging staff. As a result of the continued dry weather, the grass and debris were as dry as tinder. A lighted match dropped anywhere, a camp fire left unguarded, would start a conflagration in a moment which, with a wind behind it, could not be overtaken. Some settlers, with utter lack of foresight or utter indifference, choose such a time for burning the slash on their lands, with the result of sometimes destroying their own and their neighbours' houses and property. A much fuller and more widespread education in care in the handling of fire is necessary if the best efforts of the fire patrol are not to be rendered entirely nugatory at any recurrence of a dry season. To assist in the work of education, a small pamphlet emphasizing the dangers resulting from fires has been prepared, and is being printed in several different languages for distribution to persons making homestead entry and others.

Attention should, however, be called to the fact that this department is responsible only for the protection of timber on Dominion lands. It is not responsible for preventing fires on the prairies or in the settlements, except as these fires may be in proximity to or may endanger the forest. The suffering and loss occasioned by such fires should be sufficient warning to the public to observe proper precautions and take preventive measures.

FIRES ALONG RAILWAY.

In the early spring reports were received through the newspapers that dangerous forest fires were raging in the vicinity of Hudson Bay Junction which threatened to sweep the whole district. I obtained reports from the fire rangers in the district and from the lumbermen operating there, and these were to the effect that little damage had been done. In order, however, to assure myself in regard to the situation, I visited Hudson Bay Junction and went over the ground with the chief ranger, Mr. E. Hawke. I found that several fires had started in the spring, and that the condition of affairs was for a while very threatening, but that owing to the exertions of the fire rangers and the lumber companies, the fires were confined to small dimensions, only a few acres being burned over in each case.

An inspection was made of the line of the Canadian Northern railway while in this vicinity, and it was found that to prevent the starting of fires from the track it would be necessary to have the right of way cleared of the dry grass and other inflammable material, and arrangements were made with the general manager of the railway to have this done thoroughly in the spring under supervision of the fire rangers, when it could be carried out without danger.*

A special patrol was established along the line of construction of the extension of the Canadian Northern railway north of the Saskatchewan river from Prince Albert. The first portion of this road runs through a jackpine forest, which has been cut over for ties, and in which there is considerable debris. The first part of the work was carefully supervised, and the right of way was cut over carefully and thoroughly cleaned up. Only one fire escaped from this part of the operations, and the method of its escape illustrates the danger from handling fire in any way. The debris of clearing was being burned up on the right of way and the fire was being carefully watched. A small whirlwind came down the right of way, lifted some of the burning brands over the heads of the men and threw them into the bush, starting a fire that burned over several acres of young timber and that was only extinguished after several hours' hard fighting. An unfortunate effort to economize so as to keep within the appropriation resulted in such threatening conditions that it was necessary to continue the patrol with the hope that provision might be made later for covering the expenditure.

The patrol along the line of the Grand Trunk Pacific railway, under Forest Ranger J. W. McLaggan, was well organized throughout the season, and was started sufficiently early to ensure that any danger should be forestalled. Each ranger had a patrol of about twenty miles along the right of way, which he patrolled in one direction one day and in the other the next, meeting the rangers on the neighbouring patrols. The efficiency of the service is shown by the fact that during the whole season fire escaping from the right of way did not extend over more than twenty acres, and this even through the very dry months of the fall.

The officers and engineers of the railway company and the contractors and their managers co-operated heartily with the fire-ranging service. The wood cut from the right of way was, when not useful for other purposes, gathered into heaps at least twenty feet from the edge and there burned. Where these precautions were not being observed the fire ranger stopped the work, and in the month of September finally prohibited burning the heavy slash until the snow fell.

During the fall there were many fires in the district, but only the area mentioned was damaged by fires from the right-of-way.

Arrangements were made with the superintendent of the British Columbia division of the Canadian Pacific railway for a better clearing of the right-of-way through that province.

The Dominion timber agent at New Westminster, having called attention to the continual difficulty found through fires starting along the line of the Great Northern

* This arrangement was not satisfactorily carried out by the railway company.

Railway Company, and having submitted evidence to show that these fires were caused from locomotives on the railway, a formal complaint against the company was laid before the Railway Commission.

The Railway Commission has also been asked to give authority to officers of the fire-ranging staff at divisional points on the railway to make inspections of locomotives so that immediate inspections may be made when locomotives are believed to be defective in equipment. No arrangement has yet been made, however.

A patrol was made in the Lac La Ronge district, where the mining excitement continued during last season, and where there was considerable danger from fire. No serious fires were reported.

The Athabaska, Lesser Slave and Peace River districts were also patrolled and many fires were prevented. The staff of rangers is, however, too small for the extensive territory to be protected and it will be necessary to increase the number. I regret to report that Mr. Peter Loutit, one of the rangers on the Athabaska river, was accidentally drowned while on duty in September last. He was one of the first rangers appointed on this river, and the reports from the inspector in charge of his work, and from others, were that his patrol was efficiently and faithfully looked after. He leaves a wife and a family of small children.

The patrol in the northern districts will be strengthened during the season of 1910, and a special inspection of timber will be made along the lines of the proposed Hudson Bay railway and the Alberta and Great Waterways railway.

DOMINION PARKS.

The only change in the staff of the parks is the appointment of Mr. Joseph Coxford as superintendent of Elk Island park in place of Mr. E. Simmons, resigned.

The new regulations for the parks are working satisfactorily on the whole, though a few minor changes may be required. The prohibition of dogs running at large in the parks has assisted materially in the protection of the game.

When I was at Banff a meeting of the citizens was called to present suggestions as to improvements required. The matters asked for were a reduction in electric light rates, extension of sidewalks, improvement of trails, better accommodation in the bath houses at the hot springs, the making of Banff a winter resort, better fire protection and other minor points.

The question of reduction of rates was taken up with the Bankhead Mines, Limited, which supply Banff, and an arrangement has been reached for a reduction.

In accordance with your instructions, the commissioner of the Dominion parks and myself visited some of the leading sanitaria in the United States to gain information as to the buildings and equipment of bath houses, and a report on the matter has been submitted.

The possibility of making Banff a winter resort has been discussed with the Canadian Pacific Railway Company, and with their co-operation it is hoped that a beginning in that direction will soon be made.

The other matters are being dealt with.

That the national parks are becoming game preserves in fact is being repeatedly evidenced. Three game wardens have been employed during the year in connection with Rocky Mountains park and Yoho park, and the reports show that as a result of their work and of the regulation prohibiting dogs from running at large, game is more frequently seen in the vicinity of Banff. Game hunters in the neighbourhood of Buffalo park last season stated that the game when disturbed would invariably fly over the fence and settle in the park for protection. An interesting discovery was made by the superintendent of Buffalo park, who, during last December, in the course of a buffalo round-up, came upon a herd of twenty-five deer. These deer, together

with a fine buck elk, were enclosed by the wire fence. A census of animals in Elk park, taken during January last, showed that besides the buffalo there were in the park twenty-seven elk and thirty deer.

During the year two further shipments of buffalo, numbering 218 head, were secured from Montana and placed in Buffalo park with very small loss. This is very gratifying when the hardships incidental to the round-up and confinement from ten to thirteen days in the cars are considered. Mr. Pablo has been prosecuting his work of rounding up the remaining animals, and it is hoped that the balance of the herd may be secured this summer.

Canada has now grazing within her various parks, exclusive of this spring's natural increase, 683 head of buffalo, 625 head of which are in Buffalo park, 43 head in Elk park, and 15 head in Rocky Mountains park.

In October last considerable publicity was given in the press to a report to the effect that a prairie fire then raging in the vicinity of Buffalo park had swept into the park, burned the fence and liberated the buffalo, which were then said to be stampeding northward beyond the possibility of recovery. This report was, however, without foundation, for though bad fires prevailed on the south and west sides of the park the precautionary measures taken against such a contingency during the previous season, by plowing fire breaks around and across the park, saved it from the fire.

Elk park was also threatened during the same season, but prompt and effectual measures were taken to keep the fire outside of the park limits.

JASPER PARK.

In September, accompanied by Mr. Howard Douglas, Commissioner of Dominion Parks, I visited Jasper park, in the Rocky mountains, on the line of the Grand Trunk Pacific railway. The valley of the Athabaska river as it passes through the park is most beautifully situated, surrounded on every hand by lofty and beautiful mountain scenery. The valley is wider than that of the Bow river, the mountains do not overhang so closely, and there are prairies of half a mile to a mile in width and stretching for several miles. On these flats are the ruins of Jasper House and Henry House, old trading posts of the Hudson's Bay and Northwest Trading companies. These prairies have been occupied by families who have been located thereon fourteen years. They have practised agriculture successfully, and have no difficulty in raising crops every year. The elevation is not great, the summit of the pass being 3,733 feet above sea level, and the influence of the chinook winds gives a milder climate even than that outside of the mountains. The soil is light, and it is a remarkable fact that irrigation for the raising of crops is being practised by Mr. L. J. Swift, one of the earliest settlers.

In places along the flats of the Athabaska river and in a few favoured spots stands of mature green timber remain, but they are but a remnant compared with the forests that must have once covered the district, as shown by the remains scattered over the ground. It is a disheartening sight to see how this country has been burned over, even up into the mountains and along the small creek valleys. The last great fires occurred at about the time of the rush to the Yukon. There is encouragement in the fact, however, that the natural reproduction both of pine and spruce is good, and if this can be protected the reforestation can be easily accomplished.

We visited the hot springs on Fiddle creek after a hard day's travel over muskeg and windfalls, but the beauty of the scenery along the narrow valley of the creek under overhanging cliffs and beneath snow-capped mountains made ample amends for the difficulty of reaching it. The spring visited has a temperature of about 116°, and the water has a distinctly sulphurous odour and taste. A small sample of the water was brought back, and a tentative analysis was made by Mr. F. T. Shutt, Chemist

of the Central Experimental Farm. The quantity of water was not sufficient, however, for a reliable analysis, and the results can be taken only as a general indication of its character.

Mr. J. W. McLaggan was appointed acting superintendent of Jasper park, so as to provide for its protection during the construction of the Grand Trunk Pacific railway. A patrol of the Royal Northwest Mounted Police was also established in the park, to provide for the protection of life and property and of the game, especially mountain sheep and goat, which were threatened by unlawful killing.

IRRIGATION.

The development of irrigation continues steadily, and the demands on the water supply demonstrate that the hydrographic survey was not begun too soon and cannot be developed too rapidly. The limit of the development of southern Alberta and Saskatchewan is largely the limit of the supply of water, and this not only in relation to its use for irrigation but perhaps more as to a supply for domestic purposes. No town can grow beyond the point where it can supply its population with water, and the development of many of the towns in the districts mentioned can only be continued as a result of careful investigation and economical management of the water supply.

An instance of this is seen in the valley of Moosejaw creek, where a special study of the watershed and the possible supply is now under way. This creek runs parallel to the Soo line of the Canadian Pacific railway, and passes through the city of Moosejaw, and that city, as well as the towns and villages along the Soo line, must look to this creek and its tributaries for their main supply. The fuller use that can be made of it means the larger development for the district, and plans can be laid for its full use only after a careful and thorough investigation of the annual precipitation, the watershed and the run-off. Such an inspection should be made of all the watersheds in the irrigation district, which means a topographical as well as a hydrographic survey.

In the reports of the assistant engineers on the irrigation surveys will be found interesting discussions of some questions that are arising in connection with irrigation administration.

SOUTHERN ALBERTA LAND COMPANY.

During the past year the Southern Alberta Land Company has made substantial progress on its large irrigation project. A dam has been built across Bow river, in township 21, range 25, west of the 4th meridian, which raises the water level some 5 feet and diverts a portion of the flow into the main canal. This canal has been practically completed for some 40 miles to the north end of the Lake McGregor reservoir, and work has been begun on the dam at the north end of the reservoir. The construction work has been very heavy in some places, there being one cut of 50 feet and another of 25 feet. The expenditure on this portion of the work has been in the neighbourhood of half a million dollars.

During the season of 1910 the company proposes to complete the work on the diversion canal, build the dams at the north and south ends of the reservoir and continue the main canal eastward from a point near the southern end of the reservoir. There will be some particularly difficult and expensive work where this canal leaves the reservoir, the country along the Little Bow river being very rough and broken. Eastward from this point, however, the character of the country improves and construction presents fewer difficulties. Construction is to be vigorously pushed and the company expects to be able to turn water into the reservoir by the end of the season.

CANADIAN PACIFIC RAILWAY COMPANY.

The company has up to the present devoted its energies towards the completion of its canal system in the western section of its tract, lying nearest to the city of Calgary. This portion of the work, while yet uncompleted, is sufficiently advanced to permit of the supply of water to most of the irrigable land already disposed of, and this year it is intended to extend the canals eastward and to construct a second system tapping the Bow river at the Horseshoe Bend, about 80 miles from Calgary, for the irrigation of the eastern portion of the tract. It is understood that the proposal is to construct a dam in the river at this point and to raise the water some 50 feet, which, considering the large volume of water carried by the stream during flood periods, is a large undertaking. No plans of the proposed dam or other works at this point have yet been filed by the company.

It will be several years yet before the system will be completed, but the company has disposed of a considerable portion of the western third of its tract and is now in a position to supply water thereon. Some 2,000 agreements have already been made for the supply of water, and these are being submitted for registration in the department as rapidly as possible. The examination and registration of these agreements involves considerable additional work, both in the office of the commissioner and in the department.

SMALL IRRIGATION PROJECTS.

The greatest activity continues to be in the region to the south of the Cypress hills, and the irrigable land in the valleys has now been about all taken up, and the available water supply has practically all been filed upon. Resort must now be had to the storage of flood water and the construction of larger and more expensive canal systems for the irrigation of the higher lands. Surveys are now being made to determine the possibility of such storage and the location of suitable sites.

Present indications point to a considerable development of irrigated farming in this district, and to its extension to the eastward and westward along the international boundary. Settlement is also extending into the country between the Red Deer and South Saskatchewan rivers north of Medicine Hat and to the country north of the Red Deer, and numerous applications for water have been received from these districts. The rainfall during 1909 was unusually abundant, but irrigation was practised to a considerable extent in spite of this by the more progressive settlers, who have become convinced of its value as a form of 'crop insurance.'

HYDROGRAPHIC SURVEY.

There were four parties working on stream measurements during last season, one in the Calgary district, one in the Macleod district, one in the Maple Creek district, and one on Milk river. A report is being published giving detailed results of the stream measurements obtained during the season, combined with any previous measurements. From year to year these reports will be more valuable to civic and other engineers dealing with water supply questions in the west.

Considerable settlement is going into the Wood Mountain district and the valley of the Frenchman river lying south and east of the Cypress hills, and consequently numerous applications for water rights are being made. It is therefore of importance that the hydrographic survey should be extended to this district immediately, so that these applications may be intelligently dealt with. A similar condition exists in the district along the Red Deer river north of the Canadian Pacific Railway Company's tract.

MILK AND ST. MARY RIVERS.

In view of the fact that the division of the waters of the St. Mary and Milk rivers between Canada and the United States was being considered in connection with the Waterways treaty, a special vote was obtained for an examination of these rivers. This work was placed in charge of Mr. F. H. Peters, who is an honour graduate in engineering of the Royal Military College, and has had considerable experience on the Georgian Bay Canal survey and elsewhere. A careful examination of the course of Milk river was made, measurements of the flow taken and gauge rods established. A summary of the results is published separately in the report of the Hydrographic survey. This work will be continued in 1910 under charge of Mr. Peters.

IRRIGATION SCHEMES.

—	Number of Schemes.	Acres Irrigated.
Licensed	183	48,293
Authorized	156	124,205
Applications	23	10,459
	362	182,957

DOMESTIC AND INDUSTRIAL SCHEMES.

—	Railway.	Municipal.	Domestic.	Miscellaneous.	Total.
Licensed	105	8	24	10	147
Authorized	29	17	6	7	59
Applications	10	7	1	1	19
	144	32	31	18	225

DRAINAGE SCHEMES.

Approved	10
Applications	3

STATEMENT of receipts from irrigation fees for the fiscal year ending March 31, 1910.

1909—		
April	to revenue	$ 42 25
May	"	34 75
June	"	10 00
July	"	82 25
August	"	50 25
September	"	105 00
October	"	126 25
November	"	58 25
December	"	110 50
1910—		
January	"	100 25
February	"	98 00
March	"	50 50
		$868 25

Respectfully submitted,

R. H. CAMPBELL,

Superintendent of Forestry and Irrigation.

SESSIONAL PAPER No. 25

APPENDIX No. 1.

REPORT OF THE INSPECTOR OF FOREST RESERVES.

DEPARTMENT OF THE INTERIOR,
OTTAWA, March 31, 1910.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry and Irrigation,
Ottawa.

SIR,—I have the honour to submit a report of the work done upon the Dominion forest reserves during the year ending March 31, 1910.

The following is a list of the forest rangers in charge of the reserves, to whom credit is due for the successful work of the past year.

Mr. W. A. Davis, Chief Forest Ranger, Dauphin, Manitoba, superintends the work on the Riding Mountain, Duck Mountain, Porcupine and Lake Manitoba West forest reserves.

LIST OF FOREST RANGERS.

Reserve.	Forest Ranger.	Post Office.	Province.
Riding Mountain	Albert McLeod	Kelwood	Manitoba.
	John W. Robertson	Gilbert Plains	"
	William Middleton	Elphinstone	"
Duck Mountain	Duncan Pearson	Grand View	"
	William G. Nesbitt	Swan River	"
Porcupine	William Sifton	Minitonas	"
Lake Manitoba West	Franz Hoffman	Bellhampton	"
Spruce Woods	Joseph Coxe	Douglas	"
Turtle Mountain	Chas. A. Walkinshaw	Boissevain	"
Moose Mountain	John Rutherford	Carlyle	Saskatchewan.
Beaver Hills	Barney Griffith	Rock Dell	"
Cypress Hills	James Ferguson	Elkwater	Alberta.
Monte Hills	G. J. Duncan	Monte Creek	British Columbia.

The above-mentioned forest rangers are employed constantly upon the reserves, with work as indicated in this report. They are permitted to employ help as the necessities of their work require. During the past summer, each ranger employed two or three men to help in locating and cutting out boundary lines and in making roads. During the danger period in the spring, and again in the fall, each was permitted to employ two or three men to assist him in fire ranging. When fire occurred, the forest ranger was expected to extinguish the flames, and he exercised his own judgment in calling out men to assist in the work. Workmen received $2 a day, and when fighting fire board was furnished extra. Fire rangers received $75 a month, each providing himself with a horse.

FIRE PROTECTION.

All other work on the forest reserves has been held subservient to that of guarding the forest against fire. During the danger periods the rangers, besides posting in all 1,226 fire notices, patrolled the reserves constantly on the lookout for fire. During the year 75 fires which had started within the reserve boundaries were extinguished before they had destroyed any saw timber. Four fires, three of which had started in the settlements, did considerable damage. One of these originated in the Riding Mountain reserve in township 21, range 20, west of the 1st meridian. The forest ranger with a force of men fought and extinguished this fire, but not before it had destroyed saw timber amounting to 20,000 board feet.

A fire entered the Duck Mountain reserve in township 34, range 26, west of the 1st meridian, and was extinguished by the forest ranger after it had burned 20,000 feet of reserve timber.

The largest fire occurred on the Lake Manitoba West reserve. This fire entered the reserve from the south. The forest ranger succeeded in keeping it out of the saw timber, but it burned over five square miles of small scrub poplar. The fire was no doubt due to the carelessness of settlers in clearing their land. A fire occurred on the Turtle Mountain reserve, destroying 25 acres of young poplar. This came into the reserve from the United States, and was due to the carelessness of a man named Ziler, who set out fire upon his land and took no care to keep it under control.

About 25 acres of young poplar was burned, also, on the Spruce Woods reserve in Manitoba. The fire which did this damage was set by sparks from locomotives.

Of the fires which occurred on the reserves, 45 were due to camp fires, 10 to settlers clearing land, six to sparks from locomotives, three to squatters, one to settler burning stack, and 10 to unknown causes.

BURNED GUARDS.

To prevent fires from coming into the reserves from the prairie, the forest rangers burned the grass along the boundaries where such measure was thought necessary. This was done in the spring after the snow had left the grass land, but before it was out of the woods. In all, 91 miles of such guard was burned, nine around the Riding Mountain reserve, 70 around the Duck Mountain, 10 around the Spruce Woods and two around the Lake Manitoba West reserve.

PLOUGHED GUARDS.

Along the eastern boundary of the Spruce Woods reserve the forest ranger ploughed a fire guard 25 miles long and eight feet wide. Besides this, the Canadian Northern Railway Company ploughed a guard along each side of their right-of-way through the reserve for a distance of seven miles. The Canadian Pacific runs along the north side of the Spruce Woods reserve. The company ploughed here a guard seven miles long along the south side of their tract. Another such fire break three miles long was ploughed in the Riding Mountain reserve. These guards were all made eight feet wide. A double guard was made for a length of nine miles around the Cypress Hills reserve in Alberta. Each ploughed strip is four feet wide and between them is a grass strip about a rod wide. When this guard was made, it was the intention to burn the grass strip, but later it was thought safer to leave it unburned. This arrangement makes an efficient fire guard; but the ploughed strips should be made each eight feet wide with a grass strip two rods wide between them.

The department paid $7 a mile for making a guard 8 feet wide, which is about the rate allowed by the Canadian Pacific and Canadian Northern railroads for similar work. It is the intention to keep these guards free of grass and weeds by disc-harrowing in spring and fall just before the danger periods.

FIRE ROADS.

During the year the rangers were actively employed in making roads along the boundaries and through the reserves. These are so located that when a fire occurs men can be promptly transported to it to extinguish the flames. The roads make it possible, also, to patrol the reserves more thoroughly, and they allow settlers an easy means of getting out timber. They may, also, in case of necessity, be used as lines from which to back-fire. It is the intention that these roads shall eventually be made a uniform width of 16 feet; but where the clearing was difficult it was thought best to make, at first, a passage just wide enough for a wagon; then, as time permits, the

ranger can devote his energies to making the road wider and improving the bed. These roads will need more or less attention every year, especially through poplar woods where the young growth would soon obstruct the passage.

An idea of the extent of work done by the rangers in this direction may be gained from the following table:—

BOUNDARY ROADS MADE DURING YEAR ENDING MARCH 31, 1910.

Name of Reserve.	Miles in Length.	Width in Feet.	Cost.
			$ cts.
Riding Mountain	20	6	424 00
"	50	8	462 46
"	24	16	305 45
Duck Mountain	14	8	207 50
"	28	12	413 42
Porcupine	3	3	68 15
Lake Manitoba West	4	5	50 00
Spruce Woods	6	16	134 00
Turtle Mountain	14	12	487 00
Beaver Hills	36	3	32 00
Totals	199	Aver. 8·9	2,583 98

This gives an average cost of $12.98 per mile of road 8·9 feet wide. Although the intention was that these roads should be at first mere passage-ways through the forest, yet some of them are already in excellent condition.

One has already rendered good service in transporting men to fires which occurred in the Turtle mountain. The forest ranger reporting these fires writes thus: 'There were several fires started in the reserve, some at the west end and others along the International boundary. Owing to the road being along the boundary, some of us were quickly on the spot and put them out.' Most of the fires in this reserve have come from Dakota. Heretofore the roads all ran north and south and there was no wagon road east and west until the ranger this year constructed this road along the boundary. It is a well-made road, graded in places, with culverts and bridges where they are needed.

Besides these boundary roads the forest ranger on the Moose mountain made an excellent road 11 miles long and 16 feet wide into the interior of the reserve. The items of cost for this road were as follows. They are given as they indicate, in some degree, the character of the work done on the roads:—

Plant	$ 37 75
Twenty logs at 20c	4 00
Three axes and nails	9 45
Rent of scraper, 9 days	4 50
Drawing timber	4 50
Moving tents	4 50
Use of plough, 9 days	2 25
Team, 9 days	40 50
Wages of 5 men for 9 days	122 50
Total	$229 95

In the Porcupine reserve the ranger cleaned logs and brush away from a road 78 miles in length, repairing fords and bridges in many places along the way.

SETTLERS' SLASHINGS.

Settlers' slashings have been very destructive to the woods. This has hardly been due to wilfulness, but rather to lack of knowledge on the part of the settler as to how the woods should be treated. The department is, therefore, through the forest rangers, distributing freely slips of paper instructing the settlers to take no wood or hay from a forest reserve without permit; to cut where the ranger directs; to select their timber here and there wherever they find trees growing too thickly together; to cut low stumps; to take out of the woods all parts over four inches in diameter of every tree cut; to cut the branches so that they will lie flat on the ground, and to extinguish thoroughly any fire they may kindle.

THE SAWMILLS.

There are a large number of small mills surrounding the forest reserves. These mills are largely supported by timber obtained through settlers' permits. A settler obtains a permit for a given quantity of timber. He takes the permit to a millman, who takes from the woods the quantity of timber stated in the permit, brings it to his mill and lets the settler have the lumber, charging him the price of sawing. Some of these millmen are careless in their lumbering methods, but as a rule they use the timber much more economically, and leave the woods in much better condition than the average settler.

Heretofore mills have not been permitted to enter the reserves. It seems to me, however, that the time has arrived when portable mills—but these only—should be permitted to do so. The borders of the reserves have in many cases been overlumbered, while there is much over-mature timber in the interior left uncut. They might be permitted to operate under some such conditions as the following: Timber tracts in the reserves might be examined by the department, and those tracts located and fully described where it is determined that the timber should be cut. The department might advertise for tenders to cut during one season a stated quantity under restrictions given in the advertisement. Settlers might be allowed then to bring their permits to the mill and get the lumber called for in the permits. The whole operation could be supervised by an official of the department stationed at the mill. This official would supervise the cutting in the woods, keep tally of the mill cut, measure out lumber to the settlers and make certain technical studies of the woods as required by the department.

The restrictions under which the timber should be cut were stated in my report of 1908-9 as follows: Trees to be cut should be marked previously by the department, and the millman should cut only these and should cut all of them. Trees should be cut down with a saw. Stumps should be left not more than a foot high. The brush should be cut so as to lie flat on the ground, except along the trails or roads, where it should be piled and burned under the supervision of the forest ranger.

All poles or young trees cut on account of road making or the felling of the larger trees should be taken out of the woods by the millmen and be piled separately from the other logs, and should remain the property of the department, to be afterwards disposed of either to the millman or others. Such arrangement need not prohibit the settler from taking out his own timber and bringing it to this mill, or taking it to any other mill, if he choose to do so.

A mill in the Cypress Hills, in Alberta, was in the fall of 1908 placed under such restrictions. Soon after starting operations the mill was burned down. It was immediately rebuilt, showing that the restrictions were not considered too severe. At the end of one year the millman was asked to make a statement as to how the restrictions suited him. He replied that they were satisfactory, and asked for renewal of his permit, which request was granted by the department.

LICENSE BERTHS.

