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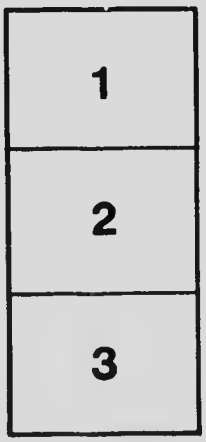

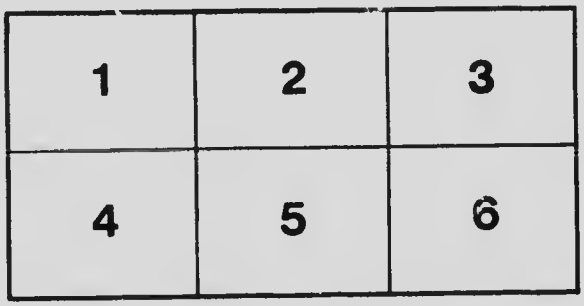

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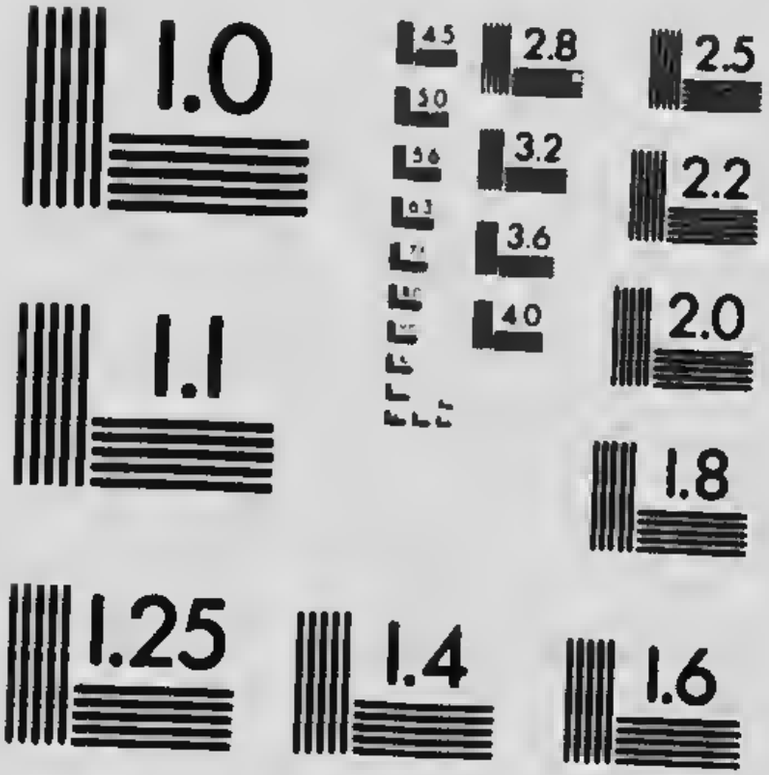

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HON. FRANK OLIVER, Minister ; W. W. COTÉ, Deputy Minister
FORESTRY BRANCH—BULLETIN No. 18
R. H. CAMPBELL, Superintendent of Forestry

ROCKY MOUNTAINS FOREST RESERVE

REPORT OF BOUNDARY SURVEY PARTIES

BY
G. H. EDGECOMBE, B.Sc., B.Sc.F., AND P. Z. CAVERHILL, B.Sc.F.

OTTAWA
GOVERNMENT PRINTING BUREAU
1911

00925056

Mixed meadow and woodland, Three-point Creek.

Photo by G. H. Edgecumbe, Phot.

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269—1½

FORESTRY BRANCH,

OTTAWA, January 30, 1911.

W. W. CORY, Esq., C.M.G.,

Deputy Minister of the Interior.

SIR,—I submit herewith two reports, one by Mr. G. H. Edgecombe and the other by Mr. P. Z. Caverhill, the two foresters in charge of two forest survey parties on the eastern slope of the Rocky mountains during the past summer. The object of the survey was to determine the line of the eastern boundary of the Rocky mountains forest reserve, and after careful consideration and for the reasons set out in their reports a line at a general elevation of a little over four thousand feet was determined on as the proper line for the boundary of the reserve. It is considered that all the land above that elevation would be most valuable if used for timber purposes. The highest line of tree growth is about six thousand feet, and therefore if the tracts between four thousand and six thousand feet in elevation are not included there will be practically no ripe timber land in the reserve, and the benefits sought to be obtained by it would be to a large extent unprovided for.

They therefore decided to recommend the line shown in blue on the maps accompanying their reports, as the one which should be established as the eastern boundary of the reserve, and I agree with their recommendation.

I may add that I consider the work that has been done by these two parties during the past year has been very satisfactory. They have covered a large area extending from the international boundary to the North Saskatchewan river, a distance of nearly 250 miles, and have given a very close description of the tract examined.