Previous to the time when the reserves were made by parliament, the department had granted licenses to cut timber on certain areas called 'License berths.' These licenses are renewable from year to year while there is on the berth timber of the kind and dimensions described in the license in sufficient quantity to be commercially valuable if the terms and conditions of the license have been fulfilled. The following table gives a statement in regard to the berths still being operated upon the forest reserves:—

Reserve.	Number of Berth.	Area.	Quantity cut.
MANITOBA.		Sq. Miles.	Board Feet.
Duck Mountain	14	3·30	
" "	15	4·53	
" "	23	6·67	
" "	25	2·49	
" "	25A	10·81	
" "	26A	5·17	
" "	27A	11·50	863,477
" "	48	4·50	
" "	Pt. 571A	2·00	6,000,000
" "	742	6·24	245,372
" "	986	50·00	
" "	Pt. 1089	·25	
" "	1120	14·83	
" "	Pt. 1148	·50	
Total	14	122·79	7,108,849
Riding Mountain	551D	18·00	
" "	571	4·75	
" "	Pt. 571A	21·25	
" "	575	18·00	
" "	Pt. 578	5·00	25,000
" "	752	3·00	
Total	6	70·00	25,000
Lake Manitoba West	567	8·00	
Summary.			
Duck Mountain	14	122·79	7,108,849
Riding Mountain	6	70 00	25,000
Lake Manitoba West	1	8·00	
Total	21	200·79	7,133,849
ALBERTA.			
Jasper Park	Pt. 1099	45·32	
" "	1279	·75	
" "	1333	2·82	
" "	1334	3·00	
" "	1335	3·00	
" "	1336	2·00	
Total	6	56·89	

Reserve.	Number of Berth.	Area.	Quantity cut.
		Sq. Miles.	Board Feet.
Rocky Mountains Park	318E	16·50	
" " "	318F	16·06	
" " "	318H	6·00	
" " "	3181	4·00	
" " "	417K	5·63	
" " "		7·50	6,040,831
" " "	468	50·00	
" " "	1100	143·45	252,000
" " "	Pt. 1168	85·00	
Total	8	334·08	6,292,831
Summary.			
Jasper Park	6	56·89	
Rocky Mountains Park	8	334·08	6,292,831
Total	14	390·97	6,292,831
BRITISH COLUMBIA.			
Yoho Park	29	13·16	7,915,285
" "	231	·79	
" "	256	·16	90,363
" "	257	·31	11,804
" "	258	1·00	
" "	260	·75	
" "	261	·30	
" "	262	·25	
" "	278	1·25	15,407
" "	Pt. 406	6·09	
" "	Pt. 421	3·93	
" "	Pt. 422 Blk. 1	1·75	
Total	12	29·74	8,032,859
Glacier Park	Pt. 32	·23	
" "	40 Blk. 1	6·25	
" "	117	3·37	
" "	Pt. 292	5·38	
" "	328	1·85	
" "	329	2·63	
" "	Pt. 333 Blk. 4 & 5 App.	5·00	
" "	342	10·42	1,786,791
Total	8	35·13	1,786,791
Long Lake	Pt. 420	25·00	
Donald	Pt. 20	7·77	
"	42	8·50	
"	Pt. 47	·41	
Total	3	16·68	
Summary.			
Yoho Park	12	29·74	8,032,859
Glacier Park	8	35·13	1,786,791
Long Lake	1	25·00	
Donald	3	16·68	
Total	24	106·55	9,819,650

Province.	Number of Berths.	Total Area.	Quantity cut.
		Sq. Miles.	Board Feet.
Manitoba	21	200·79	7,133,849
Alberta	14	390·97	6,292,831
British Columbia	24	106·55	9,819,650
	59	698·31	23,246,330

PERMIT BERTHS.

Besides the license berths, there are certain permit berths which were granted some years ago at public competition when the timber regulations made provision for disposing of berths under permit in this way.

TIMBER BERTHS.

Reserves.	Number of Berth.	Area Sq. Miles.	Quantity Cut.		
			Lineal feet.	Cords.	Board feet.
Manitoba.					
Riding Mountain	914	1·00			
Duck Mountain	Pt. 827	·50			469,419
Total	2	1·50			469,419
Alberta.					
Rocky Mountains Park	873	2·10			
	1028	2·85			
	1123	7·00	2,000	100	
	1183	3·00	9,000	200	
	1186	2·50			
	1194	3·75	11,500	100	
	1217	2·00	4,000	69	
	1227	1·72			
	1426	1·00			
Total	9	25·92	26,500	469	
British Columbia.					
Yoho Park	367	4·50	2,000	100	
	431	2·00			
	435	9 75		376	
Total	3	16·25	2,000	476	
Summary.					
Manitoba	2	1·05			469,419
Alberta	9	25·92	26,500	469	
British Columbia	3	16·25	2,000	476	
Total	14	43·67	28,500	945	469,419

SETTLERS' PERMITS.

In years preceding the one just closed, when a settler wished to get timber from a forest reserve, he obtained a requisition from a justice of the peace or from a commissioner. This requisition was sent to the Dominion Lands Office with the office fee of 25 cents; the land agent issued the permit. The settler took the timber allowed by the permit, and then returned the permit to the Land Office after having made affidavit thereon as to the timber taken. As a result of this procedure the forest rangers did not know to whom permits were granted, nor on which tracts the permits allowed the cutting to be done. During last year, however, the forest rangers granted the requisitions, and were in a much better position to know of illegal cutting. To further assist the rangers in this respect, it is necessary that they should be authorized to receive the return of permits and take the affidavits thereon.

The following tables will show the amount of requisition business the rangers have had during the year just closed:—

SETTLERS' PERMITS ISSUED BY MANITOBA AGENCIES.

Reserve.	No. of permits.	Lumber.	Logs.	Cordwood.	Fence posts.	Fence rails and poles.	Receipts.
Dauphin Agency.		Ft. B.M.	Lineal ft.	Cords.	No.	No.	$ cts.
Riding Mountain	644	2,781,110	22,755	2,878	43,400	41,600	3,906 85
Duck Mountain	95	540,785	3,310	75	6,000	500	330 45
Manitoba West	70	277,650	25,098	25	14,450	12,350	45 10
Porcupine							
Total	809	3,599,545	51,163	2,978	63,850	54,450	4,282 40
Brandon Agency.							
Riding Mountain	9	90,000					242 25
Turtle Mountain	172		1,300	2,030			136 75
Moose Mountain	48			765		200	12 00
Total	229	90,000	1,300	2,795		200	391 00
Summary for Manitoba.	1,038	3,689,545	52,463	5,773	63,850	54,650	4,673 40

COMPARISON OF PERMITS ISSUED AT DAUPHIN AGENCY.

—	No. of permits.	Sawn lumber.	Lineal feet of logs.	Cordwood.	Poles, rails.	Posts.	Revenue.
		B.M.		Cords.	Pieces.		$ cts.
From the forest reserves	809	3,599,545	51,163	2,978	83,850	54,650	4,282 40
From Dominion Lands outside forest reserves	521	2,142,587	24,800	6,001	20,450	19,250	2,244 60
Grand total	1,330	5,742,132	75,963	8,979	104,300	73,900	6,527 00

NOTE.—Among the permits issued outside the forest reserves there was one for 15,000 shingles and one for 2,650 railway ties.

SPECIES CLASSIFICATION OF OUTPUT—DAUPHIN AGENCY.

	Lumber, Board Feet.	
	Spruce.	Poplar.
Dauphin Agency.		
Riding Mountain	2,344,319 80%	415,675 20%
Duck Mountain	528,500 94%	32,000 6%
Lake Manitoba West	288,650 96%	15,000 4%

NOTE.—1. Homestead permits (in the absence of any definite data) are assumed to be spruce; probably about 5% is poplar.
2. Approximately 2% of material included under "Spruce" is jackpine and tamarack.
3. In classes of forest products other than lumber, such as poles, posts, rails, cordwood, &c., a species classification is not possible on present data available.

SETTLERS' PERMITS ISSUED BY SASKATCHEWAN AGENCIES.

Reserve.	No. of permits.	Lumber.	Logs.	Cordwood	Fence posts.	Fence rails.	Poles.	Receipts.
Regina Agency.		Bd. Ft.	Lineal Ft.	Cords.	No.	No.	No.	$ cts.
Moose Mountain	111	.....	111,630	1,174	25,250	31,750	20,960	27 75
Estevan Agency.								
Moose Mountain	197	.....	61,150	2,676	17,600	27,900	27,320	59 25
Yorkton Agency.								
Beaver Hills	2	.....	2,000	20	500	700	400	50
Prince Albert Agency.								
The Pines	131	240,096	42,723	2,126	20,110	72,325	13,020	541 50
Summary for Saskatchewan	441	240,096	217,503	5,996	63,460	132,675	61,700	629 00

SETTLERS' PERMITS ISSUED BY ALBERTA AGENCIES.

Reserve.	No. of permits.	Lumber.	Logs.	Cordwood	Fence posts.	Fence rails.	Poles.	Receipts.
Lethbridge Agency.		Bd. Ft.	Lineal Ft.	Cords.	No.	No.	No.	$ cts.
Cypress Hills	4		9,000	28	900	2,700	1,100	1 00
Edmonton Agency.								
Cooking Lake	6	14,250	520		300	1,750		4 50
Elk Park	1	1,000						1 75
Total	7	15,250	520		300	1,750		6 25
Banff Agency.								
Rocky Mountain	48	93,298		6,602			39,590	1,033 57
Summary for Alberta	59	108,548	9,520	6,630	1,200	4,450	40,690	1,040 82

SETTLERS' PERMITS ISSUED BY BRITISH COLUMBIA AGENCIES.

Reserve.	No. of permits.	Lumber.	Logs.	Cordwood	Fence posts.	Fence rails.	Poles.	Receipts.
New Westminster Agency.		Bd. Ft.	Lineal Ft.	Cords.	No.	No.	No.	$ cts.
Martin Mountain		59,094						

GENERAL SUMMARY.

Manitoba	1,038	3,689,545	52,463	5,773	63,850	54,650		4,673 40
Saskatchewan	441	240,096	217,503	5,996	63,460	132,675	61,760	629 00
Alberta	59	108,548	9,520	6,630	1,200	4,450	40,690	1,040 82
British Columbia		59,094						
Total	1,538	4,097,283	279,486	18,399	128,510	191,775	102,390	6,343 22

TOTAL OUTPUT OF TIMBER FROM DOMINION FOREST RESERVES.

—	Number.	Lumber.	Logs.	Cordwood	Fence posts.	Fence rails.	Poles.
		Ft.B.M.	Lineal Ft.	Cords.	No.	No.	No.
License berths	59	23,246,330					
Permit berths	13		28,500	945			
Square mile permits	2	469,419					
Settlers' permits	1,538	4,097,283	279,486	18,399	128,510	191,775	102,390
Total	1,612	27,813,032	307,986	19,344	128,510	191,775	102,390

TIMBER SEIZURES.

During the year the rangers have been very active in guarding the reserves against the removal of timber without permit. Heretofore settlers have had difficulty in locating the boundaries of the reserves. To be sure, some of them did not care to know where the boundaries were, as they intended to get timber without permit wherever it was located. Others, however, unintentionally took timber from the reserves thinking that they were obtaining it from private property or from other Dominion lands. As a result, they got into trouble with the forest ranger, who had instructions to seize all timber taken without permit.

To overcome this difficulty, the forest rangers began in 1908 the work of marking the boundaries of the reserves with triangular iron stakes painted red. This work was continued in 1909, the rangers thus marking 76 miles around the Riding Mountain reserve, 66 miles around the Duck Mountain, 51 miles around Porcupine Mountain, 9 miles around Lake Manitoba West reserve, 21 miles around Turtle Mountain, and 36 miles around the Beaver Hills reserve, making a total of 259 miles staked during the year. There were, however, 408 miles located, leaving 149 miles now ready for the iron stakes, at present marked temporarily with wooden ones. With the lines thus plainly marked, the removal of timber without permit is inexcusable.

The following table indicates the number of seizures made during the year, and states the quantities and kinds of timber seized, with receipts therefrom:—

TIMBER SEIZED—Dauphin District.

Reserve.	Number of Seizures.	Lumber.	Logs.	Cordwood	Fence posts.	Fence rails and poles.	Receipts.	Amount paid approximately.
		Ft. B.M.	Lineal Ft.	Cords.		No.	$ cts.	p. c.
Riding Mountain..	52	212,349	3,361	21	680	1,845	1,351 50	60
Duck Mountain...	4	95,000	....	50	.....	....	551 30	6
Manitoba West...	7	78,656	.....	50	.....	....	288 30	12
Porcupine Mount'n	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	63	386,005	3,361	121	680	1,845	2,191 10	40

TOTAL Seizures on all Dominion Lands in the District (including Forest Reserves).

	105	470,165	6,016	268	1,940	2,037	2,805 20

APPROXIMATE Percentage from Forest Reserves.

	60%	82%	56%	45%	35%	90%	70%

HAY PERMITS.

The department has encouraged the removal of hay from the reserves, carrying out the policy that the reserves are for the judicious use of the people.

The following table shows the number of permits issued for hay, the number of tons cut and the revenue derived therefrom:—

HAY PERMITS ISSUED.

Reserve.	No. of Permits.	Tons Cut.	Revenue Derived.
Dauphin Agency.			$ cts.
Riding Mountain	59	1,076	140 60
Duck Mountain	2	15	2 50
Lake Manitoba			
Porcupine			
Total for above reserves	61	1,091	143 10
Total for all vacant Dominion lands in Dauphin district, including above reserves	255	4,875	581 15
Approximate p. c. from reserves	24 p.c.	23 p.c.	24 p.c.
Average permit calls for 20 tons.			
Brandon Agency.			
TurtleMountain	19	375	47 00
Prince Albert Agency.			
The Pines	4	42	6 80
SUMMARY.			
Dauphin agency	61	1,091	143 10
Brandon agency	19	375	47 00
Prince Albert agency	4	42	6 80
Total	84	1,508	196 90

GRAZING.

Heretofore the department has in no way regulated grazing on the forest reserves. In several districts the settlers desire such regulation. For instance, in the Turtle Mountain reserve there is an excellent grazing tract consisting of part of township 1, range 22, and all of township 1, range 21. The settlers in the vicinity of the reserve desire that this area be fenced by the department and that they be allowed to graze their cattle thereon at a charge of about 25 cents a month.

The forest ranger has located the line along which such fence should be built. The area has numerous lakes. By running the fence, as indicated in the ranger's report which has been sent to the department, from lake to lake around the tract, the fence would require to be 5,361 rods long, would require 16,083 pounds of wire for three strands, and would cost $1,876, estimating at 35 cents a rod.

From inquiries among the settlers the ranger is firm in his conviction that the returns from grazing would pay for the fence in two years.

There are, also, ranchers in the vicinity of the Riding Mountain reserve who are desirous of grazing their cattle on the reserve. Over-grazing would be detrimental to the reserve, but a limited number of cattle or horses to keep down the long grass would be beneficial.

Nearly all the reserves have areas covered with long grass which are, as they now exist, rather a menace, as they carry fire rapidly. These would be better grazed.

REFORESTING.

During the summer of 1909 the forest rangers collected 57 bushels of spruce cones, 9 bushels tamarack, 32 bushels jackpine, and 6 bushels of Douglas fir. These were sent to Indian Head where, during the winter, the seed was extracted, some to be used in the nursery at that place, the rest for the rangers to sow on the forest reserves.

Last year three nursery beds were made on the Spruce Woods reserve which, when examined last fall, showed encouraging growth. On the Cypress hills jackpine and lodgepole pine seed sown in furrows did well, the trees making a growth of 4 inches last year. On the Duck Mountain 1 acre over which the fire had run last spring was successfully planted with jackpine and white spruce. On the Riding Mountain an acre was planted with a garden seeder. The trees grew but were nearly all destroyed by hail. A few other experiments were made, but the work being entirely new to the rangers their success was only indifferent. This summer the work will be carried on more systematically and better results are hoped for.

Though it is the policy of the department to devote its energies mostly to placing under proper protection the mature timber and the young growth already on the reserves, it seems to me that certain tracts might receive a good deal of attention in the way of reforesting. The Spruce Woods reserve in Manitoba, the Pines reserve in Saskatchewan and the Cypress Hills reserve in Alberta are such areas. I would recommend that upon each of these reserves the work be carried on upon a scale sufficiently large to occupy the entire time of at least one forester.

FOREST SURVEYS.

During the summer several large areas were examined with a view to determining their suitability for being added to the forest reserves. Chief Ranger W. A. Davis, with a small party, examined a large area adjacent to the Duck Mountain reserve. The tract contains 184,000 acres. This survey was made in considerable detail, the physical features of each section being stated and shown on a map prepared by Mr. Davis. Most of this territory was found to be so rough and rocky or so swampy as to be entirely unsuited to agriculture. As a result of the survey such land has been withdrawn from settlement. Other parts, suitable for farming, were not withdrawn.

A territory consisting of 157 square miles on the east side of the Spruce Woods reserve was carefully examined. Most of this ground consists of light sand. Many people have tried to farm it, but have abandoned the project. About two years ago a number of entries were made for homesteads on this tract, mostly by young men of neighbouring villages, without having previously seen the land. Very few of these have made any improvements. A report was made to the department, showing all lands entered for, and giving a detailed statement of improvements thereon. This territory has been withdrawn from further settlement, and all unpatented lands hereafter abandoned therein or cancelled for lack of improvements are to become part of this reserve.

A similar survey was made of the Cypress hills in Alberta, a territory adjacent to the reserve which previously existed there. The ground has an average altitude of about 3,000 feet above sea level, and is mostly so stony that it could not be ploughed. It is already quite well covered with trees, mostly lodgepole pine and spruce. If the fire is kept out, the whole ground will soon become covered with trees. This area, which comprises 88,960 acres, is also withdrawn from settlement.

An inspection trip was made in midsummer along the eastern slope of the Rockies, beginning in the mountains due west of High river and extending south to Frank. The inspector made the trip in company with Chief Forest Ranger Margach. Comparatively little large timber was observed. On certain areas, to be sure, there is

a stand of 20,000 feet per acre. Along the North branch of the Highwood river, near the forks, is a large area covered with such fine growth. Also along the Northwest branch of the Oldman there is some large timber. The hills are clothed, however, with a fine growth of young pine, spruce, balsam and fir. Farming on the area examined is out of the question. The whole eastern slope has since this examination been reserved from further settlement pending a more detailed survey locating the boundaries which the reserve should have.

GAME RESERVES.

Last fall the Moose Mountain reserve in Saskatchewan was made also a game and fish reserve. Following the initiative taken by the department in this matter, the Saskatchewan Government, in their session last fall, prohibited the taking of game on any of the Dominion forest reserves in that province. Recommendation was made during the summer that the Spruce Woods and the Turtle Mountain reserves be also made game and fish reserves. A game reserve in the Riding mountain has been under consideration for some time, but a difficulty appears from the fact that the Hudson's Bay Company still holds possession of certain lands within the proposed area.

Respectfully submitted,

A. KNECHTEL.

APPENDIX No. 2.

REPORT OF J. R. DICKSON.

DAUPHIN, MANITOBA, February 10, 1910.

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

SIR,—I beg to report as follows regarding the work done under your instructions during 1909.

I reached Ottawa from the west on January 8, and for three months was engaged in tabulating field data obtained in the Riding mountain surveys of previous years. In connection with this work went the preparation of a bulletin dealing with the forest conditions of, and a provisional plan of management for, the Riding Mountain reserve. A number of other reports covering special work done in 1908 were also written.

On April 6, I left for Revelstoke, B.C., to carry out your instructions regarding a study of arable lands in the timber berths of the Columbia river valley. The late spring and deep snow made work slow and arduous for the first two weeks, but by May 1 conditions for field work were fairly good. On April 28, Mr. D. R. Cameron arrived to assist me, and I cannot speak too highly of his uniformly good work all through the season.

We cruised by 'forties,' except as stated below, all the arable bench and bottom lands embraced by the timber berths in the valley, within the limits of the Railway Belt. For each 'forty' also a sketch map was made showing the topography and the location of the soil and timber 'types,' and for each berth covered, a general or summary report was sent in. Where, however, a uniform stand of heavy timber occurred, the berth was passed by.

In the valley of the Columbia river, south from Revelstoke, there is a large area of bottom land and low benches, say 7,000 acres, much of which will make good fruit land when cleared, well suited for small fruits and the hardier larger ones, though probably the line must be drawn at peaches and grapes. Timber berths now cover over 90 per cent of this area, and of these some 60 per cent has been cut over more or less closely. Of course, the cost of clearing off these heavy cedar slashings to fit the land for farming is high, $100 to $150 per acre, but squatters are entering, and the work of improvement will proceed rapidly as soon as a feasible scheme of co-operation is evolved among the settlers, or capital steps in to aid. In fact, during September a steam stumping outfit was introduced and is proving very satisfactory, clearing off nearly an acre on heavy cedar slashing every day. The soil is a loam of varying texture, usually sandy, and at times with a considerable mica inclusion, but on the whole decidedly fertile and sufficiently well watered for agriculture.

Wherever the moisture contained in the soil is sufficient, the stand of timber is pure cedar *(Thuya plicata)* varying in virgin stand, from 20,000 to 80,000 feet board measure per acre. On the better drained benches and slopes, either this cedar or western hemlock *(Tsuga heterophyla)* occurs, with a mixture of Douglas fir *(Pseudotsuga mucronata)* and white pine *(Pinus monticola)*, and the yield of saw stuff would vary between 10 and 30 thousand per acre. On the driest benches is a forest of pure hemlock, which is usually from 50 to 80 per cent defective, and under present conditions, not worth lumbering.

It seems only right and reasonable that these arable stretches along the river should be thrown open to bona fide settlers as rapidly as the present licensees can remove the commercial timber. By having the latter concentrate their operations under government supervision, the problem may be solved without friction arising through any undue sacrifice on the part of the lumbering interests.

Along the Columbia, north from Revelstoke, within the limits of the belt, there is very little arable land, perhaps 1,000 acres, but the valley is fairly well timbered with a varying stand of cedar, hemlock, fir and pine, which has suffered very little as yet from fire.

WORK AROUND SHUSWAP LAKE.

On June 1 we proceeded to the Shuswap Lake district to make a similar close study of the arable benches about the lake embraced within the existing timber berths. Detailed maps and reports covering this work were sent in as it progressed.

The lake comprises five long, narrow, divergent, ford-like arms, with steeply sloping rocky shores, save for occasional creek deltas or low rolling benches of agricultural utility. The soil is a light sandy loam to marl, and well suited for fruit-growing. The areas of commercially valuable saw timber about the lake are now scattered and of small extent. Probably 80 per cent of the virgin forest has been fire-swept within the past century and the second growth is still too small and patchy to be worth lumbering.

This lake region does not require irrigation, has a most delightful climate, and being only some 1,200 feet above the sea is well suited to the production of fruit of the finest appearance and quality.

I was not surprised, therefore, to find squatters located, literally, in every nook and corner. They are a good class too, as a rule, and, given a little encouragement, would very soon establish a number of prosperous communities. At present, however, development is being held back by timber limits held under license, and of course these vested interests merit adequate consideration. But while it is true that in a number of cases squatters have encroached upon, or are threatening valuable timber, it is equally true that 70 to 80 per cent of the berth land squatted upon has either been burnt over or cut over, or both, more or less recently, and the scattered remnant of merchantable saw-stuff upon it would not repay the relatively high cost of lumbering.

The whole situation points to the need of a simple land classification, and in taxing timber-berth holders a lower rental may be applied to absolute forest land, and a higher rental to rich bottom lands suitable to the valuable food crops.

PRELIMINARY WORK ON THE PROPOSED RECONNAISSANCE SURVEY OF RAILWAY BELT.

On completing the above berth inspection work on August 6, Mr. Cameron and myself were joined by Mr. G. A. Gutches and Mr. H. C. Wallin, who acted as my assistants for the balance of the season. For two weeks we were engaged in experimental reconnaissance work, to answer a number of questions which had arisen as to the best means of conducting the proposed rapid survey of the Railway Belt. A brief report covering the above was forwarded you at that time.

The object of this Belt survey, as I understand it, is to obtain accurate knowledge of the present actual timber conditions within the belt. That is to say:—

1. A forest map showing the location and relative area of the stands of:—
   (*a*) Merchantable saw timber.
   (*b*) Pole stuff.
   (*c*) Reproduction.
   (*d*) Unstocked.

2. Field notes to accompany above, giving:—
   (*a*) Average yield of commercial timber by types, and its percentage composition.
   (*b*) Relative accessibility of such commercial timber as measured by probable cost of lumbering.
   (*c*) Estimate of total timber now standing in the belt.

A beginning was made on this work, a narrow strip being completed across the belt at Shuswap lake. The new Atlas Legend proved satisfactory in mapping.

It would seem advisable to confine the work at first to those parts of the belt already triangulated, because the securing of a reliable 'control' survey involves a great deal of extra time, labour and expense. The mountainous nature of the country and the purpose of the survey, render a party of two to four men the most efficient working unit. Each party should travel as lightly as possible, and lose no time over irrelevant data, such as growth studies, or weather observations.

Parties at work might be shifted once or twice during the season, to take full advantage of the varying weather and climatic conditions within the belt.

LOCATING NEW RESERVES.

The following three weeks were employed in locating suitable boundaries for the proposed new forest reserves along the high 'Mount Ida' ridge south of Salmon Arm (48 square miles), and the rough 'Fly Hill' country to the west (254 square miles).

The environs of the present Martin Mountain reserve were also examined with a view to extension. With all of this work I found local settlers in full sympathy and accord.

In the boundary location, the object sought was to so place the 'line' as to exclude from the proposed reserve all lands of actual or possible agricultural utility, without, however, sacrificing unduly the necessity for a reasonable compactness of area and regularity of outline.

Southeast of the Martin Mountain reserve lie some 20 square miles of rough, rocky lands, which should be included therein. The Mount Ida watershed, largely fire-swept about forty years ago, now carries valuable young stands of pine and fir, which can only be protected by reserving the area.

The 'Fly Hill' area is certainly well suited to fulfil the purposes of a forest reserve, especially as regards the all important local question of water supply. A dozen large creeks and many smaller ones originate there; and, furthermore, it is

probable that this extensive tract of forest does not a little to prevent the further encroachment of the 'dry belt' into the now fertile and well watered Salmon Arm locality.

On September 15, following your instructions, we started to make a reconnaissance survey of the proposed Nicola forest reserve, a rocky, mountainous plateau southeast of Ashcroft, having a general elevation of 3,000 to 6,000 feet, and embracing 620 square miles. This work was completed October 20, when full reports and maps depicting the conditions were forwarded to Ottawa. In this work, besides examining the timber, the soil conditions, and the agricultural possibilities of the interior, we located the most suitable boundary line round the whole area.