I would suggest that the reports and accompanying map be published as a special bulletin.

Respectfully submitted,

R. H. CAMPBELL,

Superintendent of Forestry.

ROCKY MOUNTAINS FOREST RESERVE

Report of G. H. Edgecombe.

OTTAWA, ONT., December 27, 1910

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

SIR,—I beg to submit the following report on the work which I have carried on under your instructions during the past summer.

NATURE OF THE WORK.

The work, which was to determine the southern portion of a line which should be fixed as the eastern boundary of a forest reserve to be established on the eastern slope of the Rocky mountains, was of the nature of a reconnaissance survey and in-

PLATE II.

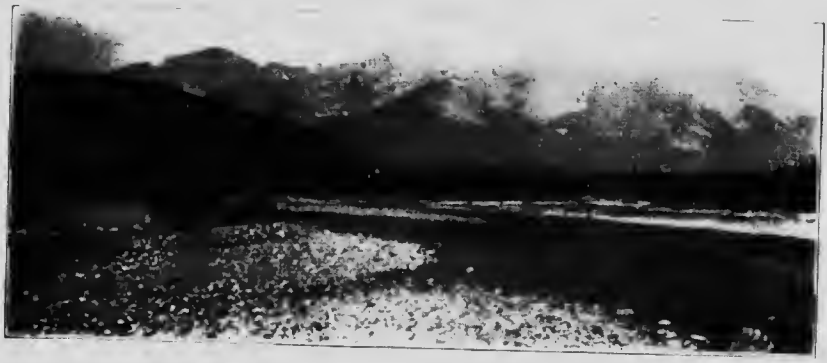

Photo by G. H. Edgecombe, 1910.

Elbow River: Opal Mountains in the distance. Timber growth to about 5,900 ft. elevation.

cluded the mapping of the forest type and physical features. In following instructions to exclude all agricultural land, a line at about 4,400 feet altitude was found to divide the agricultural from the non-agricultural and true woodland. However, on account of local conditions a line at an elevation of 4,800 feet and over was often followed

DISTRICT TRAVERSED.

The district traversed was from the Elbow river, in township 22, range 4, west of the 5th meridian, southward to the international boundary in township 1, range 27, west of the 4th meridian.

TIME IN SURVEYING DISTRICT.

The party, which was at first composed of six members, but in August increased to eight, started work June 10. A loss of three weeks time was caused in July and

August by forest fires. On account of this delay and to hasten the work, two members of the party, H. C. Belyea and C. H. Morse, spent most of September in collecting data along the Crowsnest branch of the Canadian Pacific railway, while the rest of the party continued the work southward. The international boundary was reached October 10 when the party broke up.

THE BOUNDARY LAID DOWN BY ORDER IN COUNCIL, MAY, 1910.

In May, 1910, an order in council established a line as the eastern boundary of a reserve on the above slope. Upon examination it was found that for a large part of this Southern district this boundary would not fulfil the object of the reserve which is to supply timber and wood to the prairies and protection to the watershed. It includes only an alpine country, a large percentage of which is above the tree limit, and the remainder inaccessible as regards timber supply for years to come. Large portions

PLATE III.

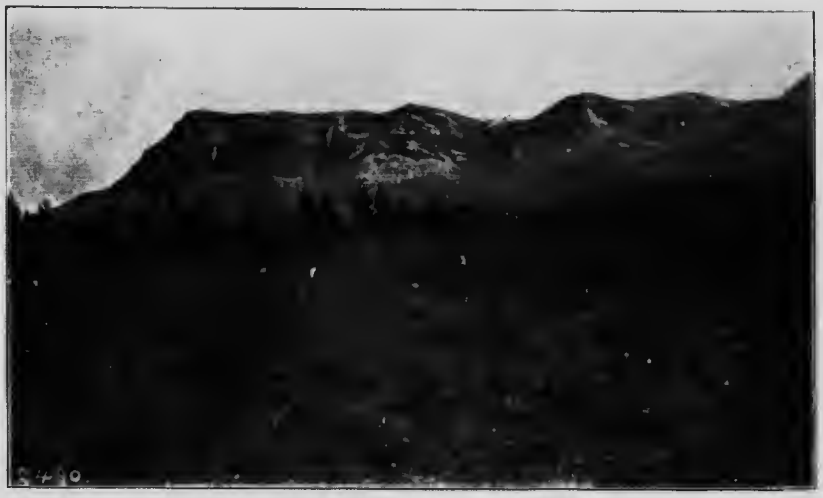

Photo by G. H. Edgecombe, 1910.

East side of Victoria Peak, showing wood growth near timber line.

of it have been burnt over, leaving bare eroded hillsides which were formerly covered by a thin soil and coniferous wood growth.

Again, eastward of the line established by order in council extended a district (in the northern part as far east as fifteen miles) the topography, altitude, nature of the soil and wood growth of which would warrant reservation. This country on account of its light soil and elevation is unfit for agricultural settlement, and is strictly woodland with its valleys of open grazing. It is in this district that, on account of local demand and transportation, wood will be first used in preference to that in the interior country, and by the present methods of lumbering will become deteriorated as regards future supply and protection to the waterflow.

PLATE IV.

Photo G. H. Edgecombe, 1910.

The common open or poplar-covered south exposures. Note coal-bearing seam on hill side. (South Sheep Creek).

TOPOGRAPHY.

The topography of the country examined varies greatly, from a foothill region in the north to the Rocky mountains proper which change abruptly into the rolling prairie in the south.

North of the Oldman river the foothills extend east of the Rocky mountains proper from six to eighteen miles; long bare ridges such for instance as the Fisher, Highwood and Livingstone ranges intervene and reach an altitude from 6,500 to 7,500 feet. Going southward these ranges and hills gradually decrease in altitude, merging into the prairie; and the mountains, which reach in their eastern summits an altitude of 6,800 feet and over, break abruptly into it. In the very south the Wilson range extends eastward for about nine miles along the international boundary. Just south of the boundary it reaches an elevation of 9,000 feet but on this side, the elevation ranges from 5,000 to 6,500 feet.

The trend which the eastern edge of the foothills takes is the same as that of the Rocky mountains; that is, from the international boundary northward to the south fork of the Oldman river the trend is N 35° W, from this point north to the Highwood river it is N 12° W. and thence goes north in a direction of N 35° W.

The hills reach an altitude above their valleys of 400 to 1,500 feet. West of the proposed line the valleys become more deep and the slopes which east of this line are moderate become very steep.

The rivers, the Elbow, the Highwood, the Oldman, the Waterton and the Belly cut at right angles to the ridges and have their sources well up in the mountains, while the creeks find their sources in the first range of hills. The creeks are numerous and supply a large amount of water to the prairies. Last summer, both the rivers and the creeks were fordable at all times, but they are subject to floods, especially in the month of June, which result from the sudden melting of the snow on the mountains and ranges above timber line.

All the above-named rivers with the tributary creeks join the South Saskatchewan river and are thus a large factor in the water supply of the prairies hundreds of miles away. The maintenance of an equable waterflow is thus desirable, and the importance of the protection to the watershed is evident.

ROCK AND SOIL.

The geological formation of the foot-hills is mainly cretaceous, with infoldings of shale and coal, while that of the mountains is of the older Palæozoic rock.

Above timber line, which can be placed at an altitude of about 6,100 feet, the hill-tops and mountains become bare, exposing sandstone and cherty and silicious limestone. Most of the hills at lower elevation have stony outcrops.

In the valleys the soil is a sandy loam with a subsoil of gravel. It is deep but light. As the elevation increases the soil becomes thinner verging into gravelly and stony, the depth of soil varying with the moisture and slope.

TREE GROWTH.

The principal trees found on the eastern slope are:—

Picea Engelmanni (Engelm.) Engelmann spruce.

Picea canadensis (Mill B.S.P.) White spruce.

Pseudotsuga mucronata (Sudw.) Douglas fir.
Pinus Murrayana (Murray.) Lodgepole pine.
Populus balsamifera (Linn.) Balsam poplar.
Populus acuminata (Rydb.) Cottonwood.
Populus deltoides (Marsh). "
Larix Lyalli (Parl.) Lyall larch.

The Engelmann spruce is one of the chief timber trees. It is found on the northern exposures and along river bottoms, where the loam is fresh to moist. The maximum diameter noticed was 42 inches, breast high, while the height was 130 feet. Young spruce seedlings require shade and thus the more light-requiring lodgepole pine and poplar are apt to obtain possession of the land, forming a temporary type. Thus along the slope are large areas, where fires have destroyed the former spruce forest, which is now replaced by one of lodgepole pine and poplar.

Like Engelmann spruce the white spruce was chiefly associated with northern exposures and also on stony slopes. Of the merchantable spruce, however, Engelmann spruce appeared to be the chief timber tree, but the white in favourable conditions produces excellent saw material.

Black spruce comes in on the edge of muskegs and on barren stony slopes. Southward it gradually disappears.

Douglas spruce or red fir was found mostly on southern exposures and only on the lower slopes. It occurs in small groves in the open, likely caused by the protection of its thick bark, while other species have been killed by fire. The quality is variable. In seeding qualities it appears very much like the spruce. The diameter ranges to 34 inches and the height to 90 feet.