General Conditions.—The entire area is rough, mountainous country, with a number of peaks in the neighbourhood of 6,000 feet. It has everywhere been fire-swept time and again within the past half century, resulting either in serious defect to, or total destruction of, the original stands of timber. To-day there is no tract of timber within the whole area which, under present market conditions, would yield a profit over the high cost of logging. Perhaps 25 per cent of the total area, chiefly confined to the lower fir and bullpine slopes down the west side, offers fair summer range. The other 75 per cent, except for a half dozen homesteads in the 'Highland' and 'Skukum' valleys, is useless for farming or grazing. It is absolute forest land.

Water.—In the depressions of the lofty upper plateau are a considerable number of small lakes, the source of some twenty creeks, each one of which could be utilized ten times over in developing the country below.

Already the settlers are contending for control of these streams, for this is the heart of the 'dry belt.' Their flow governs the fertility and prosperity of large tributary localities, and only the presence of a forest reserve on these hills can render their flow a permanent, maximum and uniform one.

Timbers.—The upper plateau carries a monotonous stand of lodgepole pine (*P. murrayana*), about half of which has reached small pole size, i.e., four to eight inches D.B.H.; the other half is mere reproduction. The pole stuff would now cut 10 to 20 cords of fuel per acre, but if fire can be excluded it will in a few years form extensive and valuable stands of tie timber. The fir and bullpine on the slopes below are for the most part short, very limby and badly fire-scarred, yielding on the average from 500 to 2,000 feet B.M. of coarse lumber per acre.

Soil.—Repeated severe fires have largely destroyed the soils in the lodgepole zone, and granite, dolomite or volcanic pumice everywhere obtrude. On the lower slopes the soil is a rich, light, powdery loam, but everywhere exceedingly dry.

Remarks.—Natural reproductive conditions are splendid and every denuded area is rapidly reclothed with lodgepole pine or Douglas fir, according to altitude.

During the last week of October I looked over a large irrigation project near the source of Hat creek, and by your instructions laid out a convenient quarter section upon which 50,000 feet of fir might be cut for flume construction.

In addition I framed a set of logging rules designed to render the securing of this timber easy and inexpensive, while adequately protecting the best interests of the reserve.

On November 11 I reached Dauphin, Manitoba, to act under your general directions during the winter in the work of reserve administration and inspection, and especially to become familiar with the present methods of handling local reserve business, under land office regulations.

Between November 18 and 27 I drove some 250 miles round and through the Lake Manitoba West Forest reserve, and on return furnished you with a report on the general conditions prevailing.

This reserve has suffered extremely from fires. In 1889 a very fierce and wide-spread fire swept over 70 per cent of the whole, killing all the timber in its path, except some scrubby poplar and a few spruce bluffs. In October of 1909 another

serious fire occurred, burning some 35 square miles, over half of the whole reserve. But while the damage from this fire was severe, it was confined largely to young or half grown poplar, which had sprung up since previous fires. The reserve is a most difficult one to protect, there being always ready a highly inflammable mixture of debris, pea-vine, and reproduction, to which may be added extensive marshes and prevailing high winds. Only the most complete system of fire lines and patrol could guarantee its future safety.

Your obedient servant,

JAMES R. DICKSON,
Assistant Inspector Forest Reserves.

APPENDIX No. 3.

REPORT OF G. A. GUTCHES.

ALBUQUERQUE, M., April 22, 1910.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Canada.

SIR,—I beg to forward you a brief report of work done for the Forestry Branch from June 1, 1909, to January 10, 1910.

On June 2 I received instructions to proceed without delay to Golden, B.C., for the purpose of making an examination of the lands included in the timber berths lying along the Columbia river from the south boundary of the Railway Belt northwest to Donald, and also the berths adjacent to the Black Water and Blue Water rivers, northwest from Donald, to the north boundary of the Railway Belt.

The necessity for the examination was caused by settlers squatting upon the land leased as timber berths. The squatters maintained that there was not enough timber upon the land to warrant the lumber companies withholding it from homestead entry. The lumber companies were apparently reluctant to relinquish their hold upon the land so long as there was even a sign of timber. In choosing the lands that should be opened for homestead entry, the quantity of timber thereon was the first consideration. As a general rule, all lands not having 80,000 feet, board measure, to the forty, were considered as being denuded of merchantable timber and open for homestead entry.

The second consideration was the general possibilities of the land for agricultural purposes. At the time of examination no attempts at agriculture or fruit raising had been made on the benches and only very little on the bottom lands. Potatoes, grain, vegetables and small fruits, such as strawberries, raspberries, currants, &c., are grown with success upon the bottom lands. The outcome of the apple industry is still doubtful, although some species, such as Bismarck, Wolf River, Duchess and Yellow Transparent, appear to stand the climate very well.

With these principles in view, all the flat lands on both banks of the Columbia river were recommended for entry. All bench lands on the east bank of the river were recommended for entry, providing there were not more than 80,000 feet, board measure, to the forty. In case there was over this amount, the lumber companies were given from one to three years to remove the timber, and after the expiration of this period, it was recommended that the land be opened for settlement. All the bench lands on the west side of the river were withheld from homstead entry. This was due

to the fact that up to the present time no agricultural work had been attempted on the benches, and until those on the east side had been found suitable for cultivation, it would be impracticable to open the benches on the west side.

Timber berths numbers 47 and 20, along the Black and Blue Water rivers, are for the most part covered by merchantable timber. Berth number 47 is covered by an especially fine stand of spruce, fir, pine and cedar.

On August 1, 1909, I reported to Mr. Dickson at Sicamous, and worked with him until October 20. On November 1, I reported at Ottawa, and commenced work on the compilation of the data secured by Mr. MacMillan, relating to the forest products of Canada for the year 1908. The results were published as Bulletin No. 8.

Respectfully submitted,

G. A. GUTCHES.

APPENDIX No. 4.

REPORT OF JAS. LEAMY.

DOMINION LANDS AND CROWN TIMBER OFFICE,
NEW WESTMINSTER, B.C., December 8, 1909.

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

SIR,—I have the honour to submit herewith my report covering the protection of the forests in the Railway Belt in this province from fire during the season of 1909. The early part of the season in the month of May was very dry, and consequently dangerous from the standpoint of fires, but taking the season as a whole it was very satisfactory.

In the Palliser district, over which Mr. Frank Butwell had charge, four fires occurred, none of which destroyed any standing timber.

In Mr. Jas. C. Sheirlock's district, comprising the Beaver river and from Donald to Surprise rapids on the north boundary of the Railway Belt, no fires of any consequence occurred.

In the district presided over by Mr. Frank Ashdown, along the Columbia river on both sides from the south boundary of the Railway Belt and north to Donald, three fires occurred, none of which were the cause of destroying any timber.

In the Revelstoke district, over which Mr. R. J. Stewart had control last season, with Messrs. J. P. Kennedy, F. Y. Abey, Henry Cooke, Fred. E. Forrest, T. L. Woolsey, J. Mizon, W. J. Dickey and Henry A. Morris, as assistants, and which extends east to Glacier, west to Craigellachie, and north and south along the Columbia river to the boundary of the Railway Belt, eighteen fires occurred, in all of which approximately 10,000 feet B.M. of timber was destroyed. The most serious fire in this district occurred at Three Valley on June 7, when the sawmill of the Mundy Lumber Company was completely destroyed, together with a bridge in their logging railway, but fortunately no lumber or other timber was destroyed there.

In the Sicamous district, with Mr. J. D. McGuire as fire ranger, some three or four fires occurred, one of which threatened to destroy the southern portion of the Larch Hills Forest reserve, but was promptly attended to by the ranger, with the result that no damage occurred to standing timber. A very serious fire occurred along the Salmon river in this district in the early part of the season, running entirely over homestead lands and causing a great deal of damage to the settlers, who in some

cases lost the whole of their buildings. I went over this district some time afterwards, and while the loss occasioned was very much to be regretted, it was generally considered that it will have a good effect, as this fire cleaned up all the debris which in years past had been left lying on the ground and thus makes the security of the settlers from fire more permanent in the future. A fire also ran along the Spillimacheen river between Mara and Enderby, largely on logged and homestead lands. This fire was the cause of killing some timber on timber berth 402, but it will not be a total loss if removed within a reasonable time.

In the Notch Hill and Shuswap Lake districts, over which Mr. W. R. Peacock patrolled, no serious fires occurred, and this fact I attribute largely to your foresight in allowing me to keep the gasoline boat constantly patrolling the waters of Shuswap Lake and Seymour Arm. Many fires were discovered in an incipient stage by the ranger in charge of the boat, and some of these he was able to extinguish himself, but when assistance was required by having the boat at his command he could readily secure the same, and also inform Rangers Peacock and McGuire of such fires. I found it necessary to employ an assistant to Mr. Peacock to patrol Adams lake and vicinity for a short time, and in this connection I may say that next year I believe it will be necessary to employ a man to patrol these waters during the whole of the season, as this district is now coming into prominence through the valuable timber which adjoins the lake on either side. Sportsmen also visit this locality and it will therefore be necessary that it should receive proper attention. A fire occurred in Turtle valley, which would seem to have been set by parties who hold grazing leases thereon, and who were desirous of burning some of the debris left on the ground and thus enlarge the grazing area. No damage to standing timber was done thereby.

In the Enderby and Mabel Lake districts, over which Mr. Robert Johnstone patrolled, two fires occurred, one on timber berth 408, in which approximately 50,000 feet, board measure, of timber was fire-killed, and the other on timber berth 238, in which four acres was burned over, and approximately 50,000 feet, board measure, of standing timber destroyed.

In the Falkland and Salmon River districts, patrolled by Mr. John Bell, no timber was destroyed from public lands.

Mr. Angus McGillvray, who patrolled the Shuswap, Lytton and Nicola districts, was successful in preventing the occurrence of any fires.

Along the line of the Canadian Pacific railway, between Yale and North Bend, which was patrolled by Mr. Wm. Teague, several fires occurred, none of which did any damage other than to the property of the railway company in burning fences, &c.

In the Mission district, Mr. F. W. Hughes was successful in preventing any serious fires. I found it necessary to employ an assistant to Mr. Hughes this season, in the person of Mr. R. Siddall, who patrolled the Harrison Lake district, including Chehalis and Suicide creeks, on which is situated some of the very best timber in the Railway Belt. Mr. Siddall patrolled this district in such a careful manner that I am able to report no timber whatever destroyed during this season, and with your permission I propose to again employ a ranger in that district next year.

In the Sumas district, which embraces Cultus and Sumas lakes, Rangers Messrs. M. G. and Jasper Fadden prevented the occurrence of any serious fires, although several small fires took place, set in most cases by squatters on limits, in the vicinity of the lakes mentioned.

In the Abbotsford district, patrolled by Mr. John Ball and assistants Messrs. L. J Chapman and John Dennison, no timber whatever was destroyed, although these rangers were many times threatened with serious fires crossing from the boundary line.

On the Stave river, patrolled by Mr. D. Gilchrist, one fire occurred in which, however, no merchantable timber was destroyed.

In the Coquitlam River and Pitt Lakes districts, the ranger, Mr. M. Marshall, succeeded in preventing any timber from being destroyed, although four fires did actually occur in this district.

In the Port Haney and Lillooet districts, patrolled by Mr. M. Martyn, who also has supervision over Rangers Gilchrist, Marshall and Tweddell, no timber was destroyed.

On the North Arm of Burrard inlet, patrolled by Ranger Tweddell, no fires of any importance occurred, and this fact speaks very highly for the ranger mentioned, in view of the large number of campers who locate along these waters during the summer season.

In the Surrey district, Chief Ranger Johnson and his assistants, Messrs. Jas. Jamieson, Geo. E. Gairns and A. Buck, through constant vigilance prevented the loss of any merchantable timber. I was compelled to employ an additional ranger in that district last season, owing to the many new settlers coming in, many of whom are in ignorance of the laws regarding the setting out of fires.

Clause 5, chapter 84, intituled 'An Act to preserve the forest from destruction by fire,' which was passed at the last session of the Legislature in this province, and which reads as follows: 'It shall not be lawful for any person, by himself, his agent, servant, or contractor, to set out, or cause to be set out or started, between the first of May and the first day of October in each year, within any fire district, any fire for the purpose of clearing land, unless such owner or occupier of any land on which fire shall be so made or started for the purpose of clearing the same shall have obtained a permit, under the hand of the fire warden, assistant fire warden, government agent, gold commissioner, timber inspector, forest ranger, mining recorder, provincial police officer, or constable, or any other officer appointed under the provisions of this Act to enforce the provisions and requirements thereof, and the owner or occupier of any land on which fire shall be so made or started for the purpose of clearing the same shall, by himself, his agent, servant, or contractor, constantly watch over, manage and care for such fire, and observe every reasonable care and precaution to prevent such fire from spreading as aforesaid,' has proven to be legislation of a practical kind, and will tend in future to diminish the number of fires. As you are aware, our rangers have no authority to issue fire permits, but the provincial officers have been found willing and anxious at all times to discuss with our rangers the advisability of issuing permits where they are likely to affect Dominion timber. This is, of course, as it should be, because if we are to have any success in our endeavour to preserve the forests from destruction by fires we must have a combined effort on the part of the Dominion and provincial rangers. I have at all times advised the rangers in the first place, to make it a point to know their district thoroughly, by becoming acquainted with every camp and road therein, so that they may have a knowledge of the quickest way of getting from one point to another; in the second place, to become acquainted with as many of the settlers and other residents as possible, and endeavour to get them all interested in the protection of the forest, not through fear of the law, but by appealing to their common sense and patriotism. When we fail in this way it is of course necessary to enlist the aid of the law, and during the past season our rangers were the means of securing the conviction of several parties who disregarded the warning given to them.

In summing up, I find that approximately 110,000 feet B.M. of timber was destroyed in the whole of the Railway Belt from fire during the season, and considering the many railways which traverse the belt and the many new settlers coming in, I feel that the small loss of timber is a matter for congratulation, and I must express my deep appreciation of the faithful services given by every ranger, to whose efforts I attribute whatever success has been obtained. I must also thank you for your valuable assistance in the many matters which required consideration during the season.

Your obedient servant,

JAMES LEAMY,
Crown Timber Agent.

APPENDIX No. 5.

REPORT OF W. I. MARGACH, CHIEF FOREST RANGER.

CALGARY, ALBERTA, February 7, 1910.

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

SIR,—I beg to report on the work done by fire rangers between the international boundary and the Saskatchewan river during 1909. Twelve mounted rangers were employed, and twenty-one fires are reported to have been extinguished by the rangers, the amount spent being $3,280 in the patrol work, and a further sum of $478.20 in fighting fires. Of this amount $470.70 was spent on the Cooking Lake forest reserve, and in protecting the Elk park which immediately adjoins the Cooking Lake reserve on the north. The rangers' duty was doing patrol work and putting out any fires that they might find, of which twenty-one are reported to have been put out before burning any greater area than five acres, with the exception of the Cooking Lake forest reserve fire, of which you have a report in detail.

The rangers were employed during April and May before vegetation was started, and from August to October, which was a very dry period. During this latter period four convictions were obtained of parties using fire contrary to fire ordinances, and fined penalties from $25 to $100.

The area on which these rangers were expected to patrol is approximately 9,000 square miles, in which there are 2,500 square miles licensed as timber berths, and 500 square miles of mature timber not under license, 2,500 square miles of young timber of over 25 years' growth, 3,000 square miles of timber of less than 25 years' growth, and 500 square miles of grass or meadow land.

Respecting the licensed area, from information obtained from the lessees of the berths, from agents and woodsmen and fire rangers, together with what personal knowledge I have, this area is estimated at 1,780,000,000 feet B.M. If the royalty charge of 50 cents per thousand was the only interest held by the Dominion it would represent, on a stumpage for each square mile of 712,000 feet B.M., the sum of $356 per mile. In the protection of the same there was spent $3,280, or in round numbers, $1.84 for each million, or three-eighths of one per cent of the royalty value. There is also received annually from this area a rental of $12,500, 25 per cent of which is spent in protection from fire, leaving $356 per mile, the stumpage value, bearing no part in the charge. This is not the only value. The licensees value their interest at $1 per thousand on 712,000 feet per square mile, giving us $712 per mile, and royalty $356, being a total value per square mile of $1,068.

Then the 500 square miles still vested in the Crown of like timber being 356,000,000, at $1.50 per thousand, gives a value of $534,000. I would not say that there is not three times this area of mature timber not under license. Again, 2,500 square miles of timber of over 25 years' growth will, if given protection, have an immediate commercial value. This can only be estimated by taking the cost of the production of such an area by scientific forestry, and, if taken this way will, I believe, give a greater value than that which I have estimated the mature timber at. The value of the 3,000 square miles of timber of less than 25 years' growth can be obtained by the same method.

The rangers I found to be all capable men, and I have always had a most hearty support from them when extra work was required during dry periods. The remuneration is not sufficient to hold the most capable men. Twelve men receiving an average of $273.33 for the season, no allowance being made for the maintenance of themselves

or their mounts, is not, in my opinion, sufficient, and the service we get is fully equal to the amount paid. Another objection is that there is no permanent employment for the ranger.

I have tried to impress the timber value of the east slope of the mountains south of the Saskatchewan river, as it is to-day, with its proximity to the farms, cities and towns, having a market consuming 300,000,000 feet annually, the timber lying on rivers and streams capable of carrying the product of the forest to the wheat lands, cities and towns. For these reasons I expect to see the day when this timber will have a stumpage value of $5 per thousand feet. In the early eighties the province of Ontario received, including bonuses per thousand Doyle Log Rule, $1 per thousand; to-day the same stumpage would bring $8 to $10.

The summer of 1883 I spent entering United States land on the upper peninsula, Michigan, and the said lands had an upset price of $1.25 per acre, no reservations being made. I did not make entries of mineral or timber land that had not 50,000 feet, that is, my employers at that time put $1 as the stumpage value. To-day that timber would be worth from $12 to $15 on the stump, so that the protection of timber is a good investment to the state when the timber is mature.

Nature has reproduced a large forest of spruce and pine, a work which many foresters could not do unless capitalized with a large amount of money. Therefore this area is worthy of protection, as it has a commercial value equal to the amount which would be required to reproduce the same by scientific forestry.

Protection could be best made, in my opinion, by improving the natural conditions of the forest by cleaning the debris, making fire breaks, connecting natural breaks, patrolling, making the forest accessible to the public, and by improving the saddle trails. In doing so you will arouse an interest in the forest and the forest's wealth, that is, making the product accessible to the public on the easiest possible conditions, making it easy of access, encourage the spirit that the public are the owners, and let this branch of the department show the public that it is alive to the question by taking active protective measures, not against the public, but for the public, not for corporations or others, only the people.

Leaving all side issues, such as water supply, out of the question, the forest and its products can stand alone with the public.

Your obedient servant,

W. I. MARGACH,
Chief Forest Ranger.

APPENDIX No. 6.

REPORT OF H. A. CONROY.

OTTAWA, January 17, 1910.

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

SIR,—With reference to your suggestion that I should give a report upon the fire guardians of the north, I beg to say that the men employed as overseers are, in my opinion, the best that can be secured.

To commence with, Peter Loutit, of Fort Chipewyan, has that part of the Athabaska river north from McMurray to Smith's Landing, a rather long distance to travel. This section is fringed with a heavy growth of spruce and black bark poplar.

The spruce is quite large, and from an economical standpoint will be of great value in the future. A considerable part of this country is also excellent for agricultural purposes.

I might be permitted here to say that the Forestry Branch is doing a great amount of good in the conservation of the timber which might otherwise be destroyed by fire.

From McMurray southwest to Athabaska Landing there is quite a quantity of valuable spruce and poplar which has been saved by the watchfulness of the guardian, William Biggs, who makes his trips up and down that section of the river. He is one of the most useful men in the north.

From Athabaska Landing to Lesser Slave lake is guarded by Thomas Lylock, who is an expert canoeist and is thoroughly acquainted with the country. He is very energetic in his work, and it is said by all who know him that he saved a large amount of timber since his appointment. He travels both by land and water.

I would just mention here that all the guardians in the north can speak the native language, and by that means can secure help in extinguishing fires and gain information which may be very essential to them.

Our next section is from Lesser Slave lake to Sturgeon, north about 40 or 50 miles and southwest about 100 miles. This portion is guarded by Samuel Cunningham, a very intelligent half-breed, who is thoroughly acquainted with the country and knows where the best timber is to be found. From information received I find that he has done excellent work.

The next section is on the Peace river. This part of the country, I think, is the best in the province and should have close attention, as the settlers who come in and camp for a time leave their fires alive and when a breeze blows up a forest fire is started.

There is quite a large fringe of timber along the banks of the small rivers, such as the Hart and Smoky rivers, which will become valuable in the near future, as it will be required for the use of the incoming settlers.

Mr. McDonald has from Peace River crossing about 60 miles west to Dunvegan and down about 75 miles. This is quite a long trip, and as the current is very swift travelling up stream is rather difficult. He has certainly done very satisfactory work and is a capable and intelligent guardian.

I appointed one man, St. Pierre Fergusson, an intelligent half-breed, to guard the south side of Peace river and in and around the Grande Prairie. He, I believe, has also done good work.

I think that two more men should be appointed on the Lower Peace river, and if the Forestry Branch approved of this I would recommend George Cotter as one of these rangers. He could guard that portion lying in and around Vermilion and up and down the chutes and probably from Vermilion to Wolverine Point. That would still leave the Lower Peace without any guardian.

Another should be appointed from Chipewyan to look after that part of the country between Fort Resolution and Fort Smith.

If authority is given I will see that none but good men are appointed.

In conclusion I beg to say that these guardians have done very satisfactory work, and by their vigilance have saved the country an immense amount of valuable timber.

I regret very much to state that the department has lost a valuable man in the death of Peter Loutit, who was drowned while in the discharge of his duty.

Your obedient servant,

H. A. CONROY,
Inspector Treaty 8.

APPENDIX No. 7.

REPORT OF JOHN A. C. CAMERON, FOREST RANGER.

EDMONTON, ALBERTA, February 2, 1910.

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

SIR,—I beg to report on the work done under my instructions in forest fire protection during the past year, 1909.

Owing to the amount of railway construction, surveying of railway lines and Dominion lands, exploring of timber and minerals, lumbering and river driving, being carried on in the district which is under my supervision, it is perhaps the most difficult territory in Alberta to patrol, and one in which there is most danger from fire.

From the reports of the fire rangers who worked under my instuctions, and from my own knowledge, I do not believe there has been 50,000 feet of green merchantable timber destroyed during the year, and perhaps 25,000 feet fire-killed. We had fires and a number of them, but they were in blown down timber and windfall slashes; also in the ground.

Your obedient servant,

JOHN A. C. CAMERON,
Forest Ranger.

APPENDIX No. 8.

REPORT OF A. L. ROBERTSON, FOREST RANGER.

PRINCE ALBERT, SASKATCHEWAN, February 10, 1910.

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

SIR,—I beg herewith to submit the following report in connection with the forest fire protective service in the Northwest, Saskatchewan. The fire rangers under my supervision have been successful in preventing fires from reaching timber of commercial value. No forest fires occurred where timber of milling quality was damaged to the least extent.

Many small fires occurred through carelessness of settlers clearing land and subcontractors clearing timber from right-of-way of Canadian Northern railway line under construction between Prince Albert and Crooked Lake, a distance of 100 miles; about 70 miles of which is wooded with poplar, jackpine and spruce. The fire ranger succeeded in preventing fire from reaching the densely timbered blocks of spruce and pine under such dry weather conditions as prevailed in the west from early in July up to the snowfall, along the right-of-way, where from 30 to 40 miles were being fired, at the same time keeping such fires as escaped through lack of vigilance on the part of the men doing the work from spreading into large timber. None of the fires got more than from a few hundred yards to three-quarters of a mile from the right-of-way. This shows that the services performed by fire rangers C. S. Gladstone, Jas. Keating and John McBride were most strenuous. Wherever the fire got away from the right-of-way the damage was done to the young growing timber, and in no case did the fire reach such an extent that it could be classed as a forest fire. They were

all ground fires, consuming the forest cover of dry leaves and twigs. The most serious of the ground fires escaped from the right-of-way on section 11-49-1-W. 2nd meridian, and ran over an area of approximately one and a half miles in extent. The area had been cut over for railway ties many years ago, and was reforesting with a dense growth of banksian pine from five to twenty years' growth. About 60 per cent of this young timber was fire-killed.

Another fire escaped from the right-of-way north of Shell river, in township 50-4-W. 2nd meridian. This fire spread back from the right-of-way into reforesting banksian pine, and was also a ground fire. Owing to the great amount of debris from timber cut by settlers for building purposes and fuel, and the dense growth of young pine, it was impossible to stop the fire by beating it out, which is the only method that can be applied to ground fires. This fire burned in a zig-zag direction, covering approximately three-quarters of a section of land, and fire killed 50 per cent of the young trees. Less than two per cent of the timber that had reached twenty-five years' growth and over was injured, as the fire was not sufficiently intense to injure the thick bark. These were the only fires of any consequence that occurred in the conifer timbered area in my district.

The Canadian Northern right-of-way, from township 50-4-W. 3rd meridian to Crooked lake, passes through a poplar timbered land, except about a mile of construction which intersects block 19, T.B. 1049. All the large timber was removed from this block two years ago. Especial care was taken in clearing the right-of-way through the portion of timber berth. Many fires escaped from the right-of-way in the poplar timber area, but no timber of merchantable value other than for fuel purposes was fire-killed. The great danger from these fires was that it would reach the timber berths at Stump lake and Crooked lake owing to the dry condition of all vegetable growth. I went over the right-of-way in September and found that existing conditions were likely to prove serious, and decided to take immediate action in putting a stop to firing the timber out from the right-of-way during the day time. The manager in charge on the construction and the chief engineer promised to make every effort to prevent further danger from fire escaping from the works under their charge.

I engaged Mr. John McBride, an experienced bushman, as forest fire ranger to take charge of the last 40 miles of clearing the right-of-way from between 52 and 53, 7-W. 3rd meridian to end of construction. No fires got away from the right-of-way under Mr. McBride's supervision or from the right-of-way at any point from Shellbrook to Crooked lake after October 1.

No fires occurred in the district supervised by Mr. A. McBeth, forest fire ranger in Sturgeon Lake timber limits, including Sandy Lake and Angling Lake limits.

The area supervised by Mr. D. McLeod was also without fires for the first time in twenty years.

Fire Ranger Heedrick supervised a district in which there were many difficulties owing to the increase of settlers, and the lands within the boundary of his district are very scrubby. The occupants of lands were in the habit of taking every opportunity to set fires to clear the land. Early in the spring settlers were warned to observe the regulations in respect to setting out fires for clearance purposes, and as a result there were no fires started this way. Only one fire occurred in Mr. Heedrick's district. This was caused by parties driving through Sand Hills Forest reserve, throwing away a match into the dry grass. The fire ran over an area of about three acres in reforesting banksian pine of from twelve to fifteen years' growth, girdling about sixty per cent of the trees in that area.