Lodgepole pine, like spruce, was found mostly on northern exposures, but also on the dry, sandy soils. The seed is especially adapted for seeding up burned over areas, and on the eastern slope over which repeated fires have passed, lodgepole pine predominates and thus will become in the future the principal commercial tree. It is now much used for mine props. It rarely exceeds 18 inches in diameter and in height 85 feet. In close stands it grows very tall and straight, with little taper and free from branches, thus producing excellent poles.

The poplars apparently come in anywhere from rich river bottoms to thin stony soils of the upper slopes, but they are favoured by the southern exposures. On the river bottoms and lower slopes, the balsam poplar becomes a merchantable size from 8 to 28 inches in diameter and up to 18 inches is apparently sound. The poplars are, however, mostly small in size forming a fire or temporary type.

The larch was noticed only near the international boundary, where it was found on the upper rocky exposures of Table mountain at an elevation of over 5,500 feet. It was of a stunted scrubby growth.

The forest type on the eastern slope is a temporary type caused by the repeated fires. Merchantable spruce occurs in a comparatively few small blocks, which are mostly under license. Lodgepole pine from 5 to 40 years old covers over 40 per cent of the area.

The following in percentages of area indicates the condition of the wood-growth on about 800 square miles along the proposed boundary:—

	Per cent.
Timber	9
Spruce and pine poles	31
Pine and poplar	26
Poplar	10
Open grazing	14
Bare rock	10

From stem analyses it was found that lodgepole pine of thirty years' growth attains a diameter size of 5 inches, while in that of sixty years growth the diameter breast high becomes about 9 inches. In spruce and red fir the diameter growth was found to average, for the former, about 12 inches in ninety years, and in the latter 12 inches in 110 years.

GRAZING.

In locating the proposed line of the forest reserve, open grazing valleys were excluded, where practicable. These valleys often extend westward some miles along

PLATE V.

Photo G. H. Edmonds, 1910.

Livingstone River District: Grazing valley and pine covered hillsides.

the river valleys, which are narrow, while the hills are covered with pine and poplar. Bunch grass, wild pea and a variety of annuals form the chief herbage.

If cattle are not allowed to graze on those areas too early in the spring, nor in too large numbers, there is no reason to believe that they would damage the wood growth above the seedling stage, for they prefer grass when there is plenty of it. The damage to young seedlings would result from tramping down the young plants. From such areas, however, the cattle could be excluded.

In fact the grazing should be a great benefit in freeing the ground of the dry grass, and thus lessening the fire danger, while also, by their well trodden trails, the fire is hampered.

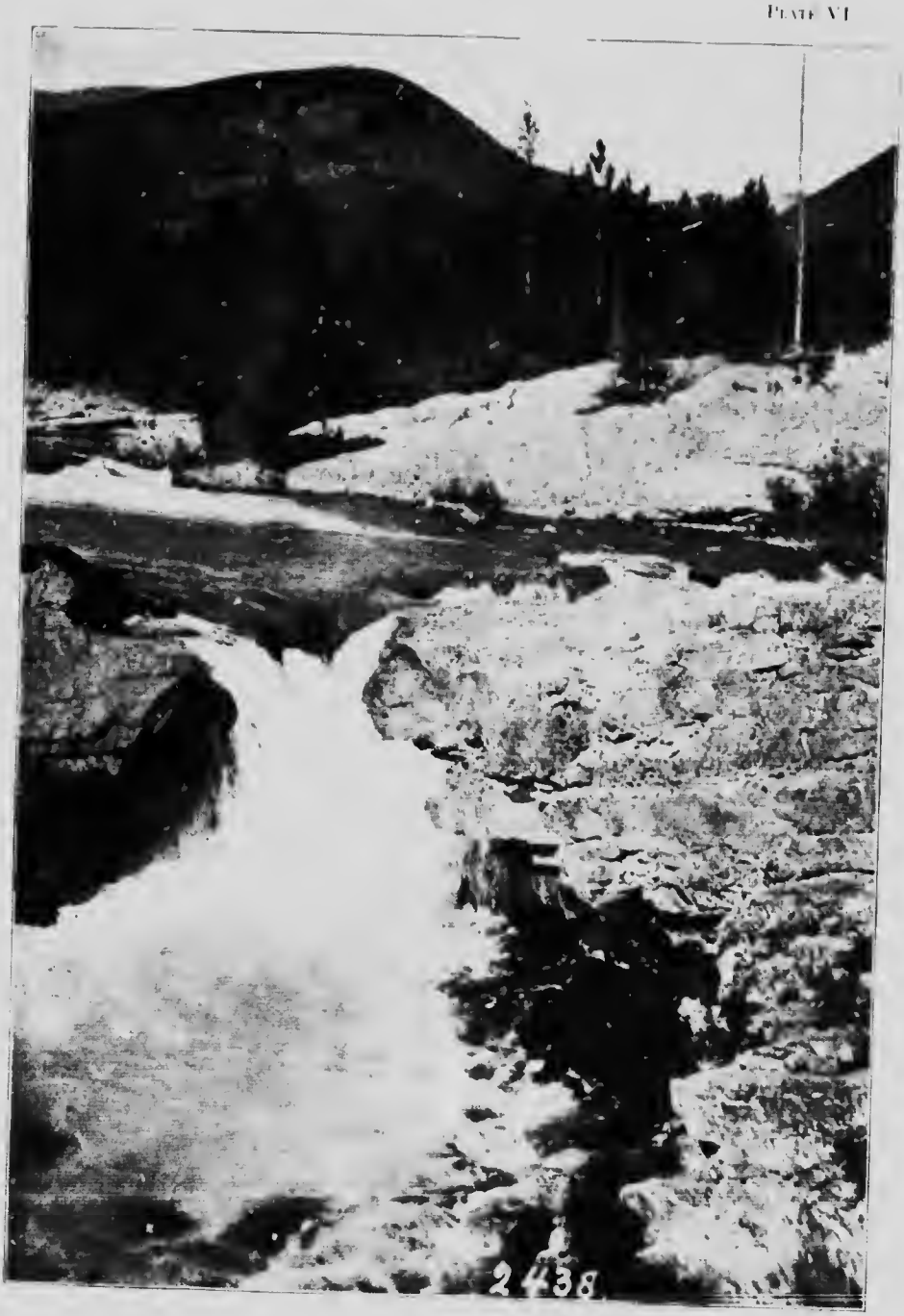

Photo G. H. Edgecombe, 1910.

20 ft. Falls on Elbow River, from which it was proposed to produce electricity to light Calgary. Note open wood growth on rocky hillsides.

SQUATTERS.

Within the proposed boundary several squatters are located well up in the foothills. They have settled on the land with the hope that the country will be surveyed and that they can then homestead. They are located on narrow river flats, which, when divided by the present system of survey, will be incapable of maintaining them, for the elevation of these places would prohibit the raising of grain and the raising of cattle would require the whole area.

While it is not desirable to have homesteaders on a reserve, the grazing flats might be leased to the present occupants, during good behaviour and as long as they abide by the regulations. From their location on much used trails and with their knowledge of the country they would be very useful as fire rangers.

HOMESTEADERS.

Homesteaders are located from one to eight miles east of the line, and are mostly employed in cattle and horse raising and in working the coal mines.

Those in the neighbourhood of the proposed boundary claim that it is impossible to ripen grain and they grow only a small quantity of green fodder. Hardy vegetables, such as turnips and cabbages are raised in small quantities.

During the five months while we were out frosts occurred each month. The settlers claimed that June was the only month likely to be free from frost.

ECONOMIC PRODUCTS.

Besides the wood, some of the resources of the reserve are coal, oil, building stone and, indirectly, water-power.

Coal was found in nearly every township along our traverse. In the north, the veins were small, but the south appeared particularly rich in the product. So far, for lack of transportation these mines have been little developed.

The oil wells are as yet little developed. Plants are established on both branches of the south fork of the Oldman river, but are not now in operation.

With transportation facilities, building stone will likely be quarried in large quantities.

Several small falls were located from which water-power could be generated. The principal one is the fall on the Elbow river from which it was proposed to produce electricity to light Calgary.

FOREST FIRES.

Since forest fires have so affected the eastern slope and as fire protection must be the chief factor in the administration of the reserve it may be well to mention this subject.

It has been already mentioned that repeated fires have devastated the eastern slope and that the forest type consequently has been altered and areas eroded. During the last sixty years likely 60 per cent of the eastern slope has been fire swept.

Last summer, on account of the exceptional dryness, high winds, lack of assistance at first, and lack of knowledge of the interior country, fires, started by the carelessness of fishermen, surveyors and also by incendiaries soon reached unmanagable

size. Fire guards were hastily ploughed in the open valleys and back-firing from these was operated.

There is now from south of the north fork of the Oldman river to north of the Highwood over forty miles of fire guard. This fire guard runs from along the proposed boundary to two miles east of it and with little expense could be kept open by ploughing one year and harrowing the next, freeing it of weeds and grasses. With a little change it could be made to answer a two-fold purpose of fire guard and road.

In the coming years the fire danger will be increased with the taking up of neighbouring lands, by the opening up of new railroads and coal mines, and on account of the large quantities of dry dead material resulting from fires. This material will do for fuel and fence posts and for mine props, if not left too long. However, a large part is inaccessible, but a considerable quantity in the more accessible parts, where the danger is now greatest, could be disposed of.

To witness such fires as occurred this summer, it is apparent that, for efficiency, the fire rangers should live on the reserve and that they are too few and their dis-

PLATE VII.

Photo G. H. Edgecombe, 1910.