Fire Ranger Douglas' district, extending from range 12, west 3rd meridian, to the 4th meridian, and from Battleford to Isle à la Crosse, is entirely too large an area for one officer to cruise over and do effective work. However, Mr. Douglas did very effective work during his term of service. Several fires were started by settlers through carelessness. Legal proceedings were taken against the parties responsible

for starting the fires and fines imposed on them. These were ground fires which did not do any damage to timber of commercial value except the poplar suitable for fuel purposes.

Mr. W. E. Gladstone, who did forest fire ranging in Pines Forest reserve, was very successful in keeping that area free from fire. The locomotive on the Canadian Northern line caused much trouble in the early spring through starting fires along the right-of-way, the regulations in respect to providing fire screens on the smoke-stacks of their locomotives not being complied with. The claim is made by the engineers that a fire screen which is situated inside the smoke-stack is kept closed when passing through timbered area. This screen is not sufficiently effective to prevent cinders from escaping from the smoke-stack. I would suggest that the regulations require all engines used on lines passing through wooded areas to be equipped with fire screens on the top of the smoke-stacks, and that the fines for non-compliance with the regulations be made sufficiently heavy to ensure observance.

This winter's timbering operations in my district will reach a cut of about 40,000,000 feet, board measure. This includes timber under license, special permit berth and settlers' free permits. The season has been most favourable for logging operations. There has been a noticeable decrease in the quantity of cordwood cutting on government land this winter. The jackpine suitable for cordwood is from seven to ten miles from Prince Albert, and owing to much of the land nearer the city having been settled, the timber which is suitable for cordwood is removed for clearance purposes and marketed in the city.

Loggers on timber berths, railway tie makers, settlers cutting timber on free permits, and cordwood cutters make no effort to dispose of the waste timber such as tree tops, limbs and timber felled and found too far decayed to be of any use. This waste timber is not disturbed unless it is found necessary to do so in clearing roads to the skidways. Another dangerous practice followed by large operators is to pile timber removed from log roads along both sides of the road, and the quantity removed from a space between 30 and 50 feet, after drying a year or two, is a source of great danger to the green timber, as it would be impossible to fight a fire if it got into debris distributed along a distance of from one to five miles.

Your obedient servant,

A. L. ROBERTSON,
Forest Ranger.

APPENDIX No. 9.

REPORT OF E. HAWKE, FOREST RANGER.

MELFORT, SASKATCHEWAN, January 31, 1910.

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

SIR,—In making a report of work done in fire ranging, I am pleased to say, we have had a most successful season; only two small fires to report. The fire ran partly over the berth of A. Marcotte, on section 17-45-4 west 2nd meridian. None of this timber will be destroyed if operations could be commenced at an early date and the burnt timber removed.

There was also a fire in berth 1071 (McDonald's), Crooked river. This fire appears to have been started by the surveyor, in township 39, between ranges 7 and 8. When our ranger visited the above limit the fire was all out, but we will not be able to estimate the damage until next spring. We do not consider it serious.

Yours truly,

E. HAWKE,
Forest Ranger.

APPENDIX No. 10.

REPORT OF ANDREW FREEMAN.

WINNIPEG, MANITOBA, March 21, 1910.

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

SIR,—I beg to submit the following report, respecting forest fires in this district, for the year 1909.

Acting under your instructions, I had fire warning notices posted, during the spring and summer, throughout the entire district where there was any likelihood of fires starting. These notices were printed in the English, French, Icelandic and Galician languages, and distributed through the various settlements and timber areas from the international boundary line as far north as Norway House on the Nelson river. The rangers who posted these notices made special efforts to warn settlers of the great danger from bush fires, and to draw their attention to the penalties provided by the statutes in cases where persons start fires and allow the same to get beyond their control. I am satisfied that these precautions taken at that particular time greatly lessened the damage done by forest fires last year, which was one of the driest ever known in this province.

In the district east of the Red river only two fires were reported by our rangers. Both of these occurred in June. The first one started close to the Canadian Northern railway track near Badger and damaged or destroyed the timber on about two and a half square miles, and about 150 cords of wood piled in the bush. The timber on the burnt area was all small and suitable only for cordwood. The inspector states in his report that he is of the opinion that this fire started from the locomotives of the Canadian Northern Railway Company.

The second fire occurred in township 18, range 7, east of the 1st meridian. The ranger reports, however, that 'very little damage was done, as the fire ran along a sand ridge and destroyed only dry jackpine, damaged by fire about six years ago.' He was unable to ascertain how this fire started.

Two serious fires occurred in the northern district: the first early in June on the Nelson river, below Norway House, and the second near Dog lake, east of the narrows of Lake Manitoba.

When our forest ranger visited Norway House, about July 20, the fire had burned over a considerable tract along the west bank of the river, and in some places three or four miles back. Heavy rains, however, extinguished this fire between July 24 and 28. I have not yet been able to procure any further report on this fire, or an estimate as to the extent of the damage done. The ranger and the officials at the post mentioned are of the opinion that the fire in question was started by Indians. In connection with this matter, I wish to point out that it is practically impossible for

this office to post fire warning notices further north than Norway House. I consider it necessary, however, that some steps should be taken to warn the Indians in the northern country of the great danger of forest fires, and, as far as possible, impress upon them the necessity of protecting the timber and not allowing fires to get beyond their control. I would respectfully suggest that your department should, if possible, make some arrangement with the Indian Commissioner whereby notices of this kind would be distributed on the various reserves where treaty money is paid.

The fire near Dog lake, referred to above, occurred in September, where a considerable area was more or less damaged and many settlers lost their hay as well as some buildings, but no loss of life was reported. The ranger who investigated and reported on this fire states that 'there was not much damage done to valuable timber, namely the spruce and tamarack, the fire having run mostly along the higher land covered by poplar, and through hay meadows.'

During the month of September and the first part of October, there was practically no rainfall in the northwest part of this district, and the timber in that section was at one time in great danger, as fires had started in several places, but, from a report received from our ranger at Dauphin, it appears that comparatively small damage was done, as snow fell throughout the district about October 10, which put out these fires.

Since that time no reports of fire in any part of the Winnipeg district have reached this office.

Respectfully submitted,

ANDREW FREEMAN,
Assistant Crown Timber Agent.

APPENDIX No. 11.

REPORT OF NORMAN M. ROSS.

INDIAN HEAD, SASKATCHEWAN, March 31, 1910.

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

SIR,—I have the honour to submit herewith my tenth annual report for the period dating from March 27, 1909.

The past season has been on the whole favourable to nursery work and tree planting generally. The winter of 1908-9, though severe, caused no particular injury on the nursery as there was a fair amount of snow held on the heeled-in stock and transplanted conifers. The large open plots of one-year ash were, however, swept entirely bare of snow and as a consequence a large percentage of the seedlings failed to start growth in the spring. Reports from the various outside plantations show that there was no unusual winter killing among the older trees except in a few places where local conditions were unfavourable to an early maturing of the new growth in the previous fall.

Spring opened very late, but once warm weather started we had no very cold spells or late spring frosts. In most districts weather conditions during the planting season were favourable with an unusual amount of rain during the early summer, causing strong and rapid growth. The latter part of the season was exceptionally dry, making conditions favourable to early maturing of the new growth. At Indian Head the ground froze up November 11.

Owing to the early part of the season being so wet the rust on the cottonwood was very prevalent in certain districts. This rust is very unsightly and causes the trees to lose their leaves early in the fall. No doubt if the same trees are badly attacked in successive seasons the result might be disastrous, but when occurring only occasionally no great injury is apparent.

We have received many reports of the winter killing of Manitoba maples sent out from the nursery in 1908. In some cases only the tops were cut back, in others both root and stem were completely killed. This loss was due to using seed collected in Dakota. Owing to a scarcity of seed in the Canadian West arrangements were made to have a supply picked in the northern part of North Dakota. As we had no direct control over the collectors it is more than probable that some of the seed was got from further south, the result being a crop of seedlings of a less hardy strain than those produced from our native seed. A few years ago we had a similar experience with seed obtained from Minnesota, also with elm seed got from the eastern states. In the latter case, however, the entire stand of seedlings was killed in the nursery during their first winter. These failures show the uselessness of importing seed from districts where the growing season is longer than ours.

In certain parts of Southern and Western Alberta more or less injury from winter killing is experienced every year. Mr. Arch. Mitchell in his report takes up this particular question more fully. In this special district we shall have to rely mostly upon Russian poplars, willows and caragana, as being the most hardy varieties. We are at the nursery increasing our stocks of these in order to make a larger distribution of them in the most unfavourable sections.

INSPECTION WORK.

During the summer the inspection of the outside plantings was divided into eight districts, covered by the following inspectors: A. Mitchell, A. P. Stevenson, J. Caldwell, A. Mackintosh, W. Guiton, Jas. Kay, Jas. N. B. McDonald, J. H. Ferguson. These inspectors have each made a detailed report of the season's work and, as usual, these reports are very favourable and indicate a continually increasing interest in tree planting.

The demand for planting stock is greater this season than ever before, without any corresponding increase in the quantity of nursery stock available for distribution. This shortage of stock was due to two causes, one being a scarcity of maple seed, the other the killing out of about 50 per cent of our one-year ash seedlings owing to lack of snow covering during the winter.

There is no doubt, however, that at the present rate of increase we cannot hope to keep pace with the demand unless our equipment is correspondingly enlarged. The following table will show how great this increase is, and we have been forced to cut down the average number of trees supplied to each applicant, from 1,400 in 1908, to about half that number this spring, though the total number of trees available for distribution is nearly twice what it was in 1908.

——	1908.	1909.	1910.
Number of applicants on Inspectors' books	3,734	5,723	*8,318
Number of applicants to receive trees	1,424	2,010	3,173
Number of trees distributed	1,800,000	2,570,000	2,533,600
Average number of trees per man	1,400	1,200	798
New applications		2,235	*3,832

Numbers marked * are approximate only as lists cannot be definitely made up till later.

In future years farmers wishing to plant will of necessity have to rely considerably on other sources than the Forestry Branch for a great deal of the planting material they will require. It is the intention to work up and distribute in future a large stock of willows. When a few trees of cottonwood, Russian poplar and willows are well established on a farm the owner will have no difficulty in obtaining plenty of cuttings on his own place to increase his plantations. There is no reason either, if farmers could only realize it, why every man should not grow quite easily all the maple and ash he may require in a small corner of the vegetable garden. It is no more difficult than cultivating a crop of peas or onions.

OFFICE WORK.

The office staff this winter consists of Mr. Mitchell and four inspectors, with Miss Lauder, who has charge of the records, and an assistant stenographer and bookkeeper. During the summer the office work is lighter, the inspectors taking up their outside work from May till November. The correspondence and other work of the office have naturally kept pace with the general development. The following figures show briefly the amount of work handled in this office:—

—	1908-9. (to March '09.)	1909-10. Apl. '09-Mar. '10.
Number of planting plans prepared	1,002	1,714
Number of pieces of mail received	7,723	12,447
Number of pieces of mail sent out	8,431	*16,059
Number of new files added	3,640	3,902

* This does not include bulletins, these being sent from the office at Ottawa.

Besides the general correspondence a great deal of work is entailed in making up the annual distribution and inspectors' lists, keeping the card index up to date, &c.

EXHIBITS.

During the past season an exhibit was prepared for both the Brandon and Calgary summer fairs. These exhibits, as in former years, consisted mainly of enlarged photographs. Mr. Mitchell was in attendance at both places and was able to give information regarding the work of our division and on tree planting generally, to many interested visitors.

At the request of the directors of each of these fairs we propose this summer to add considerably to the value of these exhibits by setting out demonstration plantations on a small scale on ground provided for the purpose by the directors, which has been properly cultivated in readiness for planting this spring. At Brandon a considerable amount of planting has been done by the Exhibition management at one time or another on the fair grounds, so that at the present time there are plenty of examples of successful growths of the more common broad-leafed varieties. Our outside exhibit at this place will then consist chiefly of plantings of the hardier varieties of conifers. A small portion of the grounds will also be utilized to demonstrate simple nursery methods such as a farmer could profitably carry on at his own home to supply young stock for his own plantations and shelter belts.

At Calgary practically nothing has been done in the tree planting line on the fair grounds. Here it is proposed to set out samples of windbreaks suitable to Alberta conditions. The majority of the trees used will be quick-growing, broad-leafed varieties, though small plantations of white spruce, jackpine and tamarack will also be set out. At Calgary also a portion of the ground will be devoted to simple nursery propagation of the ordinary broad-leafed and some of the best coniferous varieties.

The plot of ground at Brandon is somewhat more than half an acre in area, while at Calgary about an acre has been placed at our disposal.

LECTURES, &C.

As in past seasons, the results of our work and general information on prairie planting have been made public by articles prepared for the various agricultural and horticultural periodicals, by the distribution of bulletins, circulars and pamphlets, and by providing speakers to attend meetings of Farmers' Institutes in various parts of the west. Mr. Mitchell attended meetings in Alberta during the month of February, Mr. A. P. Stevenson was out in parts of Saskatchewan from January 27 till February 16, while I attended a number of meetings in Saskatchewan during the early part of February.

NURSERY WORK.

Though the spring opened up rather late, the continued favourable weather, with an abundance of rain during the early summer, resulted in a very good season for nursery stock. All varieties did wonderfully well, with the exception of two-year old ash, which as previously mentioned, suffered considerable loss from lack of snow covering during the winter. The two-year elms in well sheltered plots made extraordinary growth; in fact they grew to such a size that we experienced considerable difficulty in digging them. They are also too big to handle conveniently when packing and shipping in large numbers.

Owing to a lack of maple seed, we were not able to sow as large an area as we would have wished to do. However, what was sown came up well and made good growthy plants.

The area of ground devoted to the different varieties was as follows:—

Broad Leaf.

13½	acres	1 year maple.
16	"	2 year ash.
1½	"	2 year elms.
2	"	1 year Caragana.
3	"	willow cutting stock.
1	"	Russian poplar cutting stock.
14	"	1 year ash.
5	"	1 year elm.

Conifers.

1¼	"	transplanted tamarack.
2¾	"	transplanted evergreens.
¾	"	conifer seed beds.

60¾ acres total under nursery crops.

The following is the stock available for distribution this spring:—

Broad Leaf Varieties.

1 year Manitoba maple	1,135,500	—average stand per acre	84,111.
2 year ash	476,775	" "	28,000.
2 year elm	56,920	" "	37,950.
1 year Caragana	44,000	" "	22,000.
Willow cuttings	683,000	(estimated).	
Russian poplar	150,000	"	
Cottonwood	54,000	imported.	
White birch	3,365		
Soft maple (*Acer dasycarpum*)	1,972		
	2,605,532		

Conifers.

Tamarack	49,200
Abies concolor	102
Abies balsamea	624
Pinus flexilis	1,527
P. cembra	127
P. sylvestris	26,070
P. murrayana	2,868
P. ponderosa	338
Picea pungens	1,184
P. excelsa	9,307
P. alba	3,090
	94,437

Total of broad leaf and conifers—2,699,969.

About 2,533,600 of this number will be required for distribution. The remainder will be used for permanent planting on the nursery and for planting on the Exhibition grounds at Brandon and Calgary. A suitable allowance has also been made to cover a loss which is always inevitable when handling the stock in the spring.

Of the conifers, about 62,000 will be used for general distribution. This is the first season that any attempt has been made to send out conifers in any quantity.

Tree digging in the fall commenced September 22, finishing up on October 15.

The following areas were sown during the summer and late fall:—

5 acres elm.
1¾ acres Caragana—at the rate of 24 pounds seed per acre.
8¼ acres Manitoba maple—at the rate of 51¼ pounds seed per acre.
20 acres ash—at the rate of 32·7 pounds seed per acre.

An additional 10 acres of maple will be sown in the spring. It is hoped this summer to have about 15 acres more new land summer-fallowed and put under nursery in 1911. This, however, is the last piece of ground that can be used for nursery work, bringing our total available area up to about 85 acres.

COLLECTION OF SEED.

Owing to the absence of late spring frosts this was a good season for all kinds of broad leaf tree seeds.

Maple and ash were collected in the Qu'Appelle valley north of Indian Head, both east and west of Fort Qu'Appelle. The collection was done mostly by half-breeds. Although the seed crop was heavy, we did not get as much seed as we wished. Unfortunately the seed picking comes at a time when labour is very much in demand, and large wages are being paid for any kind of help during harvest and threshing. Altogether we were able to get about 90 2-bushel bags of maple and 100 of ash. Before those seeds can be sown with our drill they require a great deal of cleaning to remove stems and wings, so that a bag of rough seed will not equal more than a bushel when cleaned.

Elm.—During the early part of June we collected with our men a good supply of this seed, near Fort Qu'Appelle. Unfortunately it was hardly in a ripe enough condition and as a consequence did not germinate so evenly as it would have done had the picking been delayed for a few days.

White Spruce.—Cones were collected on the Spruce Woods reserve and shipped to the nursery here. Forty-five pounds of seed were extracted, an average yield of 1·52 pounds per bushel of cones.

Jackpine.—Cones collected in the Prince Albert district; 32 bushels cones only yielded nine pounds of seed. The greater proportion of these cones were very old. The very old moss-covered cones are difficult to open and seem to contain only a small proportion of good seed.

Lodgepole Pine.—Sixty bushels cones collected in the Cypress Hills reserve yielded 37 pounds clean seed. A good many of these cones were also very old.

Scotch Pine.—Ten pounds of seed was purchased in Europe for this spring's sowing.

Tamarack.—Six bushels of cones collected in northeastern Manitoba yielded 8 pounds of seed. These cones are very small, and no doubt considerable difficulty is experienced in collecting any quantity.

Black Spruce.—Two bushels cones yielded one-half pound of seed.

Douglas Fir.—Two bushels cones yielded two and three-quarter pounds of seed.

Siberian Larch.—It is hoped to procure a supply of this variety from Europe. The trials on the nursery have so far given very promising results. This larch matures up at least two weeks earlier than the common European kind and seems to be easier to transplant.

CONIFERS.

Seed Beds.—This summer we had nearly 10,000 square feet of seed beds containing one, two and three-year seedlings, the majority of the stock being Scotch pine, white spruce, jackpine, lodgepole pine and tamarack, with smaller quantities of Colorado spruce, Abies concolor, Siberian larch, Ponderosa pine and Picea ajanensis. In the fall a large number of seed beds were prepared for sowing this spring.

Transplants.—Seventy thousand two and three-year seedlings of spruce and pines were lined out in the spring. These appeared to be in pretty good condition when winter set in, and at the present time are well protected by a good covering of snow.

About one and three-quarter acres are occupied by two-year transplants. The majority of these will be dug this spring.

One and one-quarter acres were filled with bush-pulled seedlings of native tamarack.

On the whole our nursery experience with the conifers has been very satisfactory. Conditions on the nursery at present are not particularly favourable for evergreen propagation, on account of the lack of suitable shelter. Up to the present we have never done any artificial watering either in the seed beds or among the transplants. No doubt if a suitable watering plant was installed we could obtain a very much better growth, both in the seed beds and in the transplant rows.

Late last fall (early in October) the hose was turned on some of the two-year old seed beds and the soil thoroughly soaked. This was done principally that the soil might be easily dug this spring and the young plants lifted for transplanting without too much loss of roots. Owing to the very dry fall the soil in these seed beds was extremely dry and would have been very difficult to dig, if, as is quite possible, we have no rain till late in spring. No doubt it would be a good practice to thoroughly soak all the other seed beds in the fall as this would give the plants plenty of moisture to start growth on early in the following spring.

PERMANENT PLANTATIONS.

The following were set out this spring as an addition to the permanent test plantations:—

Plantation No. XXVII.—Three acres of Diamond willow, 3 feet 6 inches x 3 feet 6 inches, seedling stock, imported from North Dakota. This is a variety recommended by the United States Bureau for planting in the northwestern states as very valuable for producing fence posts.

Plantation No. XXVIII.—Two acres Manitoba maple and Dakota cottonwood, 4 feet x 4 feet 6 inches, alternate rows. Cottonwood, seedlings stock imported from North Dakota. Maples, one-year seedlings.

Plantation No. XXIX.—One acre Manitoba maples and soft maples *(Acer dasycarpum)*, 4 feet x 3 feet 6 inches, alternate rows. Manitoba maple, one-year seedlings. Soft maple, two-year seedlings from seed ripened in Manitoba.

Plantation No. XXX.—Two and one-half acres cottonwood and acute-leaf willow, 3 feet 6 inches x 3 feet 6 inches, alternate rows. Cottonwood, seedlings from North Dakota; willow, cuttings.

Plantation No. XXXI.—One and one-quarter acres Manitoba maples and acute-leaf willow, 3 feet 6 inches x 3 feet 6 inches. Maple, one-year seedlings; willow, cuttings.

All these new plantations made good growth during the summer, although about 25 per cent of the cottonwoods failed to root. As mentioned previously, the cottonwood stock was not as good as that received in other years.

The old permanent plantations have all continued to make good growth, the tamarack on the whole showing up most favourably.

Plantations Nos. XX and XXI, set out in 1908, required some filling in of blanks last spring. These are plantations of lodgepole pine. The water supply pipe for the town of Indian Head passes through those plots, and owing to several bad leaks a great deal of alkali has been brought to the surface and spread over a good area of ground. The pines seem to be unable to stand where there is alkali present in the soil, and this was responsible for the killing out of the greater number of those that had to be replaced. It is doubtful, however, whether the pines can now be successfully established in these plots until the excess of alkali has been worked out of the top soil.

The older pine and spruce plantations set out in 1905 and 1906 made splendid growth last summer, the young trees having now become well established.

This spring the following plantations will be set out:—

- 4⅛ acres Scotch pine and Caragana, alternate rows.
- 4⅛ acres Manitoba maples and tamarack, alternate rows.
- 4⅛ acres Norway spruce and Caragana, alternate rows.
- 2 acres white birch and maple, alternate rows.
- 2⅛ acres elm and maple.
- 2 acres tamarack.
- 1 acre ash and maple.

EXHIBITION PLOTS.

No new exhibition plots were set out this spring. These plots consist of 100 trees each, the plots being arranged side by side for purposes of comparison in a favourable situation for inspection by visitors to the nursery. Fourteen of these plots were planted in 1908; several more will be set out this spring, and as time goes on it is hoped to gradually add to them till every variety of tree, hardy under our conditions, is represented.

ORNAMENTAL GROUNDS AND SHRUBBERY.

All shrubs and perennial plants came through the winter of 1908-9 in good condition. Spirea Van Houteii and Spirea Arguta suffered a little from freezing back, but sufficient new wood was left to provide a very good show of bloom. All varieties of lilac bloomed very heavily.

The following roses came through the winter without any protection other than snow covering and bloomed heavily: Japanese rugosa rose, pink and white single, pink semi-double, Scotch yellow rose, Persian yellow rose, Banshee rose (light pink

double); Soleil D'or and Sallet Moss also wintered and bloomed well. These were bent down and covered with earth in the preceding fall. Perennials made a very good show, as the early summer was very favourable.

VISITORS.

The number of visitors who come to look over the nursery is increasing each year. During the past summer there were two special excursions to the nursery, one consisting of the Normal School students from Regina and the other the delegates attending the meeting of the Forestry Association held at Regina in September. A very large proportion also of the farmers attending the provincial excursions to the Experimental Farm availed themselves of the opportunity to visit the nursery station at the same time.

PLOUGHING AND FARM WORK.

About 30 acres of summer-fallow and nearly 30 acres of fresh breaking and backsetting were done during the season, besides the ploughing and preparing of about 34 acres of plots for nursery purposes. We also as usual put up sufficient hay for the horses, and grew 25 acres of oats and barley for feed.

Your obedient servant,

NORMAN M. ROSS.

APPENDIX No. 12.

REPORT OF ARCHIBALD MITCHELL.

INDIAN HEAD, SASKATCHEWAN, March 31, 1910.

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

SIR,—I have the honour to submit herewith my second report as assistant in the Planting Division of the Forestry Branch.

On June 9, after completing the office work in connection with the distribution of trees from the nursery, I spent a few days in the Qu'Appelle valley gathering elm seed.

On my return, I accompanied a new inspector, Mr. J. H. Ferguson, for about two weeks in the district around Saskatoon, in order to give him some insight into the work among the plantations.

On July 1, I went to Calgary to look after the exhibit of the Planting Division at the Provincial fair. This exhibit consists of enlarged photographs, framed, showing the development of the nursery from the bare prairie to its present state, and also a number of mounted photographs showing plantations in different parts of Alberta. These attracted a good deal of attention, and I was able to give a considerable amount of information to inquirers. Next year it is intended to have, in addition, a demonstration in plantation and nursery work in the grounds, and it is hoped these will help to stimulate still further the interest in tree planting in that province.

After the Calgary exhibition I went to the one at Brandon for five days to take charge of the Forestry exhibit there. This is one of a much more varied character than that at Calgary, and consists of specimens of oak, elm, ash, iron wood, Manitoba maple, poplar, spruce and tamarack, all grown in Manitoba. Some of them are of large size, the oak being over two feet in diameter.

Besides these there are specimens of Scotch pine, cottonwood and Manitoba maple, grown on the Experimental Farm, which illustrate how rapidly results may be obtained from planting. There is also a collection of cones, seeds and pressed specimens of leaves which are very instructive and attract a good deal of attention. A collection of pictures similar to those at Calgary completes the exhibit. It is placed in the same building as the one from the Experimental Farm and the British Columbia fruit exhibit, and is visited by a large number of people, many of whom have enquiries to make on various phases of tree and shrub growth. It is intended next year to have a small outside exhibit in the grounds similar to the one at Calgary.

After Brandon Exhibition I took up inspection work, at which I continued until October 22.

My districts this year were the Gainsboro branch of the Canadian Pacific railway in Saskatchewan, i.e., between Gainsboro and Estevan, the branch running northwest from Moosejaw to Outlook, the Grand Trunk Pacific from Raymore west, and the Pheasant Hills branch of the Canadian Pacific railway west of Saskatoon.

The men on my list numbered 549, of whom 296 had land ready for planting and will get trees in 1910. This is over 53 per cent, and a little better showing than last year, which was about 50 per cent.

The trees planted in 1909 as a rule did well, and were in most cases well cared for. The percentage of living trees was about: maple, 94 per cent; ash, 98 per cent; cottonwood, 60 per cent. Quite a number of the cottonwoods were dead, and this was remarked all over the country. They had been handled at the nursery the same as usual, and probably the reason of the great number of deaths was that they had been grown on a wetter site than usual and their roots were softer and less able to stand transplanting. They are imported from Dakota, and are grown on the sand bars of the Missouri river.

A good proportion, sometimes as high as 70 per cent, of the Manitoba maples planted in 1908 have also died over winter, root and branch. This is quite unusual, and on inquiry it was found that they had been grown from seed obtained from North Dakota, and is just another illustration of the advantage of using home-grown seed whenever possible.

The preparation of the plots for planting was well up to the standard of last year, and a large number of men had prepared several acres of land. Trees for such large areas could not, of course, be supplied, but it shows how much more interest is being taken in planting, and how the farmers are beginning to realize the necessity for substantial plantations on their farms to help to solve the fuel question, as well as for shelter.

The country along the Gainsboro-Estevan line has been settled a good many years, and when the tree distribution was begun by the Forestry Branch, many of the farmers were well enough established to take advantage of it. The trees planted then are, many of them, now in splendid shape, forming plantations which stand up quite prominently on the prairie. Some of the trees are over 20 feet high and are a good shelter for stock, garden and buildings, and are valued highly as such by the owners.

After my regular inspection was over I made a special trip into Alberta in November, to look over some of the earlier plantations in the higher districts where certain trees have been found unsuited to the locality. This was in completion of the investigation I began last year, and my trip this fall fully confirmed the conclusions arrived at then.

These districts lie along the foot-hills and are usually blessed with a better rainfall than the prairie further east, and this has resulted in a rank growth of grass which, dying down every year for perhaps centuries, has produced a soil very rich in humus. Trees planted in this soil are frequently caught and badly injured by the first frost in the fall while still growing, i.e., before they have had time to ripen their wood. This is often accentuated by the elevation of the locality, Pincher Creek, for

instance, being 3,818 feet above sea level, while Medicine Hat is only 2,171 feet, and it is no wonder that the frosts come a little earlier than further out on the prairie.

The district under consideration consists of the high land south and west of Magrath, and embracing the Cardston and Mountainview country, Pincher district, the Porcupine hills, and all west of a line stretching from Staveley to Namaka on the main line of the Canadian Pacific railway and west of range 23; from thence to the Red Deer river. All east of this it seems to be quite safe to grow cottonwoods and all the other trees found to succeed on the prairie; but in the region specified the cottonwoods will require to be replaced by Russian poplars and sharp-leaved willow. The difference between cottonwood and Russian poplar is well illustrated in some plantations belonging to Messrs. Gerhardt and A. C. Neufeldt, situated about 13 miles east of Didsbury. Here the cottonwood is only six feet to nine feet high, and has been frozen every year since it was planted. The trees are just bushes with several stems, half of which are dead. This year already, on November 20, a foot of the summer growth was frozen. The Russian poplar standing beside them are in great contrast, for they are up to 16 feet high and making three or four feet every year, with some of the stems six inches in diameter and no sign of frost hurt.

Ash is our hardiest tree on the prairies, but it suffers badly from frost hurt here and so does the elm.

Manitoba maple also kills back severely at times, and becomes a mere bush, but it will always be necessary to include it in the plantation in considerable quantity so that its leaves and branches may shade the ground. It will in this way act as a nurse for the more rapid growing and the more useful willows and Russian poplars. A few ash and elm may be included in the maple rows in order that some of the better sorts of timber may be found in the plantations in years to come; for it is more than likely that after the plantation gets up and able to afford shelter to itself, some of the elms and ashes, as well as the maples, may be able to struggle through and become good trees.

This is the idea that has been followed this year in arranging the trees for distribution in the spring of 1910, and in the higher district of Alberta the proportions will be: Russian poplar, 25 per cent; shary-leaved willow, 25 per cent; maple, 20 per cent; caragana, 20 per cent; elm, 5 per cent, and ash, 5 per cent. Caragana is hardy anywhere, and forms a very good soil cover.

In this way it is to be hoped the plantations will be successful, and an added stimulus be given to planting in these districts.

During the year I have delivered addresses at the Normal School at Calgary on November 19, in Edmonton before the Naturalists' Society there on November 24, at Regina at the Forestry Convention on September 7, at Indian Head on February 1, 1910, and while on an institute tour lasting from February 8, 1910, to February 28, I addressed 18 meetings: two of them being at Lethbridge at the short course in agriculture, and two on February 25 and 26 at Olds, at the short course there. Those at Edmonton, Indian Head, Lethbridge, Magrath and Olds were illustrated by lantern slides.

I also prepared a paper on 'Planting the School Grounds' for the convention of school trustees of Alberta at Lethbridge on February 25, which the meeting was good enough to request permission to publish for distribution among the school trustees in that province. It was illustrated with charts, and arrangements are to be made to have them reproduced in the bulletin.

At the Institute meetings in February I used a number of charts illustrating several points of interest worth observing when a farmer lays out his land. These were drawn to scale, and were intended to show the desirability of having broad belts set well back from the building. and inclosing spaces affording plenty of room for orchard, garden, buildings, shrubberies, and yard room in their shelter. A great deal of misconception prevails on these points, and in this way it was possible to bring them more clearly before the audiences.

The months of December and January were spent in the office, going over the work of the summer, and preparing the lists and plans for the spring distribution. In doing this, it was found that the demand for nursery stock was considerably greater than the supply, which necessitated the cutting down of the average per man to about 817 trees. Last year it was a little over 1,200, the lowest previously on record. This is a matter of considerable moment, if the work of clothing the prairies with a fair complement of trees is to proceed with the same vigour as it has in the past few years.

I am, sir, your obedient servant,

ARCHD. MITCHELL,
Assistant in Tree Planting Division.

APPENDIX No. 13.

REPORT OF A. P. STEVENSON.

DUNSTAN, MANITOBA, December 20, 1909.

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

SIR,—I have the honour to submit the following brief report on the work done by me under your instructions as tree planting inspector in connection with the work carried on in this province by the Forestry Branch of the Department of the Interior during the year 1909.

During the months of January and February, I addressed a series of Farmers' Institute meetings in Saskatchewan at the following places: Pense, Grand Coulee, Qu'Appelle, Indian Head, Wolseley, Summerberry, Hillesden, Beeston, Weldon, Grenfell, Broadview, Whitewood, Wapella, Fleming, Moosejaw, Marquis, Westview, Caron and Belbee.

The questions dealt with mainly at those meetings were the growing of trees on the plains, the proper preparation of the soil for the trees, their planting and management, and the value they add to the farm and general benefit to the neighbourhood. The Dominion Government co-operative tree planting scheme was outlined, and the work already done by the Forestry Branch explained. Usually the questions of the possibility of fruit growing on the plains would come up for discussion in connection with the subject. It was clearly shown that where a good shelter belt was grown the possibilities in this line of work on the farm were greatly improved, but it was just as certain that a shelter belt was a prime essential to success in this work.

On June 8, I commenced the work of inspection, and finished on November 25. The total number of names of persons on my list to be visited was 652; 140 of these will get no trees on account of the lack of preparation. A number will drop off the list, having finished planting for the time being. Thirty-two I was unable to visit on account of their isolated location and the lack of time.

The district covered this year was all of southern Manitoba, from Whitemouth in the east to the western boundary of the province south of the main line of the Canadian Pacific railway; from Winnipeg northwest to Makaroff, on the Canadian Northern; and from Winnipeg west to Pennichy, on the Grand Trunk Pacific.

The past winter was an average one in this province, a fair amount of snow covering the ground during the latter part of the winter. A considerable amount of

killing back was noticed among the one and two year old maples, especially in the southwestern part of the province. It was noticed in nearly every case where this occurred clean cultivation had been kept up late, the ground under the trees being bare of snow the larger part of the winter. It was duly impressed on those having exposed plantations that cultivation should cease among the young trees by the end of the first week in August.

Practically no damage was done this year by the vagabond gall, conditions not being favourable for its propagation. In early summer the leaves of the maple were to some extent infected with a species of gall, which caused some uneasiness, but later it disappeared and no bad effects were noticed.

The spring was a very favourable one for the planting of trees, and of the young trees planted out this spring 90 per cent of maples, 80 per cent of ash and 65 per cent of cottonwood are growing and in a thrifty condition. The latter part of the season was extremely dry and hot; the young trees came through without any apparent injury. To the thorough preparation of the soil in which the young trees are planted is without doubt due this favourable condition. The older trees on the plantations all made good average growth. The ash, as in other years, still continues the favourite when grown for two years. Among the American settlers, cottonwood is always first in demand as a fast growing tree, but when this cannot be got the Russian willow is no mean substitute; it is quick growing, and adapts itself to almost any soil and location, holding its leaves late in the fall and among the first to put them forth in the spring.

It is a yearly increasing pleasure to the inspector visiting in districts among the older plantations to notice the gradual change taking place in the landscape. Where previously there was bare, unbroken view, now it is broken by young plantations dotted all around, and yearly growing more and more in evidence. The remark is often made to me by farmers that their plantations have added from one thousand to fifteen hundred dollars to the selling value of the farm.

Along the Grand Trunk Pacific, settlement is comparatively new, and ideas on tree planting are rather crude. Perhaps five hundred trees is as many as can be conveniently handled at one time, but a good beginning has been made, the benefits of a windbreak on the farm are appreciated, and it is only the matter of a short time when considerable planting will be done along this road.

I had the pleasure of being present at the Forestry Convention at Regina, Sask., on September 3. Much useful information was disseminated, the meeting was very enthusiastic, a profitable time was had, and many things were learned that will serve a useful purpose when applied in the future.

I was pleased to again have the opportunity of visiting the Forest Nursery Station at Indian Head. To the tree inspector this is always an inspiration, to note the behaviour of the many varieties of trees grown there and the conditions under which they are grown; and the splendid object lessons to be gathered enable him more fully to answer with every confidence the many questions he has to meet while engaged inspecting forest tree plantations.

Your obedient servant,

A. P. STEVENSON,
Tree Planting Inspector.

APPENDIX No. 14.

REPORT OF JOHN CALDWELL.

VIRDEN, MANITOBA, December 14, 1909.

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

SIR,—I beg to submit to you my report on my inspection work for the summer of 1909.

The territory given me was the Canadian Pacific Railway main line from the Manitoba boundary to Regina, the Canadian Northern Railway line from Manitoba to Regina, the Arcola line from Regina back to Manitoba, and the Reston-Wolseley line.

I had about 850 farmers on my list, being one-third more than the previous year. The quantity of trees I allotted would be about a quarter of a million. The average quantity to each man beginning a plantation was about 1,300 trees, quite a few taking less to fill up blanks or to extend a little.

Several men wanted five to ten thousand and had land well prepared. These were men who would be likely to make a good success of their plantations, but with a great many new names all through the west and a greatly increased demand, it will be impossible to give these good men even half of what they require; which shows plainly that in order to supply the demand we must grow more stock. I do not care to give a beginner more than one thousand to fifteen hundred, nor do I care to give him much less.

Last spring was rather late, which gave farmers little time to do a lot of work, but the trees were pretty well planted and did well. The plantations from the beginning up to date are doing fully better than we could expect in a new country, probably 85 per cent doing well.

Rather more than usual were sent out of willow cuttings and they did well.

There is a growing demand for Russian willows and poplar and they are sure to prove good. Ash are doing well, but a lot sent out last spring were a little small. Cottonwoods were not quite as good as usual, probably because they are getting more scarce. They have done well, but I saw several patches of rust on that variety this season for the first time.

Maples planted in the spring of 1908 did well but quite a lot were killed last winter, especially where the land was a little sour, or where there was shallow planting, but the main reason was that the seed was from the south. There is nothing so good as our own native seed.

Stewart Mitchell, of Francis, has a very fine plantation five years old where the people gathered last summer for their annual picnic. In previous years they had to construct artificial shade or travel 20 miles for shelter. This is only a sample of the good work.

In last spring's planting the trees were more mixed, which is better than having each row all one variety.

I think it better to leave most of the names on the list so that they may be called upon, if not taking up too much time. I always like to call on a beginner if possible, and I missed very few last summer.

I noticed one plantation of 1,000 Ontario soft maple. They were from Iowa. This was their first summer and they looked very pretty, but I expect this winter will spoil their good looks considerably.

I also noticed several plantations of Carolina poplar from Iowa planted in the spring of 1908, yearlings. They did well the first summer, killed back pretty badly the next winter, but this last summer they made great growth and looked splendid. It is a little early to speak definitely of the Carolina poplar in our climate, but I rather expect to see them prove pretty good, especially when planted one year old. We have quite a few of this variety around Virden doing well.

Your obedient servant,

JOHN CALDWELL.

APPENDIX No. 15.

REPORT OF ANGUS MACKINTOSH.

HEADLANDS, SASKATCHEWAN, November 25, 1910.

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

SIR,—I have the honour herewith to send you my sixth annual report on the inspection work in connection with the Tree Planting Division of the Forestry Branch, with which you entrusted me in 1909.

Owing to some weeks of illness, I was not able to cover the usual extent of ground, but from the beginning of August to nearly the end of October I put in a good deal of work.

The territory allotted to me by Mr. Ross was that which stretches from Kirkella on the east to the Last Mountain lake and Lanigan on the west; and from the Grand Trunk railway and in places beyond, on the north, to the Qu'Appelle valley on the south.

It is a pleasure to be able to give a favourable report of not only the plantations made last spring, but of those formed in previous years. On account of the late spring the trees sent out this year were late in reaching the recipients, many of whom could not, through press of other work, give them immediate attention. Nevertheless they have on the whole done well, the failures not exceeding six per cent. When trees are planted late one does not look for great growth the first year, but if they live and are healthy they will show up well the second year. The greatest number of failures are usually to be found amongst the cottonwoods. That tree, however, is a fast grower, and on that account a favourite with farmers. This year the foliage of the cottonwood was, in many localities, blighted with rust. Probably the heavy rains that fell in July brought with them conditions favourable to its development. It did not, however, perceptibly check the growth of the trees. Although it caused the foliage to drop off early, the shoots ripened well and earlier than usual. The soil after all may have a streak of good in it. I saw no vagabond gall, excepting in one place, this year, and there were only a few.

The ash, I am glad to say, is steadily gaining favour with the farmers and homesteaders, and is no longer spoken of as a 'slow grower.' The growth it is making in the older plantations, where the branches of other trees have closed in upon it, is now remarkable. A growth of from two and a half to three feet is frequently met with. The ash is a tree better adapted for mixed plantations than for grouping by itself. It requires the elbowing of other and more aggressive trees to make it assert itself. Whether it will attain to timber size or not is as yet problematical; but it will at any rate reach a size that will for many purposes suit the farmer.

The elm, like the ash, is a somewhat slow grower to begin with, but it also makes up for lost time in after years. There is no question about the elm attaining to timber size. We have found elm on the banks of the Souris and in a ravine near Lumsden, with a diameter of 18 inches five feet from the ground. Rabbits, however, where there are many, have a great liking for both young elm and ash, and at times do a great deal of damage.

The suitability of the Manitoba maple, notwithstanding its habits of throwing out rambling branches and running into forks and double stems, for shelter belts is now so well known that it wants no recommendation of ours.

The Russian willow we also find well adapted for shelter belts, either as an outside row or mixed amongst other trees. Indeed, we think it might with advantage be used more extensively in the future than it has in the past in the makeup of prairie plantations.

With very few exceptions we found the older plantations inspected this season in a satisfactory state; and many of the owners are worthy of praise for the care and attention they give their trees. We estimate the failures amongst the trees in those older plantations at seven per cent, a loss hardly noticeable when trees reach a height of from 8 to 12 feet.

The question of pruning, as usual, ever and anon crops up in our rounds, and we have to use all the persuasion and advice at our command to restrain the tendency of plantation owners to use the knife. Thinning also, where the trees have attained a height of from 10 to 12 feet, is beginning to trouble the minds of some that would doubtless use the axe to bad purpose if not restrained. We would, however, remark here that an inspector should be able and willing to give advice at any rate on his last visit, as to when and how a plantation should be thinned. Thinning is not yet a pressing matter, for we believe it is not necessary until trees have reached a height of from 20 to 25 feet, unless some variety that it is desirable to foster is getting killed by a variety of less value. Where the different trees composing a mixed plantation keep pace one with the other, thinning should be put off until overcrowding will permit of no longer delay. Weeding out all the unhealthy and deformed should always be the chief aim in a first thinning. Our prairie plantations, however, are only test ones, and what tree or trees will turn out best in coming years is still a question we cannot answer. Therefore we think it would be judicious to keep a fair proportion of each variety of which a plantation may be composed upon the ground in all our thinning operations until we can judge rightly which is best and which is worst.

This is not the place for a treatise on thinning, and the test plantations at the Forestry Station at Indian Head, and the chief under whose care they are making such remarkable progress, should be our guides in this matter, as well as in that of planting.

This year has been a good one for the western farmer and homesteader, and we expect to find applications for trees largely on the increase next season on that account.

Your obedient servant,

ANGUS MACKINTOSH.

APPENDIX No. 16.

REPORT OF WALTER B. GUITON.

INDIAN HEAD, SASKATCHEWAN, March 31, 1910.

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

SIR,—I have the honour to submit to you my third annual report of tree planting inspection work, as carried on through the co-operation of the Forestry Branch of the Department of the Interior.

Since sending in my last report, dated December 26, 1908, I have been employed during the winter in the general routine of office work. On May 10 I went to the Nursery station to assist with the planting and the general spring distribution of trees until June 15, when I commenced inspection work.

The districts assigned to me for inspection were Main line Canadian Pacific railway west of Regina to Moosejaw; Soo line, Moosejaw to North Portal; Crowsnest line, Macleod, Pincher Creek and Cowley; the Alberta Irrigation lines, Stirling to Cardston, Stirling south to the International boundary.

There were 1,041 applicants on my list to visit this season. Six hundred and ninety were new applicants, 300 of whom will receive trees in the spring. The number of new applicants with ground ready to plant next spring is greater than in former years. The others will be carried over another year, thus allowing them more time to cultivate their ground. The total number of both new and old applicants to receive trees in the spring of 1910 will be 707. The total number of trees recommended by me this year was 811,200, but, owing to the scarcity of stock, this has been reduced to 560,425, thus bringing the average of trees per man to about 793. This is much lower than in previous years, due not to the relatively smaller area prepared by each man, but to the great increase in the number of applicants. The demand for trees is growing so fast, that the present facilities for raising nursery stock will not now permit of supplying the individual applicant with as many trees as has been possible in past seasons.

On June 16 I left Indian Head to commence inspection work at Pense on the main line of the Canadian Pacific railway. This is a point to which many trees have been sent for a number of years, and many of the plantations are in fine order; a good example of what many others will be in the future when the trees are as old. Some of them are from 15 to 18 feet high.

A little damage has been done to the green ash by rabbits, but this is the only place in my whole district where anything of this sort has been seen. From Pense I continued west, visiting the applicants along my route, until I reached Moosejaw. The country around here is very favourable for tree growing, as farm work usually begins about two weeks earlier in the spring than the district down the Soo line, where the ground is heavier. Owing to the long distances some of the applicants live from the railroad, I was not able to see all of them in the Moosejaw district. Many are from 60 to 80 miles south, with their nearest express office at Moosejaw. This, no doubt, will soon be changed when the extension of the Canadian Pacific railway from Weyburn to Lethbridge is pushed further west. This new line will open another vast, practically unknown, territory, which has hitherto been looked upon as fit for nothing but ranching, and which is now being taken up by the incoming settlers. These settlers are already thinking of a shelter for their buildings from the cold winds and the drifting snow, and many have already applied for trees though only newly settled on their farms.

From the district around Weyburn there has been a very large increase in the number of applicants this year. This is probably on account of the prosperous seasons the farmers have had the last few years, and there is no doubt also that the many successful plantations in the district have been instrumental in encouraging the neighbouring farmers to plant. Many of these belts are from 15 to 18 feet high, the ground being sheltered sufficiently to make cultivation no longer necessary, and from the station one can see quite a number of good plantations.

From Weyburn I continued my inspection along the Soo line until I reached North Portal, and here I found the trees had made a splendid growth this year. Care had been taken to plant the trees firmly in the ground, and cultivation had been increased owing to the wet spring and the increased number of weeds.

The district between Moosejaw and Swift Current is practically bare of trees and the applicants very widely scattered; but one can often see the results of good cultivation brought out very forcibly, for it is usually found that where cultivation has been continued through the summer, the weeds kept down and the soil stirred frequently, thus lessening evaporation, the trees have all made a very satisfactory growth.

The growth of the trees planted on the large 16-acre block in the Mennonite village south of Swift Current, has attained an average of over three feet this summer. These trees are going to be a great encouragement to tree planting, as it will demonstrate to the newer settlers the benefits derived from shelter, when planted in a large block.

I also visited the new French settlement, Notre Dame D'Auvergne. This part of the country is quite bare of trees, and one can look 20 miles or more without seeing any shrub or bush. Many of these settlers have applied for trees, though having only taken up land, and many of the places prepared were not in quite good enough condition for planting.

At Lethbridge, plantations are grown under two systems, namely, cultivation and irrigation. It has been found advisable for those following the irrigation method to turn off the flow of water the second week in July, thus allowing sufficient time for the ripening of the growth before the frost comes. The land is irrigated again the last thing in the fall so that it may freeze solid and help to check the trees from budding out too early in the spring.

The Mormon settlements south of Lethbridge, between Stirling and Cardston, have planted trees around their towns for a number of years, and many of these are from 15 to 18 feet high; behind them shelter many small plants such as gooseberries, raspberries, currants, and even apples have been grown successfully for a number of years. Irrigation is principally followed.

The district between Pincher Creek and Cowley had a very wet and late spring, followed by an early frost in the fall; and some of the trees are killed back quite a lot already. I found maple and cottonwood killing back the first year of planting. Willow, ash, Russian poplar and balm of Gilead, seem to suit well enough in this district where the climatic conditions vary so quickly. A mistake often made by planters is that they would like to plant only fast growing trees, such as Russian poplar, Dakota cottonwood and Russian willow. The advantage of having a good percentage of the more valuable but slower growing species is not yet fully appreciated.

The conditions which we have to contend with on the prairie require trees that are thoroughly hardy, and we are confined at the present time to about six varieties, namely: Maple, ash, cottonwood, willow, Russian poplar and elm.

The percentages of trees living set out this spring are: Maple, 85 per cent; willow, 90 per cent; cottonwood, 60 per cent, and ash, 95 per cent.

The plantations in my district are, on the whole, in a very satisfactory condition, and the efforts of the department to assist the farmers are meeting with good success;

but the demand is increasing every year, and many farmers are now preparing land for larger blocks to supply firewood, &c., and the demand for trees is sure to increase rapidly in the near future. I arrived back in Indian Head about the middle of October, and at once went into the office, making plans and following the general routine of office work.

Your obedient servant,

WALTER B. GUITON.

APPENDIX No. 17.

REPORT OF JAS. KAY.

INDIAN HEAD, SASKATCHEWAN, March 31, 1910.

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

SIR,—I beg to submit my second annual report on my work in connection with the inspection of plantations set out with the assistance and under the direction of the Tree Planting Division of the Forestry Branch. I was employed during the winter months in the Forestry office, Indian Head, making out lists, drawing plans, &c.

On May 7, packing and distribution of trees commenced, at which I assisted; this work finishing on May 21 in exactly one fortnight. I then assisted in transplanting small conifers and other general nursery work. In June I was sent, with Mr. Mitchell and several others, to Lake Qu'Appelle to gather elm seed, of which we were successful in securing a fairly large quantity. I started inspection work on June 15, finishing on November 6.

The district assigned me by Mr. Ross was much the same as last year in Manitoba, namely, the main line of the Canadian Pacific railway from Kirkella to Winnipeg; Glenboro to Sinclair, on the Souris branch of the Canadian Pacific railway; and Yorkton branch Canadian Pacific railway from Portage la Prairie to Jansen; the Miniota, Lenore, and Brookdale branches; the Canadian Northern railway line from Gladstone round by Swan river to Benito. After finishing this work, I was sent west to Saskatchewan, working the Prince Albert branch from Regina to Saskatoon.

Last year (1908) the number of applicants on my list in Manitoba numbered 450, and 92 new applicants received trees. The total applicants received trees to the number of 299,100. This year (1909) the number of applicants in Manitoba and Saskatchewan on my list totaled 854. Trees will be furnished to 510, of whom 338 receive trees for the first time, the total number of trees for distribution to this number being 410,600, giving an average of 803 trees per man. The original number of trees allotted, 527,425, had to be cut down to 410,600, a reduction of 116,825, for want of available stock to supply the demand.

The plantations have all made a vigorous growth this season, the only unsatisfactory feature being the 1908 maples, which were for the most part cut back to the ground, quite a few being killed outright with the frost. Those cut back to the ground came away vigorously from the roots. The seed from which these trees had been propagated had been obtained from North Dakota, and I should say this clearly demonstrated that seed should only be procured from trees acclimatized to our prairie conditions; and this has been proved in other ways. Several settlers from the United States brought tree seed with them, or had it sent along, but when sown the

results were unsatisfactory; for the most part the resultant seedlings were cut down each winter with frost owing to the young growth not ripening up before fall frosts set in.

All varieties sent out are doing well and giving entire satisfaction. The approximate percentage of trees living is about 87 per cent, which I consider very satisfactory, the lowest percentage being among the willow cuttings, the failure of many of the planters to grow these successfully being due to slack and careless planting. Much ignorance prevails as regards the growing of trees from cuttings, some having very hazy and crude ideas of either making or planting out the cuttings. With more careful and intelligent planting a much higher percentage would strike root. One man in the Saltcoats district planted 500 cuttings each year for two years, and of this number only about half a dozen failed to root. Another man in Manitoba put in 500 cottonwood cuttings, none of which took root at all; he had put them two or three inches in the ground, leaving the bulk of the cutting, entirely contrary to instructions, sticking out of the soil. Cuttings should be from 10 to 12 inches long, not less, and taken from two-year-old wood for preference. They should be put in the ground with a spade or dibble, and not forced into the soil. If so, it loosens the bark, hence the cutting will not strike. Only one bud should be left above the ground, as it is most essential to restrict evaporation from the cutting until the plant has an abundant supply of roots. They should be well tramped down when planted and made thoroughly firm. Care should also be taken to see that the bottom of the cutting is in close contact with the soil. To ensure this it is a good practice to go over them and press them down with the thumb gently a few days after planting. The cutting will yield easily if the end is not in contact with the soil.

A few planters, owing to the late spring, heeled in their trees till the press of seeding was over. The trees when eventually planted out made little or no growth during the season. The difference of growth in trees planted immediately, and trees heeled in for some time was very marked, and argues well for planting trees immediately on receiving them, as practically a year is lost by delaying the planting till the plants have burst their buds.

On the main line at various points small elm was eaten down to the level of the snow by rabbits, but they recovered and were growing vigorously when I saw them, but bushy, scrubby and disappointing as a future timber tree. Cottonwood and ash were also attacked, but suffered only slight injury.

The damage done by insect pests to plantations this season was slight, the ash and cottonwood being the only trees that were attacked, the former by a species of saw-fly, and the latter by vagabond gall. The injury, however, was not of such an extent or nature as to affect the health of the trees seriously or permanently. Fungoid diseases were found, but, like the insects' attacks, only in several widely scattered and isolated localities. These few instances arose, no doubt, through some local peculiarity of the soil or within the plants themselves.