Falls on south fork of the Oldman river, township 6, range 2, west of 5th meridian.

tricts too large. If the rangers' headquarters were located on the reserve, and in communication with the principal trails, travellers would be under a degree of supervision. The districts should be of such a size that a patrol could be made of it within a certain number of days, say for instance, five. Lookout stations could be located on commanding hills and trails cut to them. Thus the supervision of a large tract could be undertaken. The ranger should become familiar with his district and divide it off by fire guards, by trails and by natural barriers, such as streams and rocky ridges, so that a fire may be confined to one of these smaller areas.

A much larger district could be apportioned in the interior districts, traversed only by prospectors and a few others, than along the railways and eastern slopes where travellers are most frequent and by which entry is made to the interior.

The game wardens in co-operation with the rangers could assist greatly in warning campers and keeping them under supervision.

FISH AND GAME.

In most of the streams and lakes, bull, cut-throat and the so-called grey trout are found plentifully. During the summer the rivers and Waterton lakes are very popular with fishermen.

Duck, grouse and prairie chicken were seen in large numbers. Duck were particularly thick in the south on account of the numerous sloughs.

Deer were sighted quite frequently, especially after the fire when they were driven eastward to look for food.

In the south in connection with the Kootenay Lake forest reserve, there is a mountainous district which is the home of mountain sheep and goat, and bear. The United States government have set aside, as a game reserve, in Montana, an area of 1,400 square miles, just south of the international boundary. If the southern district of the eastern slope reserve were also set aside as a game reserve, the game thereon would be accessible to the Canadian sportsman, and in co-operation with the United States game reserve, foster the continuance of the game. Otherwise, with the game on one side of the international boundary protected and the other side not, the game will soon become inaccessible to the Canadians, as the animals will cross over to the protected side.

THE PORCUPINE HILLS.

East of the slopes of the Rocky mountains from four to nine miles and north of the north fork of the Oldman river are the Porcupine hills. These hills, which are in area about fifty square miles, are of a nature which would seem to render them suitable for reservation, but intervening settlers, although scattered, prevented including these lands within the eastern slope reserve. Time did not allow a thorough examination of this district.

The Porcupine hills are a series of high hills running in a southerly direction. The hillsides are covered with merchantable spruce and red fir, while the valleys are open grazing land. The hills, high, steep, stony and rough, make this district impossible for agricultural success. Out of a quarter-section only a small part would be open arable land.

Several creeks, as the Callum, the Heath, the Burton and others find their sources in these hills and water the neighbouring district.

On account of the nearness of Nanton, High River and other places the timber will soon be cut off, especially on the eastern side, leaving bare, rocky hillsides.

Thus on account of the timber and uselessness for agricultural settlement these hills would be desirable for a reserve.

Respectfully submitted,

G. H. EDGECOMBE.

PART II

PLATE VIII

Photo A. Knechtel.

Spruce on shores of Highwood river, summer, 1909

PLATE IX.

Photo R. H. Campbell.

Spruce on shores of Highwood river, after fire, 1910.

ROCKY MOUNTAIN FOREST RESERVE

Report of P. Z. Caverhill.

OTTAWA, December 22, 1910.

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

SIR, I have the honour to submit the following report on the work done by me during the past season, on the eastern slopes of the Rocky mountains between the Elbow and Saskatchewan rivers.

Under your instructions dated April 29, 1910, I reported to Mr. Knechtel in Calgary on May 30; and after a few days spent in purchasing an outfit and supplies, I proceeded to the Elbow river in township 23, range 5, west of the 5th meridian, where work was begun on June 10. The work consisted of a reconnaissance survey—locating and mapping the agricultural and non agricultural lands, and in locating a line which would divide, for practical purposes, the two classes.

THE LINE LAID DOWN BY ORDER IN COUNCIL.

The line laid down by the order in council in May, 1910, I found to be too far west. In many places it was behind the first, and sometimes behind the second, or even on the third range of bare mountains as between the Clearwater and Saskatchewan rivers. It thus included a country the greater part of which was above timber limit and far too rugged for tree growth. The purposes for which the reserve was created, viz., to perpetuate the supply of wood and posts for the prairie provinces and for the equalizing influence on the streams flowing therefrom were largely unprovided for. I found it necessary, in order that the reserve might reach its highest possibilities in these respects, to locate a line farther east and including a tract of land lying along the east of the first range, the topography, climate, and soil of which prevents it from ever being valuable for agriculture. The variation of these two lines and the character of the intervening country is shown on the accompanying map.

From June 10 until July 2 the work was carried on from day to day without break, then I was obliged to cease work in order to assist in fighting fires which were raging along Fallentimber, Greesecreek, and the Little Red Deer; seven days were thus lost. During August and the early part of September the weather was very unsettled, and frequent rains delayed us greatly, but fair progress was made. On September 21 I removed my outfit to Olds in order to allow Finlayson, McAllister and Clark, the three students of my party, to return to college. After a few days spent in obtaining new men and additional supplies, I went in on the Saskatchewan, and on October 12 began work at the 11th base line, which was carried on as rapidly as possible till November 26 when I transferred my outfit and supplies to G. A. Cronie, as instructed by you and returned to Ottawa.