The lower leaves of cottonwood were covered by a rust in the fall both in Manitoba and Saskatchewan, but the trees did not seem to suffer any ill effects from it, beyond a premature shedding of the leaves, which may have proved a blessing in disguise; inducing the trees to ripen up the new growth, which had been extremely large and good, much earlier than otherwise would have been the case, thereby lessening the danger from early frosts.

Some damage was caused by hail in some districts. Leaves were knocked off, stems and branches badly cut, tops and branches broken. In many cases cutting back close to the ground was the only remedy.

A question often asked by settlers is, 'Why cannot I get trees from the bush to grow?' In the first place, the plants taken are usually too large, and having long, straggling roots most of them are left in the soil. The trees after being planted out are often left unpruned (at least I have found it so); hence the tops all die, owing

to the inability of the reduced root system to cope with the transpiration from the large leaf surface. The top of the trees should be severely pruned and brought into due proportion with the root. The root system of young trees growing naturally in the bush differs from the roots of trees raised in a nursery, in that they generally have only a few long straggling roots, whereas nursery-grown stock are induced to form a compact, fibrous root system by transplanting once or twice. The absorbing surface of a root is generally of the current year's growth; the older parts of the root being only conductors of the moisture absorbed from the soil by the root hairs and younger part of the root. It will at once be apparent that if the whole root is not preserved, or at least as much of it as possible, the plant stands a poor chance of surviving. The same applies to conifers.

The young trees should be carefully raised, preserving as much of the root and earth as possible, at the same time covering them with burlap or wet moss, or both, to prevent the roots from drying out, as a few minutes' exposure to wind or sun will dry up and kill the younger parts of the roots, hence probably the tree itself.

Many settlers are entirely ignorant on the treatment and care of plants, e.g., one man I visited had received a consignment of fruit trees some time previously from a nursery firm. He had undone the packing and laid them carefully on the rafters of his barn. When he asked me to express my opinion of them, I told him he had made quite a good and expensive bundle of firewood. The trees cost him $36 and were entirely useless for planting.

Plantations have made an extraordinary growth this season, growths from 6 to 7 feet in the case of cottonwood, Russian poplar and willow, 4 to 6 feet with maples, 3 to 4 feet and over by ash and elm, being quite common, thereby showing that conditions were exceptionally favourable for plant growth.

The plantations I visited in western Saskatchewan compare favourably with those of equal age in Manitoba, there being practically no difference as regards rate of growth, appearance, &c.

One pleasing feature in western Saskatchewan is the large amount of land being made ready for trees by individual planters, in some cases over five acres; the aim being to have good, wide, substantial windbreaks with ample room for future development of buildings, yard room, garden, lawns, &c., in the shelter of the plantations. Quite a number of farmers setting out large plantations are procuring a little seed and raising some seedlings themselves. They are thus enabled, with the assistance of the Forestry Branch, to plant up a larger area each year. This is a feature of the work, in my opinion, that should be encouraged as much as possible.

Many planters who have large tracts of land prepared have come from the United States, and usually planted trees much farther apart than advised by the Forestry Branch. It is not an easy matter to convince them that 4 to 4 feet each way is the much better way for all concerned. They contend it is a waste of trees planting them 4 x 4 feet, and even when the reason for such close planting is explained they are barely convinced. By planting 4 x 4 feet, enough room is left to allow of horse-cultivation each way, and proper development of the roots for a long time. This stirring of the soil is necessary for keeping down weeds, and for retaining all the possible moisture in the soil. If care and cultivation of the trees have been thorough they will not require much attention after the third or fourth year. By that time they will effectually shade the soil, excluding sunlight, and to a certain extent air, thereby preventing the growth of weeds and the consequent loss of soil moisture by evaporation and undue transpiration from weeds. Horse cultivation is therefore no longer necessary, it is in fact impossible. Planting 4 feet x 4 feet also does away with the necessity for pruning. The trees soon crowd one another, sunlight and air are cut off from the lower branches, which eventually die and drop off, tending to leave clean, straight stems.

If the plantations are of equal width, say 20 to 30 yards wide, the trees afford each other mutual protection and shelter. The leaves and twigs which fall off are not blown away by the wind, but decay where they fall and form a protective mulch of mould and humus. This humus helps to obtain a more regular and equal distribution of moisture in the soil. The presence of humus adds very greatly to the water-holding capacity of the soils; by this addition of humus to light soils such moisture can be retained, and adds very much to their power of resisting drought. The humus acts in binding such soils together, rendering them more fertile.

When trees are planted, say 8 feet x 8 feet or 10 feet x 10 feet, it takes a decade or more to enable them to cover the soil and establish forest conditions. Besides, the trees have ample room for branching, which is an objectionable feature, hence the knife has to be used if clean and straight timber is required. Artificial pruning as a rule gives unsatisfactory results, few, if any, of those planting trees know how or when to begin, and when to stop when once started out with a knife or saw. With such wide planting cultivation has to be carried on for an indefinite period. The general run of individual has neither the time nor inclination to spend much time hoeing or cultivating. This can be obviated by closer planting.

Taking the plantations all over they are showing practical and very satisfactory results, this being due to the thorough preparation and cultivation of the soil insisted on by the department before and after planting. There are a few exceptions, but these may be ignored. The majority of planters take a pride and pleasure in working among their trees, and one and all of them speak highly of the good work being done by the government in this direction, and are fully alive, and take full advantage of the benefits to be derived from tree planting, and many regret leaving this work undone so long.

With favourable years and good crops, planting is likely to become an important work with farmers in western Saskatchewan. This part of the province is practically treeless. Most of the settlers have come from countries at least partially wooded, and they immediately feel the want and see the necessity for shelter round their homes, at once begin to prepare land for trees, and are quite enthusiastic about the work.

Your obedient servant,

JAMES KAY.

APPENDIX No. 18.

REPORT OF J. N. B. McDONALD.

INDIAN HEAD, SASKATCHEWAN, March 31, 1910.

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

SIR,—I have the honour to submit the following report of my second season's work as plantation inspector in connection with the Tree Planting division of the Forestry Branch.

After assisting with the office work in connection with the distribution of trees, and the gathering of elm seed at Qu'Appelle lakes, I left Indian Head for Alberta on June 14. The district assigned to me was the same as last year; the northern part of Alberta—the districts along the Canadian Northern line from Kitscoty to

Edmonton; the Calgary-Edmonton line with the Hardisty and Stettler branches; the Calgary-Macleod line to Granum, and the Canadian Pacific railway line from Cochrane to Walsh.

Last season (1908) the number to visit on my list was 568. Of these 281 received trees in 1909, averaging 1,162 trees per man, a total of 326,525 trees.

This season (1909) the number to visit was 826. Of these 374 received trees in 1910. The average number of trees per man shown by my books was 1,122, but this number had to be reduced to 852, owing to the scarcity of plants; total, 292,000 trees.

I found conditions very favourable in the northern districts, the ground in most cases being well prepared this season and the trees well looked after where already planted. Last winter was unusually hard on the younger maples, which killed back badly. The older places, however, did not suffer much, the shoots making shorter growths and ripening earlier. The character of the soil is responsible for a lot of killing back, rich black loam throwing a rank growth which is not sufficiently ripened before the first severe frosts, but where good cultivation is given in May and June the trees are good and escape with little damage compared with places where cultivation has been late or poorly done. The trees are doing well on the Hardisty and Stettler branches of the Canadian Pacific railway, especially on the lighter soils, the growth being good and ripening early.

Conditions are not so favourable from Didsbury to Calgary, west of range 24. The soil is very rich here and the elevation high. Caragana and Russian poplar are the only varieties I see giving satisfaction in this district, the others all killing back more or less. Trees looked well this season from Okotoks south to Staveley. A few of the places were neglected owing to the owners being absent or farms sold, but the success of others shows that trees will grow well here but seem to require more cultivation in May or June than the districts east and south. I have been advising all cultivation to stop about the middle of July there, to allow the young wood to ripen.

From Staveley to Granum the trees are doing well, cottonwood being the best tree and making remarkable growth.

Trees are doing well in the higher ground among the Porcupine hills west of Claresholm. There are quite a number of new applicants round Langdon, Strathmore and Gleichen on the irrigated lands of the Canadian Pacific railway. Most of them were not long enough on the farms to have ground ready for trees. At Langdon and Strathmore only four of eighteen new applicants get trees next spring. The other fourteen had all spring breaking, which is very rarely found to have been broken and backset at the proper time to allow the sod to be properly prepared for trees the following spring.

Trees are doing well in Gleichen district as far west as range 23; cottonwood averaging six feet in height in two years, with wood well ripened early in October.

Several people will apply irrigation in early summer on part of their plots as it has shown good results where tried, the growth being remarkable and so far the trees have stood the winter well. Among the Buffalo hills, in range 23, south of the Blackfoot reserve, willow cuttings planted in 1909 stand five to six feet high; maples growing a strong stem two and one-half feet high with a diameter at the ground of three-quarters of an inch, and leaves all shed on October 15. These trees were irrigated early in June.

The best trees in my district are round Medicine Hat, cottonwood growing on pure sand standing from six to nine feet with two years growth. Ash and elm suffer from jack rabbits in some of the outlying places, but cottonwood and maple are not molested.

The percentage of deaths is small among the newly planted trees; about five per cent where the trees have been well planted, but as high as fifteen per cent where the work has been done badly.

A good many of the older plantations are shading the ground and holding a leaf mulch where good cultivation has been given in the early years, but in no case have I seen trees supplied by the department, bought from nurserymen, or native trees making any progress unless good cultivation has been given until the trees were able to shade the ground and keep out, to some extent, the drying winds.

Your obedient servant,

J. N. B. McDONALD.

APPENDIX No. 19.

REPORT OF J. H. FERGUSON.

WEYBURN, SASKATCHEWAN, February 1, 1910.

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

SIR,—I have the honour to submit to you this my first report of the work done under your instructions as a tree planting inspector for the year 1909.

As per agreement I went to Indian Head on April 10 and assisted on the nursery until June 15, when, in company with Mr. A. Mitchell, I went to Saskatoon and began the inspection work. We found some very fine plantations in this locality, all in a good state of growth and plots well cultivated. Mr. Mitchell was with me a few days and then returned to Indian Head, and I started out on the Goose Lake-Calgary line, where I found some very good plots near Delisle, Tessier, Harris and Zealandia, but south and west of Zealandia the trees were not in as good condition. The land is very heavy in this locality and newly settled. The cottonwood trees did not look as well here as the other trees. A severe hail-storm went through township 28, range 12, west 3rd meridian, and stripped the leaves off the trees. This line of railroad occupied my time until July 24.

I next went to Rosthern, where there are three of the finest plantations that I saw.

From Rosthern I went to Prince Albert and out to Melfort, where the rich heavy soil seems to give gratifying results, but great care must be taken in this locality to see that the plots are in good cultivation before planting trees, as the soil seems to be the home of the blue-joint-grass, which is very injurious to the trees. This grass is easy to get rid of by deep and thorough cultivation, but almost impossible to eradicate from among trees, so much so that the inspector for the year 1908 advised smothering with straw in extreme cases. It proved successful where the work was done at the proper time and plenty of straw used.

I next went to Togo on August 9 and travelled west. There was very little work in this locality, it being a partially wooded country. Around Dana I found the plots well cultivated, and much interest seemed to be shown in the growth of shelter belts as the small poplar bluffs were often not in the right place to shelter the buildings. At Dana, Vonda, Aberdeen and intervening points there were many plantations, and with the exception of a few damaged by rabbits, these were in a fine condition. At Warman the trees did not look as well, the soil contains much alkali and the sun bakes it hard. It takes a good deal of cultivation to make tree planting a success in this locality. From Warman to Battleford is a nice country, dotted here and there with government trees, especially northeast of Borden. Through this part I was able

to inspect fifteen plantations a day. At Radisson, Rudel and Battleford are fine plantations. The Cut Knife district has very many thrifty plantations and many new applications. From Battleford to Lloydminster is partially wooded and there are not many plantations here. Again, the rabbits did some damage.

Taken as a whole, I am pleased to report the trees, with a very few exceptions, in excellent condition, and it is only a matter of time when this prairie province will be dotted with beautiful sheltered homes. As to varieties, the elm, the Russian poplar and Manitoba maple seem to do the best. The ash, because of its slow growth, does not meet with as much favour as it should. Although a slow grower it is a very valuable wood.

This spring, although late, was very favourable for tree planting and few trees died in transplanting. The people of my district fully appreciate the efforts made by the Government Tree Planting division in their behalf. A sheltered home and good crops will tend to make a contented people. Time will demonstrate the wisdom of planting these shelter belts, inside of which some small fruits can be raised for the owners' use.

Your obedient servant,

J. H. FERGUSON.

APPENDIX No. 20.

CANADIAN IRRIGATION SURVEYS.

REPORT OF JOHN STEWART, D.L.S., C.E.,

Commissioner and Chief Engineer of Irrigation, for the fiscal year 1909-10.

On May 1, 1909, I sent out two engineering parties into the field for the purpose of making inspections and surveys of all irrigation schemes in the two provinces, one in charge of Mr. R. J. Burley in Saskatchewan and eastern portion of Alberta, and the other in charge of Mr. J. S. Tempest in Alberta. Each of those engineers had instructions to make inspections of all ditches, whether licensed or in course of construction; also to make surveys of all lands applied for under the irrigation system to prove whether the scheme was a feasible one or not, and to gauge all streams in connection with such applications to find if the water supply was sufficient for the purpose or not. Under those instructions Mr. Burley made 162 inspections of schemes authorized and not completed, 38 inspections of licensed schemes, 35 surveys of lands applied for under the irrigation system, 16 transit surveys of creeks and ditches, and made 89 gaugings of streams in his territory, and sent in to this office 194 reports. As Mr. Burley had a very large territory to go over, I gave him one assistant who was capable of making surveys and gaugings of streams as well as inspecting irrigation works, and to this assistant Mr. Burley assigned the western portion of his territory, and the arrangements proved very satisfactory in getting through with the large amount of work in that section. Outside of the traverse surveys, Mr. Burley measured up 17 completed schemes for quantity of earth removed and work done on dams, flumes, headgates, &c., and made an estimate of the cost in each case.

The second party, in charge of Mr. J. S. Tempest in Alberta, made 24 inspections of schemes authorized and not completed, 94 inspections of licensed schemes, 10 surveys of land applied for under the irrigation system, 11 transit surveys of creeks and ditches, and made 59 gaugings of streams, and sent in to this office 156 reports, and measured up 12 completed schemes for quantity of earth removed and work done on dams, headgates, &c. Besides this regular work, Mr. Tempest made a traverse survey of the Waterhen lakes to show the area of land submerged by these lakes, in all about 38 miles of work.

Owing to a large amount of scattered work in both provinces that could not be got at by either of the regular inspection parties, I had to employ J. MacKinnon, C.E., to do this work. Mr. MacKinnon made 14 inspections of irrigation schemes, 18 inspections for industrial purposes, and four inspections of illegal dams and drains constructed, as well as a traverse survey of Spotted lake to show the lands submerged and that will be drained by the provincial government.

During the summer I personally inspected the Weyburn water supply from Shallow lake, the Moosejaw water supply from Snowdy's springs, the Pincher Creek dispute over straightening the course of the creek through the town, the Waterhen Lakes drainage scheme, the Maple Creek water supply from Saunders springs, Shoemaker & Burrus' protest at Spring coulée against the Alberta Railway and Irrigation Company, the Gravity water supply at Calgary, the Coleman water supply and the sulphur springs at Frank, the irrigation scheme of Dan. Drinnan at McKay creek. I also inspected the canals and ditches of the Alberta Railway and Irrigation Company. I made a resurvey of Andrew and J. R. Gordon's irrigation scheme on the

Red Deer river, a survey of W. J. Helmer's scheme on Dead Fish creek and Park & Forster's scheme on Berry creek, and an inspection of the Berry Creek Ranching Company's scheme on Berry creek. I also examined the vouchers of the Southern Alberta Land Company as to expenditure in connection with their irrigation scheme and the purchase of land.

With reference to the inside work of this office during the past year there have been the following number of communications received and sent out, viz:—

Letters received	5,254
Letters sent out	6,545
Agreements for water, in quadruplicate	896
Applications for water rights, in duplicate	68
Plans with applications, in duplicate	68
Applications to drain roads, &c	4
Right-of-way easements, in triplicate	71
Transfers of application for water	11
Right-of-way plans recorded, in quadruplicate	36
Notice of cancellation of water agreements	37
Notice of transfers of water agreements	64
Applications to cross road allowances, &c	38
Applications for right-of-way over Crown lands	23
Notices prepared for publication	51
Plans prepared for applicants	14
Number of certificates under section 20	58
Number of certificates under section 33	53
Number of licenses recorded, in triplicate	61
Number of reports received from R. J. Burley	194
Number of reports received from J. S. Tempest	156
Number of reports received from J. MacKinnon	36

In connection with right-of-way plans which are now in quadruplicate, they all have to be compared and checked over before being recorded, which means a lot of work in itself and does not show in simply quoting the number of plans received, and blue prints of all such plans have now to be made for the Provincial government. There are also a number of enclosures in letters sent out of which no account is kept and does not show as work performed. In the two provinces there are now some 364 irrigation schemes without taking into account the large projects. Of the above number 210 are in Alberta, with an irrigable area of 66,700 acres, and 154 in Saskatchewan, with an irrigable area of 50,263 acres. The large projects consist of the Canadian Pacific Railway Company's irrigation scheme, the Alberta Railway and Irrigation Company's scheme, and the Southern Alberta Land Company's irrigation scheme. The Canadiaan Pacific Railway Company now have 1,300 miles of canal and ditches built in the western section of their tract and 300 miles to be built in 1910. The acreage covered by the 1,300 miles built is 250,000 acres, and when completed 350,000 acres.

The Alberta Railway and Irrigation Company have 238 miles of canal and ditches built and 70,000 acres under irrigation last year. The Southern Alberta Land Company commenced work last summer and now have 47 miles of main canal about completed. also the dam in Bow river and the two dams in Snake valley to form the reservoir called Lake McGregor.

APPENDIX No. 21.

REPORT OF RALPH J. BURLEY,

Inspecting Engineer.

CALGARY, ALBERTA, March 31, 1910.

JOHN STEWART, Esq.,
Commissioner of Irrigation,
Calgary, Alberta.

SIR,—I beg to submit the following report upon the progress of irrigation development in the Cypress Hills district during the season of 1909.

The work of inspection was carried out along somewhat different lines from the plan followed in previous years, as my assistant, Mr. Fletcher, had become sufficiently familiar with the work of inspection during the previous season to take charge of work in the western part of the district and in June the party split up, Mr. Fletcher taking two men and a light camping outfit and moving westward with instructions to make all inspections and to establish gauging stations on the more important streams, while I moved eastward to the Maple Creek and Gull Lake districts, making all inspections on the north side of the Hills for which I had instructions at that time. Mr. Fletcher and his party rejoined me on August 2, having completed all the work for which he had instructions, and the whole party worked from one camp from that date, making several transit traverses and locations of ditches for various applicants and inspecting all the schemes on the list at the time we were passing through the different districts. This method of working the district was found to be more satisfactory than that followed in former years, but, owing to the large size of the district, the rapid increase in the number of schemes and the greater amount of traverse and level work being done, it was found impracticable to return over the ground previously covered in order to make many inspections and surveys, of which I was advised late in the season. To catch up to the work in this district I would suggest that Mr. F. T. Fletcher be given charge of the work in that part west of, say, range 26 and 27, west 3rd meridian, and that I should take charge of the work in the eastern part with a party similar to that under my management last season. By this means each party will have more time to extend the work and to make more traverses and locations of schemes, so that the applicants may be better advised as to the best scheme to construct and as to the best method of conserving and applying the available water supply to the land. It would also be possible to make a start on the work as outlined in the following pages, until such time as the appropriation could be increased sufficiently to admit of this work being carried on properly.

By having a smaller district it would be possible for each inspector to go back over the territory already covered and to make such inspections and surveys as would be necessary, for which instructions had been received after the party had passed that particular location. By this means it would be possible to keep each season's work up to date, so that at the end of each year the department and this office would have full and detailed information at hand regarding each scheme proposed, authorized, or completed.

In connection with the instructions to be issued to the inspecting engineers, I would suggest that a form be printed similar to that attached to this report and that instructions be issued on each scheme on some such form. This would have the following advantages over the present system, viz:—

1. It would give all the necessary information to the inspector regarding each scheme.

2. It would give concise instructions as to what work was required to be done by the inspector, and what information was needed by this office regarding each scheme.

3. Such instructions would be in such shape as to be easily carried about by the inspector and could be filed in small compass in such a way as to be quickly and easily consulted when required.

4. A copy could be kept on file and at any time when further information was required another form could be quickly filled out and forwarded, and when the inspector's report was received it could be compared with the instructions issued.

5. The information contained in such instructions would often greatly facilitate proper completion of applications, as the inspector could advise the applicants of the necessary steps to be taken in connection with right-of-way, filling up and filing of the different forms, and he could in many cases be of assistance in hastening the acquirement of the necessary easements, &c.

HYDROGRAPHIC WORK.

In carrying out the hydrographic work during the past season an effort was made to avoid duplicating work done by the hydrographic surveys and to obtain some records on small creeks and coulées untouched by them. In the irrigation work in this district information is urgently needed respecting the smaller creeks, tributaries and coulées, as it is in these cases where doubt arises as to the feasibility of any scheme as regards water supply. This can only be well done by means of a system of careful observations on rainfall, percentage of run-off, definition of drainage areas, character of stream bed, and soil and sub-soil of basin, seepage and evaporation, and peculiarities of flow, in the case of each stream and tributaries, but in the meantime, until such information can be obtained, it was considered that miscellaneous gaugings as often as possible during the summer would be of value as giving some idea of the flow during different periods of the irrigation season.

During the past season gauging stations were established on the following streams, viz:—

BATTLE CREEK.

This station was established on June 3, 1909. It is located on the steel traffic bridge on the surveyed trail, about one-eighth mile south of Tenmile police detachment and two and one-half miles from Battle Creek post office.

The channel is straight for about 500 feet above and 300 feet below the bridge. The right bank is high, clean, and not liable to overflow at the station, while the left bank is grown up with willow scrub. There is only one channel, excepting at very high stages when the water overflows above the station into Middle creek.

The bed of the stream is sandy and clean, and at high stages the water would be 10 feet deep. The velocity is slow at low water and medium at high. Discharge measurements at low water, made at wading section 200 yards below the bridge and at high water from the bridge.

A standard gauge chain is attached to the down-stream side of the bridge, length of chain 18·85 feet. The bench mark is top of pier on the left side of the creek and is marked with white paint, elevation 13·79 feet, and another on the top of the iron survey pin on the left bank, elevation 13·46 feet. Elevations refer to the datum of the gauge.

LODGE CREEK.

This station was established July 22, 1909. It is situated about one-half mile below the junction of the east and west branches, 54 feet from the north side of the road allowance between sections 15 and 10, township 6, range 3, west 4th meridian, and is about 45 miles south of Medicine Hat.

The channel is straight for about 60 feet above and 250 feet below the station, and the banks are high and not liable to overflow, but are covered with a growth of willow brush which was practically cleared for some 50 feet below cross section.

The bed of the channel is of clay, and all vegetation was cleared near cross section. There is one channel at all stages and the water will be some 12 feet deep at flood.

Cross section is not suited to high-water measurements until a cable is put in place, on account of depth.

The gauge height consists of a rod 2 inches x 2 inches x 10 feet, spiked to a post, which is well braced and sunk into the bed of the creek some four feet. The bench marks consist of a round stake with square top, and 5-inch spike driven in centre, projecting above the ground 6 inches, elevation 13·71, and a row of 5-inch spikes 6 inches above ground on a gatepost near J. E. Hartt's house. Bench mark elevation, 14·13 feet. Elevations refer to datum of gauge.

BULLSHEAD CREEK.

This station was established on July 26, 1909. It is located on the traffic bridge on southwest ¼ of section 16, township 12, range 5, west 4th meridian. about four miles from Medicine Hat and three and one-half miles from Coleridge, and is one mile above the junction of Bullshead and Ross creeks.

The channel is straight for about 200 feet above and 450 feet below the station and the banks are high, clean and not liable to overflow. The bed is very sandy, clean and liable to shift somewhat. At very low water there are several channels, but at highwater only one and, on account of the width, the water will seldom be over three to four feet deep and flows with medium velocity.

The gauge height consists of a rod 2 inches x 2 inches x 10 feet spiked on the down-stream side of the first row of piles from the right abutment. The bench marks are (1) a spike driven on top of centre row of piles, elevation 7·39; and (2) the top of a wooden plug driven flush with the ground in mound on right bank; elevation, 6·34. Elevations refer to datum of gauge.

MCKAY CREEK.

This station was established on July 29, 1909, and is located on the traffic bridge one-half mile south of the Canadian Pacific railway track at Walsh, on the track from Walsh to Irvine. This bridge is on the northwest ¼ of section 26, township 11, range 1, west 4th meridian.

The channel is straight for about 225 feet above and 500 feet below the station, and the current is sluggish. Both banks are clean but liable to overflow during very high water. The bed is clean, composed of clay and not liable to shift, and the stream flows in one channel except at extremely high stages.

The gauge height is a rod 2 inches x 2 inches x 10 feet nailed to an upright timber on the up-stream side of the bridge near the right abutment. Measurements will be made from the floor of the bridge during high water, and at a wading station below at low stages.

ROSS CREEK.

This station was established July 28, 1909, and is located on the traffic bridge in the townsite of Irvine, 430 yards south of the Canadian Pacific Railway main line, and some 600 yards below the Canadian Pacific Railway reservoir dam at Irvine.

The channel has a slight curve 75 feet above the cross section, but is comparatively straight for 600 feet above and 50 feet below. The banks are of clay, high, clean, steep and not liable to overflow. The bed is composed of gravel and sand and is not liable to shift. The water flows in one channel at all stages.

The gauge consists of a 2-inch x 2-inch x 10-foot rod located on the down stream side of the first row of piles from the left abutment. Measurements were made by wading at low water and from the bridge in high water.

The bench marks are (1) top of first row of piles from left abutment, elevation 15·52 feet; and (2) top of south rail of Canadian Pacific railway north of station, elevation 23·11. Elevations refer to datum of gauge.

A list of the gaugings made during the past season is attached to this report.

In carrying out this work in the future it would appear advisable, in addition to the actual meterings, to obtain as much information regarding slopes and high-water discharges as can be obtained in the time available for such work. Levels so obtained could be referred to some permanent bench mark, such as a post in the nearest section mound, and these could be used to advantage at a later date in connection with contour reconnaissance surveys should such be established. In the meantime much valuable information would be obtained which could be tabulated and filed for reference, so that by carrying on such work from year to year on different portions of the creeks we would gradually obtain information which would enable us to contour the creek valleys at least, and such lines and references could be used to great advantage by contouring and mapping parties. In addition we would be in possession of much valuable information regarding the amount of water flowing in the smaller creeks during flood periods.