In deciding upon the aforesaid boundary I have kept in mind the following points:—

(1) The topography and soil.
(2) The elevation and climate.
(3) Timber, its future growth and value.

TOPOGRAPHY AND SOIL.

The topography changed greatly as we went north. Between the Elbow and Bow rivers the country is very hilly, reaching its highest elevation in Moose mountain, 7,936 feet. From this centre hills extend in every direction, composed of layers of sandstone over deposits of shale, except to the south where the hills along the

PLATE X.

Photo P. Z. Carcelill, 1910.

Douglas fir in Bow river valley. Diameter breast high 30 to 36 inches.

Cañon branch of the Elbow are of limestone formation and far too rugged for tree growth. The soil here varies from deep alluvial clay in the valleys to gravel with outcrops of sandstone on the hills. After crossing the southern boundary of the Stony Indian reserve the altitude drops suddenly to an elevation of 4,000 feet, in

the valley of the Bow river. This valley extends level and open to the foot of the first range of mountains. On the east of the line recommended the country is gently rolling and almost open, except on the hilltops which are covered with a light growth of poplar.

From the Bow river to the Red Deer the mountains recede to the west and several ranges of hills extend along their base. These have steep wooded sides separated by narrow muskeg valleys. These ranges are cut across by the Ghost, Little Red Deer, Fallentimber and Red Deer rivers, making the whole country very broken. East of the line there is a similar strip six to eight miles wide. Here, however, the valleys are open and contain good grass for grazing or hay.

PLATE XI.

Photo P. Z. Caverhill, Pelo.
Saskatchewan river near mouth of Mire creek.

From the James to the Clearwater is a level plateau extending several miles on each side of the line and broken only by the Raven and Stony creek. This is well wooded by pine poles. The soil here is of glacial deposit, very stony in many places and of little value for agricultural purposes. It has all been burned over and all vegetable matter removed.

After crossing the Clearwater the country is a succession of valleys and intervening ridges extending from SW to NE. Through these valleys flow the numerous branches, Prairie creek, Sheep creek, and Rough creek. The elevation here varies from 4,000 feet in the valleys to 4,600 on the hills. The soil is mostly clay loam with rock exposures on the slopes, which are here more gentle than farther south.

The valley of the Saskatchewan consists of a number of terraces, varying from 10 to 40 rods wide, and differing in elevation from 10 to 50 feet. These are very stony and beach-like at the edge, the stone extending sometimes the entire width. The whole valley has been burned as far west as Mire creek and a naturally poor soil very much impoverished.

CLIMATE AND ELEVATION.

The climate at the elevation of the line (4,000 feet) is subject to diurnal changes, the days being hot and the nights cool and subject to frost. Almost every week we had one or more frosty nights, and exceptionally heavy frosts were recorded on the following dates: June 22, July 2, July 4, and July 10. On these nights water froze over ¼ inch thick. This was sufficient to kill any but the hardiest of vegetable growth. I was told by ranchers that oats and other hardy grains might ripen once in ten years and they are only planted for green feed. This feed is not considered as good as the natural wild bunchgrass, as is shown by the statement of J. G. Creighton, 'When land has to be broken its practical value in this country is gone.'

In Berbury settlement turnips and some hardy vegetables are grown, but potatoes will not ripen. The inhabitants hope, however, on more cultivation to be able to ripen grain. The elevation is here 3,900 feet. From these conditions the conclusion must be drawn that there is little if any possibility of profitable farming being carried on above an elevation of 4,000 feet.

This season was exceptional with regard to rainfall. June and July, when rain is expected, were very dry, while August and the first part of September were very wet making it almost impossible for the ranchers to cure their hay.

While farming practically ceases at an elevation of 4,000 feet or under, grazing land is found in the valleys at a much higher elevation, and ex extends up into the mountains themselves. The area is limited, however, and confined to the valleys only, as is shown by the accompanying map. The cipal grazing areas are in narrow strips along the Bragg, Jumpingpound, Ghost, cese creek and Fallentimber, with a larger area on the Red Deer and James rivers. While it would be impossible to draw a practicable line which would exclude these lands from the reserve, I believe they can be as well administered within it, under grazing lease. The grazing is advantageous in two ways: first, it rids the forest of dry and inflammable grass, and second, the cattle in going to and from their feeding grounds do so on well defined paths which could be used as fire guards if occasion arose.

THE TIMBER.