CONTOUR SURVEYS.

The question of a careful and accurate topographical survey of the western provinces, and more especially that part of them comprising the semi-arid or irrigation belt, is one which should be given attention in the near future, as each year the settlement of these lands makes the acquirement of such information more difficult and more expensive. To do this work at the least cost it would appear that some such system of contour surveys as that inaugurated by Mr. J. S. Dennis, would be the most satisfactory and, as outline levels have already been run over a large part of the southern portion of this district including the Cypress Hills, the work of contouring could easily be extended from these lines.

Such a system would put the department in possession of accurate information respecting drainage areas, which is very necessary in the computation of run-off, and without which any system of hydrographic work is of doubtful value and accuracy as regards its application to general conditions and to the estimation of the probable amount of flow annually in a particular watercourse when such information is required in connection with inspections as to feasibility. Not only must the computations on the measured streams be more or less inaccurate but the drainage area of the watercourse under consideration must of necessity be inaccurate, as many of them are not shown on the subdivision maps and it is necessary for the inspector to estimate the area in each case. In considering the feasibility of any proposed scheme the department should be in possession of accurate information regarding the average amount of run-off per square mile during the irrigation season, the possibilities of storing water during the dry season, and the extent of the drainage area feeding the source of supply under consideration. This can only be determined by a careful topographical and hydrographical survey showing the conditions in different parts of the country.

In connection with irrigation work such a survey would show possibilities of expansion which are to-day not considered owing to lack of information. It would apply particularly to reservoir sites, showing the best locations and, in each case, not only the capacity of the site and the possibilities of storing, but also the total area which is, or could be made, tributary to it, both as regards supply and the amount of land which could be served by such reservoir. It would also show the

nature of the area in each case as regards slope, soil and subsoil, and amount of timber, all of which factors enter largely into the determination of the advisability of establishing reservoir sites. A mere traverse of any site, unless such matters are taken into consideration, is of small value.

In addition to the points outlined above, a contour map would demonstrate possibilities of development along many different lines as, for example, in railroad work. It would show the nature of the country to be traversed, the difficulties to be encountered, and would be of great assistance in locating the best line, both from the viewpoint of economy, easy grades and curves, and length of track. In conjunction with the hydrographic work it would furnish most of the essential information regarding the possibilities of power development throughout the country, showing the best locations and the amount of power which could be developed.

ESTABLISHMENT OF GAUGE HEIGHTS.

Under subsection (n) of section 54 of the Irrigation Act, the minister has the power to establish gauges for the determination of the three stages of stream flow, known as low, high and flood water, and, as all our licenses under the present system are granted at one or another of these stages, it would appear very important that they be determined and defined at or near the intake of each ditch at as early a date as possible. Owing to the varying conditions of flow found in most of the creeks in the Cypress hills, one gauge rod on a creek will give little or no idea of the flow at a point on the creek above or below it, and the only feasible scheme appears to be establishment and marking of small rods near the intake of each ditch. By this means each applicant will be in a position to know at what time it is permissible for him to use water, and by means of frequent measurements of the ditch and stream the department would, in a few years, be in possession of valuable information regarding the capacity and rate of flow in the ditch, and could by this means get a rough idea as to the amount of water used per unit area of land during the irrigation season. From year to year the work could be extended and rods placed in the ditches as well as in the creeks, until eventually it could be ascertained exactly how much water was necessary in any district for the successful irrigation of the land and at what periods its application produced the best results.

After a few years of such observations the extent to which any headgate should be opened, could be determined and each applicant instructed on this point. The information otherwise gained would be of great interest to the irrigators themselves, and the publication of results obtained by applying water in different ways and at different times would no doubt be found very useful, both to those who were practising irrigation and to those who were contemplating the installation of schemes.

Although such work would present many difficulties and would necessitate a careful study of conditions in each case, it would not only be the source of useful information but it will only be a matter of time until the whole available water supply will be conserved and used, when such work will become imperative if the department is to be in a position to settle disputes arising between applicants.

LICENSES.

The question of granting water rights at high and flood water is one which should have serious attention in the near future and, unless some different basis from that used at present is decided upon, there is very little value to be attached to such a license in the Cypress Hills district, where the run-off or period of high water usually extends over one month or less. The present duty of water, viz.: one second foot for one hundred and fifty acres, gives, during the irrigation season, slightly over two feet in depth on the land to be irrigated, while, even if the flood lasted a month,

which would be unusual, the licensee at highwater would only be entitled to one-fifth of this amount. A possible solution of this difficulty would be the granting of water rights on the basis of acre feet and, while a careful study and a series of experiments on this question may develop some better method, it would appear that this solution has much to commend it, both in the case of high and low water licenses. It is found better in practical irrigation, to use comparatively large volumes of water and so cover the ground in the shortest possible period, whereas the present system of using a smaller volume of water continuously has many defects, more especially where the water is cold. The application of cold water chills the ground and stops the growth for varying periods depending upon the weather conditions, so that when water is used continuously it will be seen that this effect must be of considerable importance, while on the other hand, when a large volume of water is thrown over the land within a short space of time this effect will be much shorter in duration and the growth will not be retarded to such an extent as in the former case. A further argument against the present system lies in the fact that while irrigation is being carried on it needs continuous and careful attention to prevent the water breaking away and running over land where it is not wanted, which would in many cases cause great damage to both land and crops.

By granting water rights on the basis of acre feet, the applicant would be entitled to use a certain volume of water as and when he pleased, and would be in a position to apply it in whatever way he should find, by experiment, to produce the best results in his particular case. It is probable that this method would be found to encourage the storage of water because, when the applicants realized the value of the water, they would make all possible arrangements to conserve it and to use it in the manner best adapted for their lands, so that by this means even low water licensees would be encouraged to store water at high stages and the low water flow would not be interfered with to such an extent as under the present system.

With respect to the granting of low water licenses on creeks that go dry during certain parts of the irrigation season this appears to be a mistake, for, although section 11 of the Act is intended to cover such cases, it does not appear to work automatically but leaves each case to be decided by the department. To properly protect riparian owners it would appear that some change should be made which would be retroactive, because in many instances the low water in a stream has been over-recorded owing to lack of hydrographical information, as, for example, on Hay creek, and to adjust such cases a clause should be added whereby no person shall, in any case, divert water from a stream when such diversion shall deprive any riparian owner of the water for domestic purposes.

Respecting the diversion of water from one watershed to another, this would appear to be a matter for settlement by the department, each case being decided as to whether it would be in the best interests of the community or not.

EXTENSION OF WORK.

In addition to the extension outlined above it would appear to be advisable to have a small reconnaissance party in the field to obtain some information regarding the flow of the streams, the nature of the land as regards its adaptability to irrigation, and the probability of irrigation expansion in the eastern part of the Frenchman watershed and in the Wood Mountain district. The construction of the new railway from Weyburn to Lethbridge and consequent settlement of this land will soon, no doubt, be an accomplished fact, and unless steps are taken within the next year or two to obtain such information it may be found that a similar condition will prevail respecting this district as occurred in the Cypress hills, that is, a large increase in the number of applications for water rights and for land under the irrigation system, with no information on file upon which to base decisions.

Another question which will require attention is the establishment of stations for the observation of precipitation, seepage, evaporation, and duty of water, in different parts of the semi-arid belt. All these factors enter largely into the determination of the proper use of water for irrigation and, as conditions vary a great deal in this belt, it would seem important that additional stations be established so that this department may be in possession of this information as soon as possible. It may, and probably will, be found that the present duty of water is too low for some districts, owing to greater rainfall, less evaporation or less seepage, or to the fact that the level of the ground water has risen owing to the continued irrigation of the land. Such stations might be established to advantage at or near Medicine Hat and Lethbridge, and on the north and south sides of the Cypress hills near both the eastern and western ends, as well as in the Canadian Pacific Railway tract.

PROGRESS OF DITCH CONSTRUCTION.

During the past year much better progress was made toward the completion of the majority of schemes in this district than has been the case in previous years, owing probably to several causes, the most important of which was the drought during the summer of 1908. The season just past was also much more favourable to this class of work, and the applicants themselves are taking a greater interest in irrigation as the country becomes settled. As the majority of schemes at present are owned by ranchers whose hay supply is being cut off by the rapid settlement at present in progress on both sides of the hills, the necessity for producing fodder crops on their own lands, if they are to remain in the ranching business, is becoming apparent to all and hence the greater activity displayed.

There has also been an increasing number of applications to purchase, under the irrigation system, and there appears to be a greater tendency to acquire land for speculative purposes, but as such schemes are usually constructed more for the purpose of gaining title to the lands than from any desire to improve it by means of irrigation, it would appear that these applications should be discouraged, and when it is considered that any scheme is not intended to be used after patent is issued, the applicants should be required to construct works up to the highest standard if they have received authorization.

In continuation of the work of obtaining accurate information regarding the larger schemes, some twelve ditches and reservoirs were traversed with the transit and a number of both main ditches and laterals were located for various applicants. The whole system of ditches below the reservoirs on the Moorhead & Fearon scheme was relocated. Two more seasons should see this work practically completed for the larger schemes, and in the case of smaller ones there will be but little difficulty in getting locations sufficiently accurate with the compass.

*Attached hereto is a schedule showing the inspections, gaugings, traverses, surveys, &c., made during the past season.

All of which is respectfully submitted.

Your obedient servant,

RALPH J. BURLEY.

*Not printed.

APPENDIX No. 22.

REPORT OF J. S. TEMPEST,

Inspecting Engineer.

CALGARY, ALBERTA, March 31, 1910.

JOHN STEWART, Esq.,
Commissioner of Irrigation,
Calgary, Alta.

SIR,—I have the honour to submit the following report of my inspections, surveys and hydrographic observations made during the year 1909-10.

I started out on my tour of inspection on May 12, 1909, with the following instructions:—

1. To inspect and report on all licensed schemes in the western and southern parts of southern Alberta, whether for irrigation, domestic or industrial purposes.

2. To inspect and estimate cost of all authorized schemes, newly completed or not completed.

3. To inspect and report on the feasibility of schemes applied for, as instructed from time to time.

4. To make observations of flow of streams encountered on my trip, when convenient.

I took as small an outfit as possible for myself and two men so as to travel light and yet be independent of ranchers and farmers for board and sleeping accommodation. To convey the outfit and field instruments I had two government teams and two democrats. Owing to the rough nature of the country, the difficulty of taking a democrat to some of the schemes and to expedite the work by saving myself much walking, I bought a saddle horse which I used nearly all summer. This I found especially useful on moving days when I could visit schemes situated at some distance from the main road, while the loaded democrats could take the shortest route to the next camping place.

When special surveys were to be made, and especially when there was much cutting to be done, I employed additional help. It would be more economical if another man were added to the regular party.

The plan of carrying a camping and cooking outfit worked well and I believe was more economical, convenient and practicable than boarding with farmers and ranchers as has been suggested. The latter plan I know from experience would be attended with much inconvenience and unpleasantness both to inspector and host, even when there is a ranch or farm house within convenient distance of the work.

SUMMARY OF YEAR'S WORK.

Inspections.—I inspected 94 licensed irrigation schemes, 24 authorized schemes, 10 schemes for domestic and industrial purposes and 14 new schemes.

Surveys.—Besides the surveys for new schemes mentioned above I made a survey of the Waterhen lakes near Kinistino in Saskatchewan, the length of the traverse being 38 miles, also 10 surveys of land applied for and 11 surveys of creeks and ditches.

During the year I made 53 gaugings of streams, using Price's meter No. 522, and six gaugings by weir measurement. The results of these observations, I understand, were forwarded to the Hydrographic department from time to time.

Office work—

Sept. 30-Oct. 5.—Draughting Spotted lake and other schemes.

Nov. 1-Nov. 22.—Draughting Waterhen lakes and other schemes.

Dec. 1-Dec. 11.—Draughting additions to large office map and other schemes.

Dec. 21-Jan. 21, 1910.—Draughting additions to large office map and other schemes.

Feb. 1-Mar. 16.—Draughting, preparing report and collecting information for next year's work.

GENERAL REPORT OF LICENSED IRRIGATION SCHEMES.

Of the 94 licensed irrigation schemes inspected only 14 were in use. The remaining 80 schemes were in a more or less neglected state and not in use. Most of them had not been used for several years.

The reason given for non-use, as a rule, was that there had been sufficient rainfall in recent years to ensure fairly good hay crops. On examining the rainfall reports from 1885 to 1909, I do not find so substantial an increase in precipitation in recent years as to obviate or lessen the necessity of irrigation for producing good crops. The large crops now produced every year from the lands still under irrigation, compared with the small crops taken off only in alternate years from the unirrigated lands, prove the immense value and profitable investment of irrigation. I do not consider that any slight increase there may have been in the rainfall had anything to do with this general non-use of water rights. In fact there is very little evidence of many of the schemes ever having been used at all.

From what I can gather it appears that in the 90's a general desire to irrigate was kindled by the enthusiasm and energy of certain government officials. Irrigation works were put in and land taken up under the Irrigation Act by men fully convinced of the value of irrigation and anxious to produce larger crops for their increasing herds. Engineers made plans and laid out dams and ditches and these were constructed after the most approved methods. The owners of the works, however, as a rule had no experience of irrigation and were quite ignorant of the manner of carrying out the necessary details of bringing the whole irrigable area under water by laterals, furrows and the different methods of flooding, and of caring for and making full use of their constructed works. As fair crops could be had without any trouble and as wide ranges of pasture were still open, their irrigation works were allowed to fall into decay.

Some of the applicants for land under the irrigation system were typical ranchers and were actuated in some cases purely by a desire to produce more winter feed and in other cases by a very natural desire to prevent new settlers from taking up the choicest parts of the ranges. These ranchers, unaccustomed and disinclined to undertake any operations having a semblance to farming, were not likely to take kindly to the tedious work and patient attention required every season in the renovation of dams and repairs to ditches. After a few spasmodic attempts to put things right once and for all, many gave the matter up, apparently disheartened and disgusted. Some there were who took up more irrigation land than they could successfully handle and could neither give the necessary attention personally nor afford to pay for hired help.

Many cases, perhaps the majority of cases of non-use, would not have occurred if the owner had had experience or knowledge how to irrigate or the advantage of experienced neighbours.

In those countries where irrigation has been practised for years, new and improved methods are continually being discovered and the science of irrigation has probably advanced as much in recent years as the science of agriculture generally, but here in the foothills these people, with every advantage of suitable lands and a

plentiful supply of water, after being incited to undertake the irrigation of their lands, have been left to work out the problem alone. Of these 94 schemes only 44 have been officially visited since 1904 and 24 schemes have apparently never been visited since they were licensed, no doubt on account of the small staff and pressure of other work.

If schemes were visited regularly, not only with a view to ascertaining whether the works were in order but to advise as to the particular methods most suitable for bringing under water the irrigable areas of individual schemes, to discuss the best methods of treating different crops and generally to encourage and stimulate a desire amongst holders to bring irrigation to a higher standard, I have no doubt a great change for the good would soon be brought about in this foothill country.

I venture to make the following suggestions which, if put into effect, I think would contribute much towards putting new life into this district:—

1. To establish on some of the still vacant Dominion lands one or more demonstration farms, where the different methods of irrigating should be practised on different kinds of crops and where strict records of operations and results should be kept. After the initial cost of farm implements, buildings and construction of irrigation works the farm should be at least self-supporting.

2. To publish in pamphlet form a full and detailed description of the different processes of irrigation, of the construction and maintenance of works and any other matters calculated to encourage and enlighten farmers on the subject. An effort in this direction was made by Mr. J. S. Dennis in 'Information and Statistics Relating to Irrigation,' Part III of the General Report on Irrigation, 1894.

3. Not to grant patent to the land applied for under the irrigation system until the irrigable area is actually being efficiently irrigated. At present an applicant acquires water license and patent to the land as soon as works and main ditches have been completed and approved by the inspecting officer, although the irrigable area may still be covered with brush or consist partly of undrained swamp.

HYDROGRAPHIC WORK.

As above stated, during the year I made 53 gaugings of streams with Price's meter, No. 522, and six weir measurements, the results of which observations, I understand, were forwarded from time to time to the Hydrographic office.

Although in a tract of country 150 miles long by 20 miles and upwards in width, where there are only 14 small irrigation schemes being used and few water licenses for domestic and industrial purposes, there is not much fear of any user not getting all the water he needs and such a thing as the possibility of a dispute is out of the question for years to come, still the experience of older countries shows the wisdom of getting extensive and accurate records of the flow of streams, run-off, &c., over as extended a period as possible. Quite as important as this hydrographic work, which is receiving great attention now, is the topographical work, which has been dropped during recent years. In 1902 and 1903, while engaged in engineering work in Southern California, a country that has been developed marvellously in recent years and where irrigation has been brought to a state of great perfection, I saw much of the advantages of the excellent topographical contour maps prepared by the United States government and sold to the public. These maps were largely used by engineers and others connected with new electric roads and irrigation and municipal water supply schemes and contributed largely in encouraging new enterprises and in the development of the country. Without these, hydrographic observations are incomplete and insufficient. By more clearly defining the drainage areas, their slopes and the fall of streams, a more accurate knowledge of the nature, characteristics and causes affecting the flow of streams and run-off are ascertained, while many schemes too large for individual effort and bringing larger areas under irrigation, as well as

suitable reservoir sites, power sites and railway schemes are suggested and become apparent on inspection of such contour maps.

CROPS UNDER IRRIGATION.

In western southern Alberta, the foothill country, irrigation is used only for hay crops, alfalfa, timothy, bromus and wild grass. This is strictly a ranching country, but recently settlers have crowded in further and further until the ranges have become so limited that ranchers find they can no longer let their cattle and horses rustle through the winter without feeding them hay, and the large quantity of winter feed it is necessary to produce is becoming a very burning question with many of them. Some are trying to increase their holdings, and others finding this impossible are now seriously considering means of increasing the productiveness of the land. One rancher with some experience of irrigation says that under irrigation he can raise good hay crops every year, while the same lands not under water produced only very indifferent crops in alternate years. In a very short time intensive methods of farming will have to be adopted or progress will be at an end and the output of cattle and horses be at a standstill from this important section of ranching country.

Practical irrigation is almost dead, and yet is the only means of increasing the winter feed now necessary for any increase of stock and further development of the ranching industry.

Actual irrigation schemes are so rare that I was unable to gather much information as to the results and advantages of the practice in this portion of Alberta. I found that one of the best paying crops under irrigation was alfalfa. Two large crops were taken off in several places, while a third crop in one case was eaten off by cattle and hogs. I was told of failures, but these were the results of improper treatment and were not attributable to climate or soil. Almost invariably, when alfalfa is first sowed, weeds spring up and grow rapidly. These, if allowed to stand, would soon choke and destroy much of the young alfalfa. When the weeds are a little higher than the alfalfa the mower should be run over, and by cutting the weeds give the alfalfa a good chance and ensure a good, healthy, first year's growth. It is also a good plan to well flood the land late in the fall. A thick crust of ice is formed which holds back the alfalfa in the following spring, until the settled genial weather comes, otherwise the quick-growing plant, responding to the earliest warm days, buds out, only to be nipped and often seriously damaged by the inevitable cold snaps that occur early in the year.

On July 27 I visited the ranch of Mr. Geo. Lane, near Willow Creek. He had about 30 or 35 acres in alfalfa under irrigation. One crop had already been taken off and made into hay. A second crop was about a foot or a foot and a half high. This second crop I afterwards learned was cut before the end of summer and a third crop fed to hogs and cattle.

On August 4 I inspected the works of the Glengarry Ranch Company. Here I found a heavy crop of timothy grown under irrigation, while part of the same field, with similar aspect and soil, but not under irrigation, was very inferior in quantity and weight.

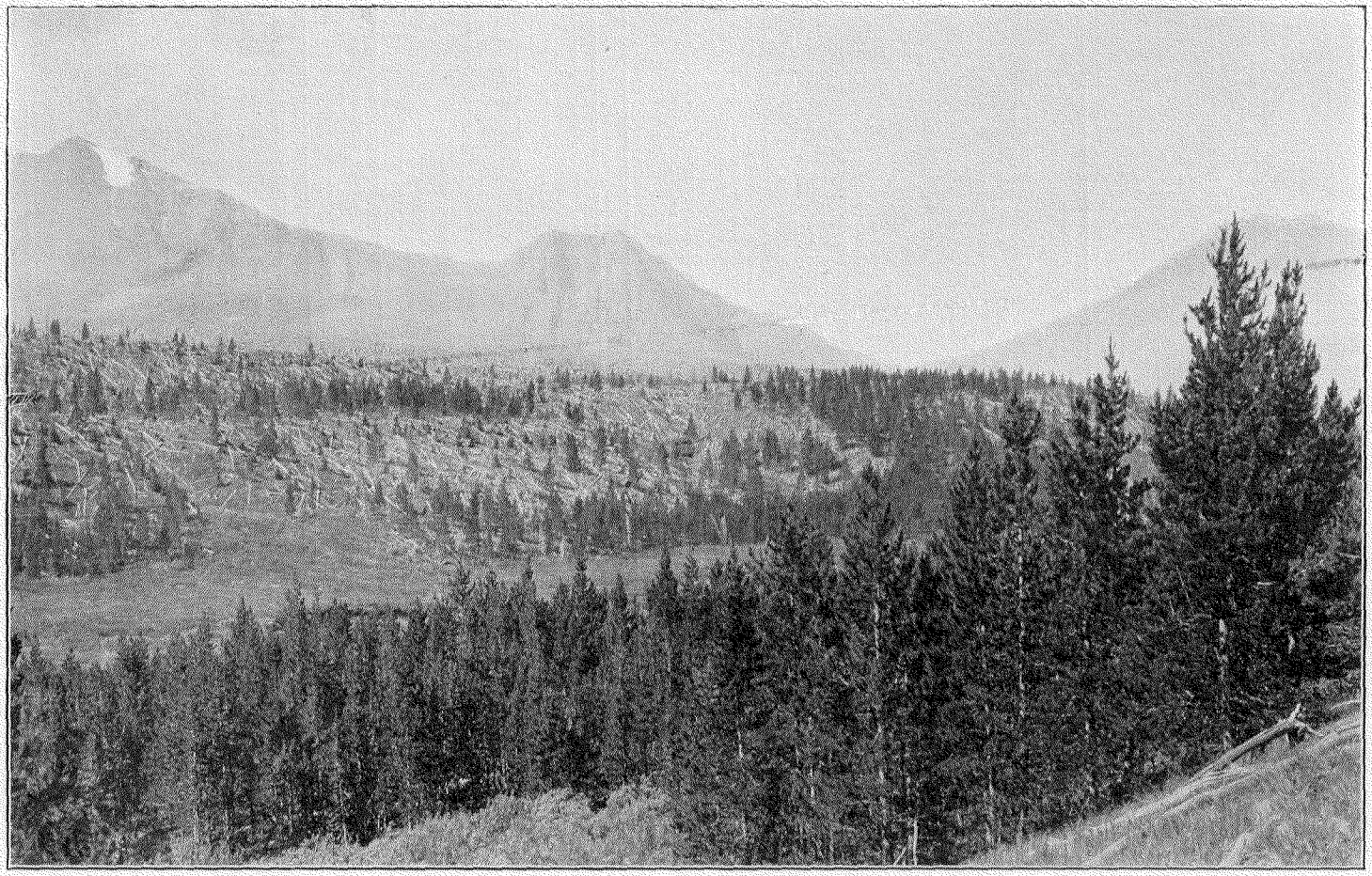
The Deer Creek Cattle Company and the Milk River Cattle Company each took off two heavy crops of alfalfa grown under irrigation.

Mrs. Sickler in the Milk River valley experimented in a small way in growing alfalfa under irrigation. She cut two crops during the summer and a third crop was left on the ground. I found the stalks of this third crop averaged about three and one-half feet in length.

Your obedient servant.

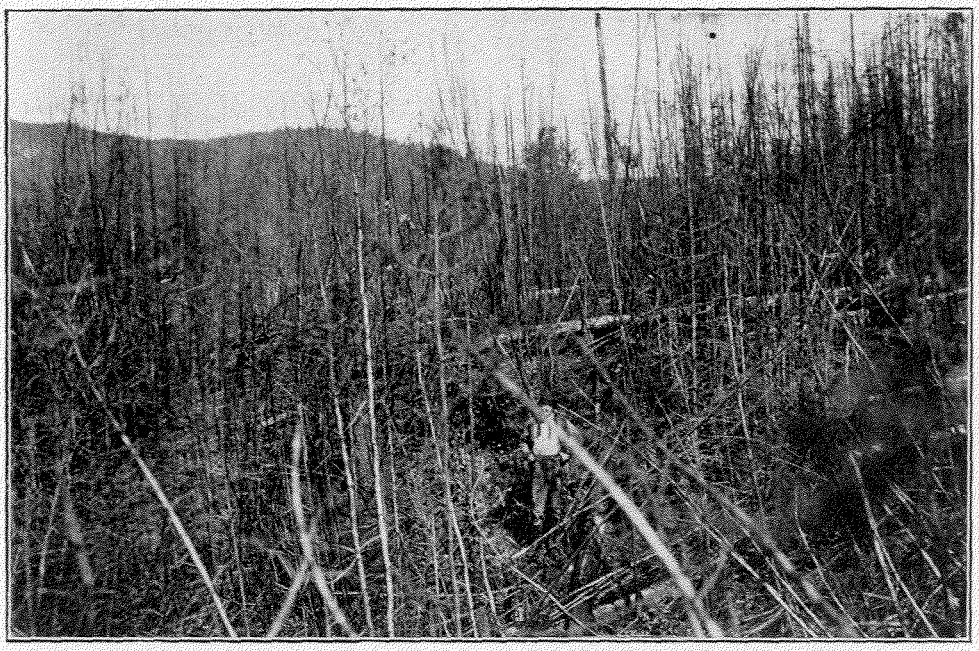
J. S. TEMPEST.

Photo by A. Knechtel, 1909.



Ten miles of mountain side, along the north-west branch of Oldman River. Covered with fallen timber, the result of forest fires.

Photo by J. R. Dickson, 1909.



Result of fire in 1908, all trees killed. (Sec. 18, Tp. 22, Rge. 10, W. 6th Mer.)

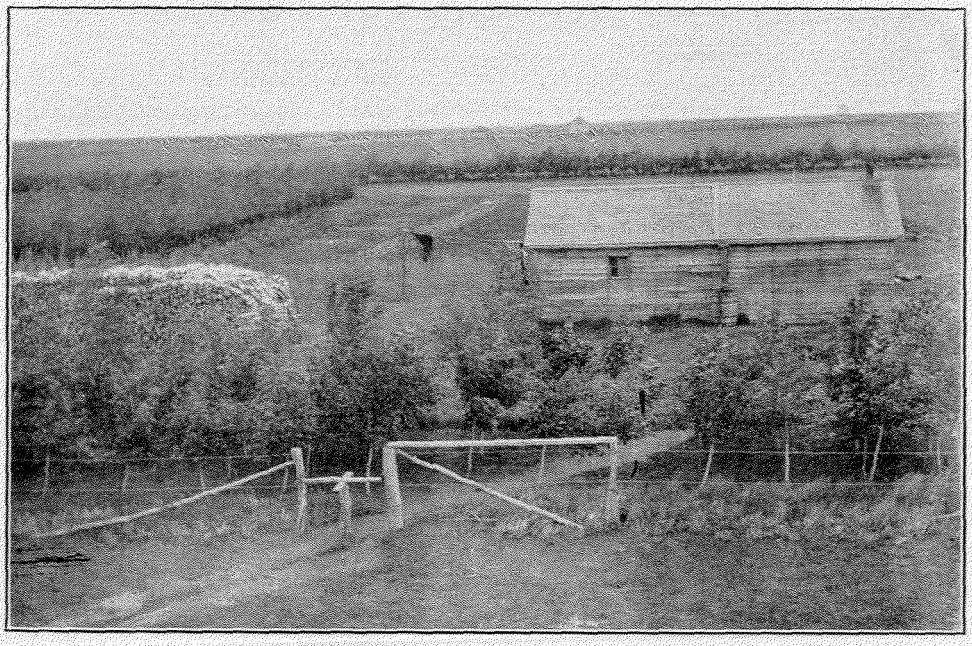
Photo by J. R. Dickson, 1909.

Prairie in Lake Manitoba West Reserve. The result of repeated fires.

Photo by A. Knechtel, 1909.

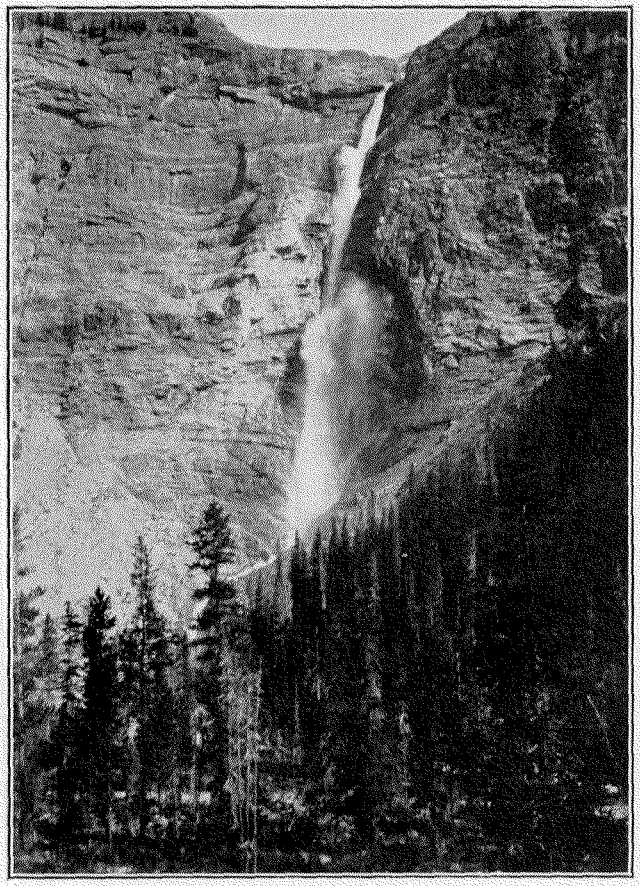
Tree Growth at timber line, eastern Slope of Rocky Mountains, Alta.

Photo by A. Mitchell, 1909.



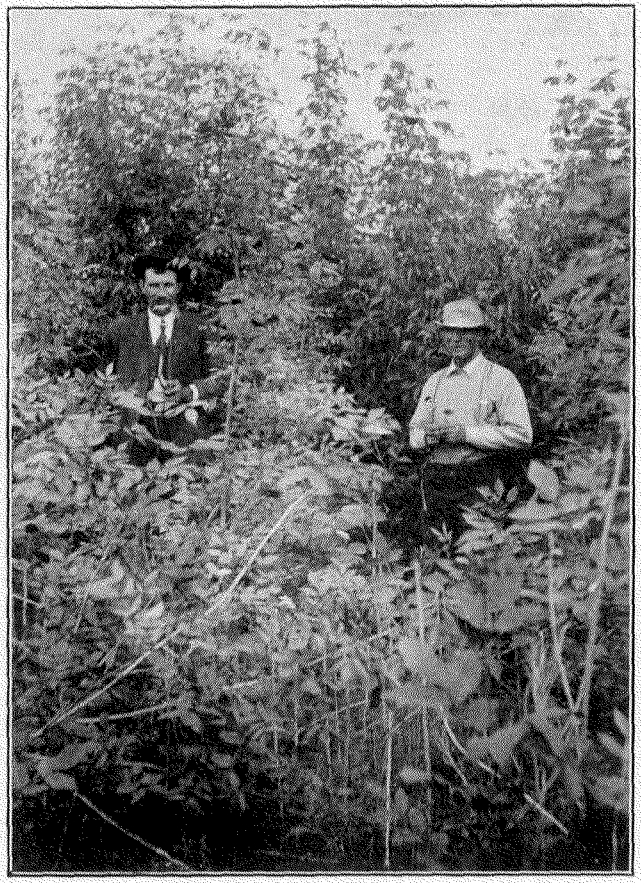
Plantation on farm of Thos. Peat, near Asquith, Sask. (Sec. 16, Tp. 36, Rge. 9, W. 3rd Mer.)

Photo by R. H. Campbell, 1909.



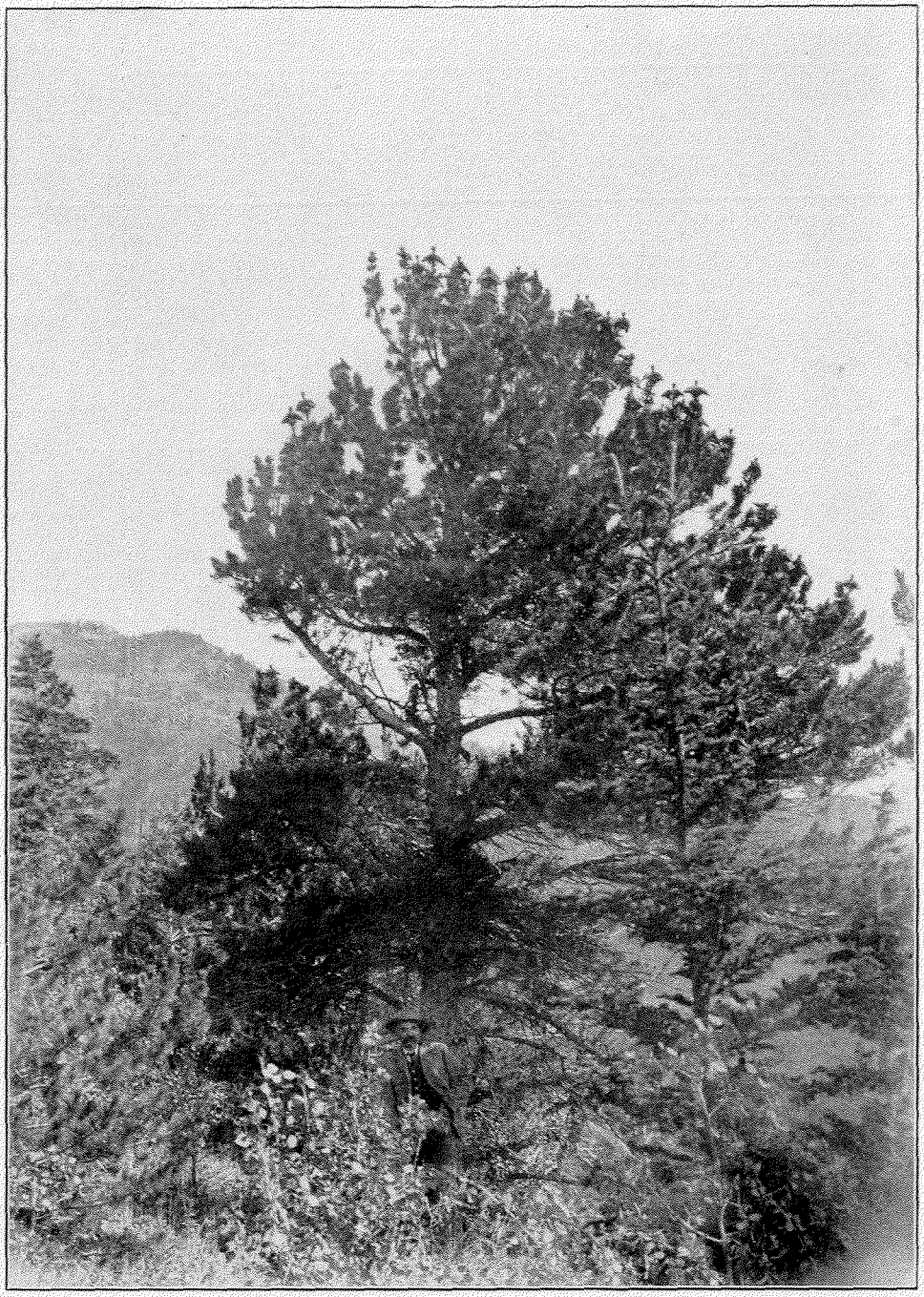
Takkakaw Falls, Yoho Park, B. C.

Photo by A. Mitchell, 1909.



Plantation of Maple and Ash, on farm of G. H. West, Sec. 28, Tp. 36, Rge. 7, W. 3rd Mer., near Cory, Sask., four years growth.

Photo by A. Knechtel, 1909.

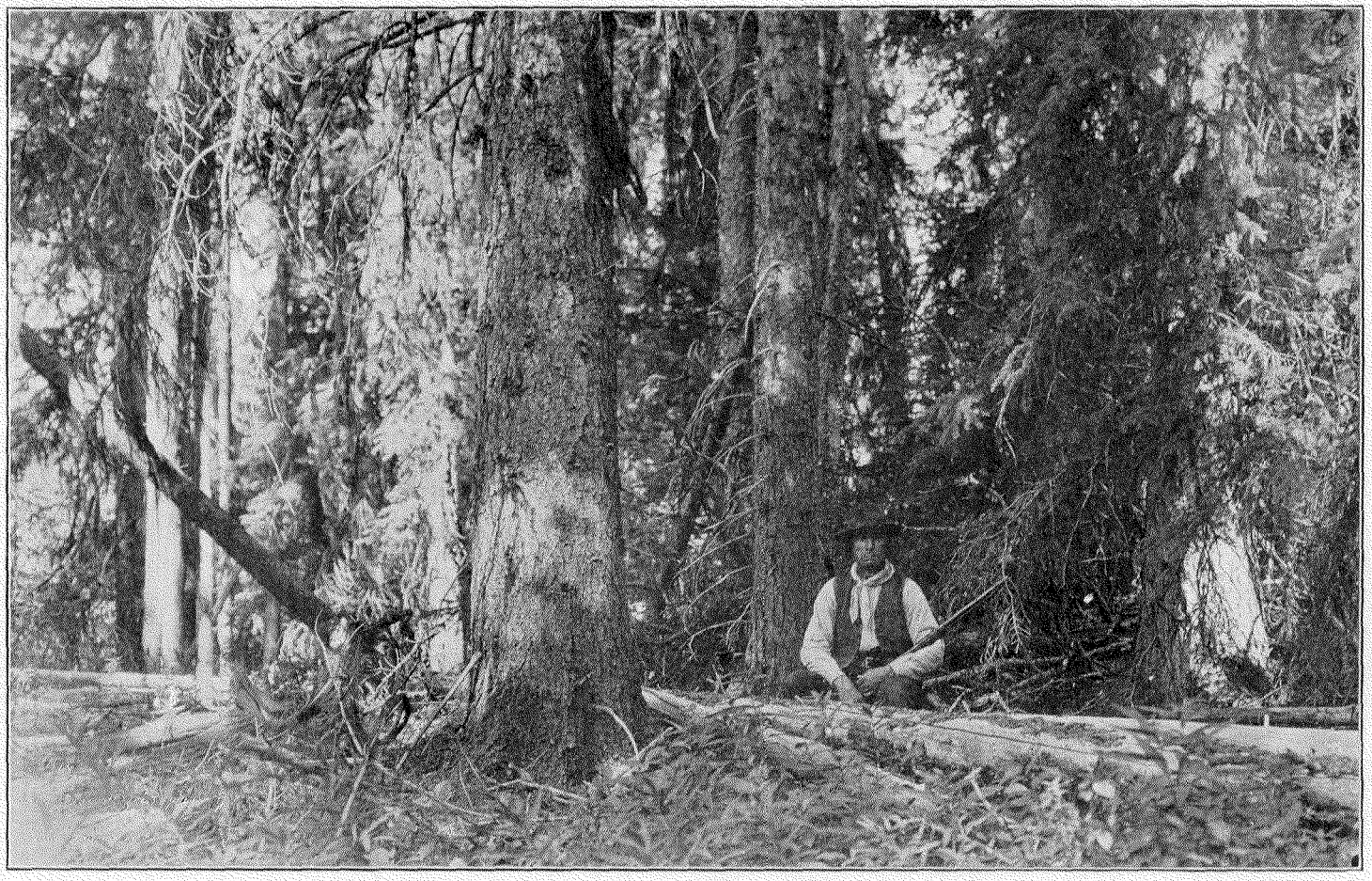


White Pine Tree (Pinus flexilis family), showing Cones, on shore North branch Highwood River, eastern Slope of the Rocky Mountains, Alta.

Photo by J. R. Dickson, 1909.

Typical view on site of big fire of 1908, all the timber is killed. (N.E. ¼, Sec. 16, Tp. 23, Rge. 10, W. 6th Mer.)

Phot. A. Knechtel, 1909.

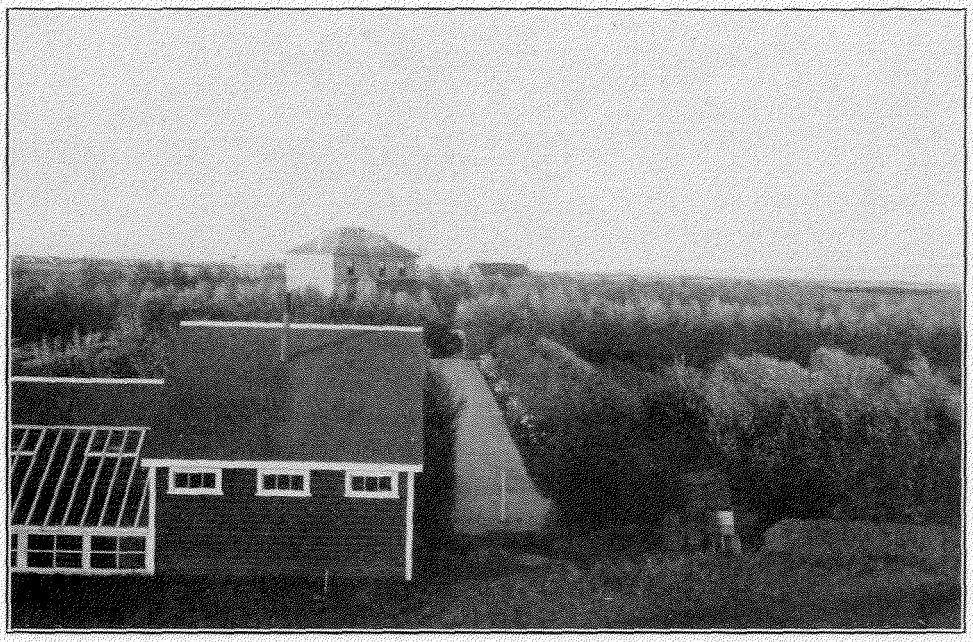


Spruce on the shores of the Highwood River. Eastern slope of the Rocky Mountains.

Photo by J. R. Dickson, 1909.

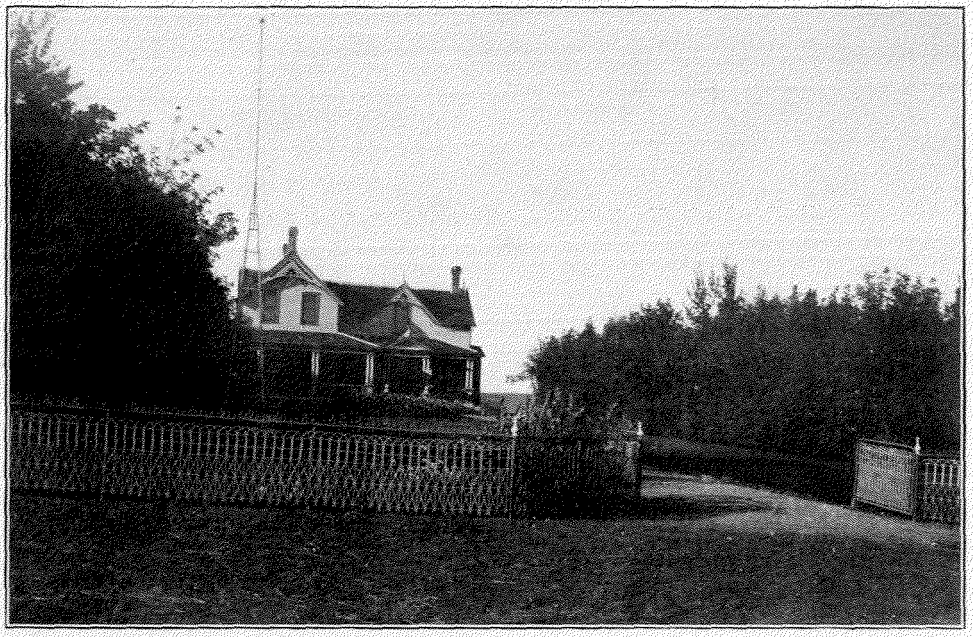
Typical Squatters' Buildings beside heavy timber, Columbia Valley, near Revelstoke, B. C.

Photo by N. M. Ross, 1909.



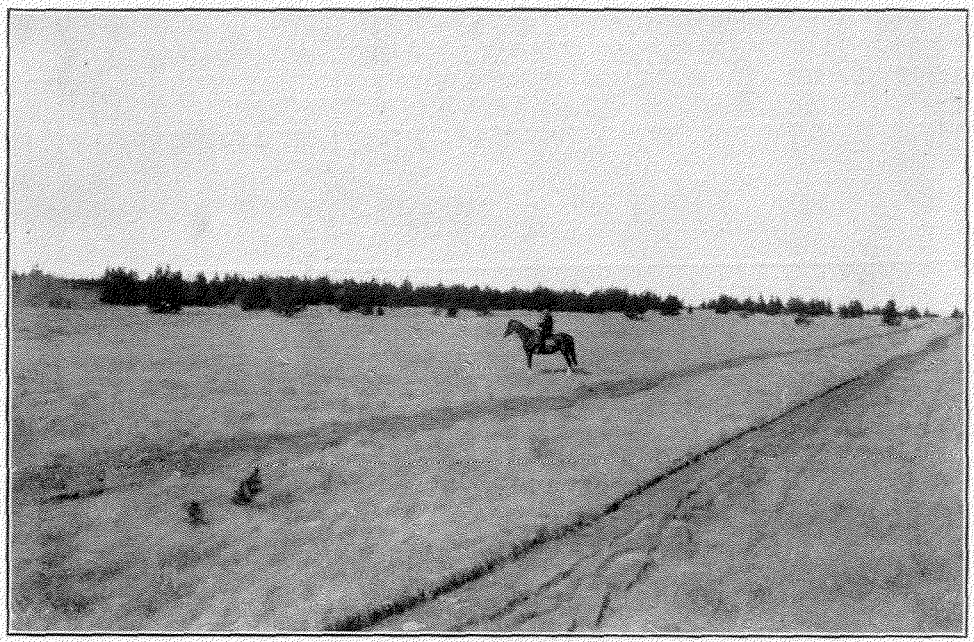
View of Forest Nursery Station, Indian Head, Sask., looking north from barns, seedhouse in foreground.

Photo by N. M. Ross, 1909.



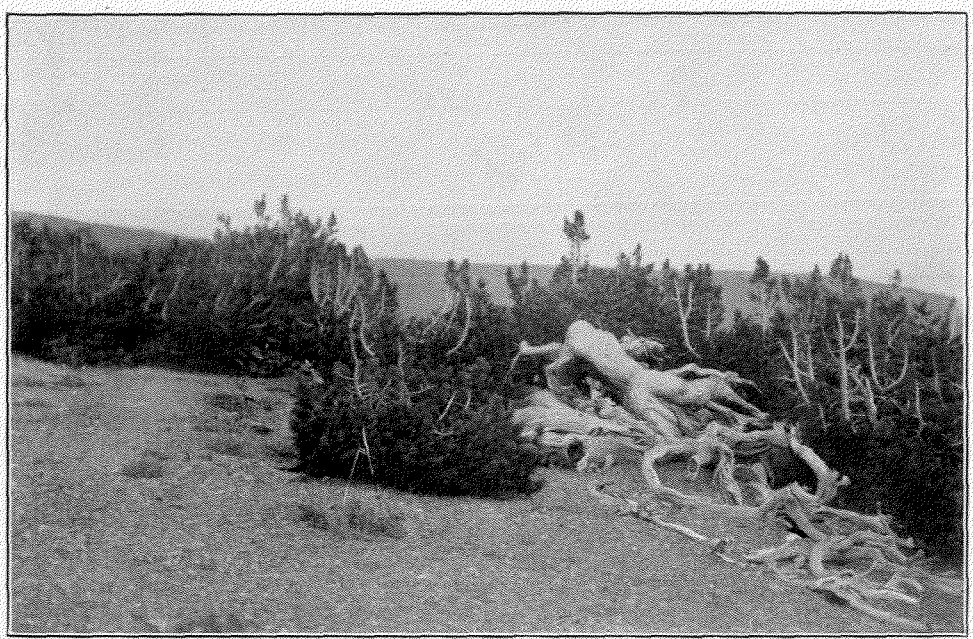
House and lawn on farm of Wm. Patterson, Indian Head, Sask. Shelter belt of Maple on each side.

Photo by A. Knechtel, 1909



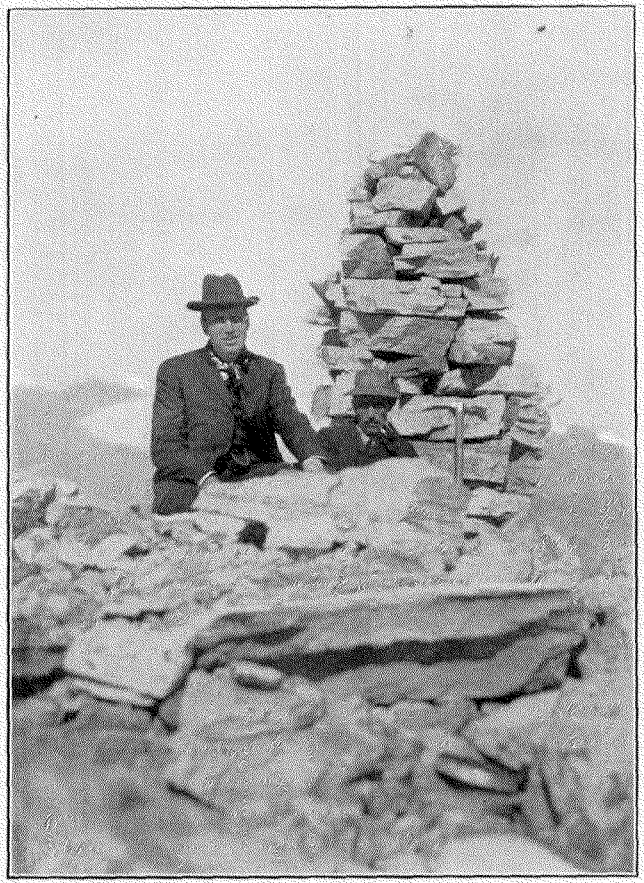
Fire Guard around Cypress Hill Forest Reserve.

Photo by A. Knechtel, 1909.



Prostrate Trunk of White-barked Pine (Pinus Albicaulis Engel) at timber line near head of Salter Creek, eastern Slope of Rocky Mountains, Alta.

Photo by R. H. Campbell, 1909.

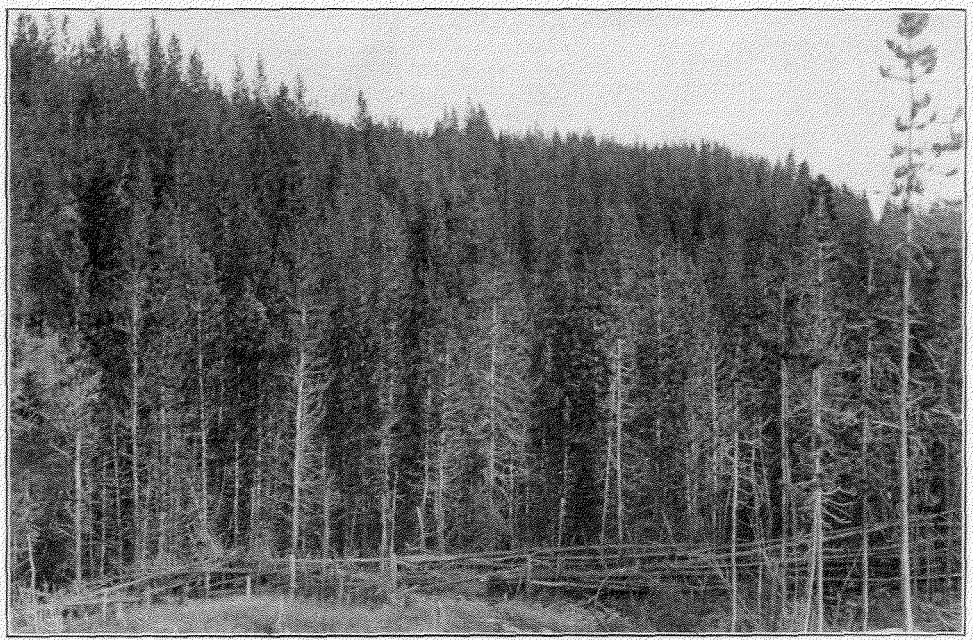


Summit of Mount Stephen, Jasper Park, B. C.

Photo by J. R. Dickson, 1909.

View near Shuswap Lake, B.C., Government road, showing 50-year old Stand of mixed timber, 4″ to 8″ diameter, at breast height. (S.W. ¼ of Sec. 15, Tp. 23, Rge. 10, W. 6th Mer.)

Photo by A. Knechtel, 1909.



Lodgepole Pine (Pinus Murrayana) and White Spruce (Picea Canadensis), along Battle Creek, Alta., Cypress Hills Reserve.

Photo by A. Mitchell, 1909.

Plantation of D. J. Whitney, Lethbridge, Alta. Trees planted in 1904. Height 20 ft. under irrigation.