The forest may be divided into main types: first the original forest type, occupying about 14 per cent of the region, and second the fire formed type. The first is again subdivided into three types: (*a*) the slope type, composed of pine, spruce and poplar in varying proportions, depending on exposure, soil, slope and moisture content. This type contains nearly all the merchantable timber and is shown on the accompanying map in dark green; (*b*) the swamp type, covering only a small area, being confined to the borders of muskegs. It is composed of small black spruce and larch; (*c*) the river bottom type, found along rivers and on rich alluvial lands. Spruce and balm compose this type. They reach a large size and make fine timber. The fire-formed type occupies about 75 per cent of the region and is formed of pure lodgepole pine stands, or on the steeper slopes of willow and alder brush. It results directly from fire, and the wonderful reproductive capacity of the pine. As we come east near the prairie aspen takes the place of pine in this type.

Poplar and spruce stand on river bottom of Sheep creek

Photo P. Z. Cornell, Pilot.

The most common species found are:—

Pinus Murrayana. Lodgepole pine.
Picea Engelmanni. Engelman (White) spruce.
Populus tremuloides. Aspen.
Populus balsamifera. Balm.
Pseudotsuga mucronata. Douglas fir.
Picea mariana. Black spruce.

Besides these are found in limited quantities *Abies balsamea, Larix laricina* and *Betula alba*, var. *papyrifera.*

Larch is the best wood found in this region, because of its lasting qualities and greater strength, but owing to its limited quantities will scarcely be of commercial importance.

PLATE XIII.

Photo P. Z. Caverhill, 1910.
Saskatchewan river, showing common lodgepole pine growth.

White spruce is found in large quantities along the streams and on northern slopes where it reaches a diameter of 3 feet and a height of 90 to 100 feet. It avoids the dryer ground and does not seed in for years after a fire, waiting for cover of some other trees to be first established as a nurse crop. The growth is fairly rapid as shown by the following table made from the study of a few mature trees.

GROWTH OF WHITE SPRUCE.

Age in years.	Diameter in inches.	Height in feet.
10	0·9	7
20	1·9	12
30	3·2	18
40	4·6	28
50	5·9	37
60	7·7	46
70	8·6	54
80	9·6	61
90	10·8	67
100	12·0	74

PLATE XIV.

Photo P. Z. Caverhill, 1910.

Valley of Saskatchewan looking west showing miles of burned timber. Township 40, range 12, west of the 5th meridian.

PLATE XV.

Photo R. H. Campbell.

Fir on Oldman river, after fire of summer, 1910.

This wood possesses many good technical qualities and is the chief timber tree of this region.

Lodgepole pine follows spruce closely but is more liable to defect and does not possess the strength. With the large area covered by second growth pine it is bound in the future to be the chief tree for commercial purposes.

It seeds in on a large range of burned-over soils but does best on light clay or sand, avoiding the poorly drained soils. The growth is rapid at first but falls off after forty or fifty years. It is usually short and bushy in open stands.

The following table shows the growth on burned over lands:—

Age in years.	Diameter in inches.	Height in feet.
10	1·0	7·5
20	2·0	15
30	3·2	21·5
40	4·6	28
50	6·2	34
60	8·2	40

Aspen is found on southern slopes, especially along the east but disappears as we go west. It has not been used much for lumber but makes good wood and is used for posts.

Douglas or red fir is found in the valleys of the Bow and Ghost rivers and while reaching a large size is very limby. It is used to a considerable extent for lumber.

The other species are of less importance and only used for posts or fuel.

FISH AND GAME.

Fish abound in all the streams and lakes. The following varieties were noticed: Cutthroat trout, bull trout, grayling, pike and suckers. These in many cases reach a large size. Bull trout were caught weighing 7 to 8 pounds and much larger ones were reported.

Game is abundant especially in the north. Moose, deer, elk and sheep were seen, while the several varieties of grouse and prairie chicken were very plentiful. Fur-bearing animals such as mink, otter, lynx, wolves, bear and beaver are found. With its vast extent and varying topography this reserve should become the greatest game reserve in the world, and from this source alone a large revenue will be obtained in future years.

MINING AND MINERALS.

Little mining is carried on in this region. Coal outcrops in various places on the Elbow, Bragg, Fallentimber, Red Deer and Saskatchewan, but the seams are only a few inches thick and of a low grade. Valuable seams exist farther west on the Saskatchewan, Brazeau and McLeod rivers, which are being developed and railroads are rapidly pushing lines in that direction by way of the Saskatchewan.

Limestone, shale and sandstone exist in large quantities and with better transportation facilities will be valuable for building purposes.

FIRE.

Fire is the worst enemy the forest has. Eighty per cent of the territory surveyed has been burned in the last fifty years, and 60 per cent of this or 48 per cent of the entire country has been burned over in the last twenty-five years. The causes of these fires have been various, many laying the blame to the Indians, who believed if the forest were destroyed new grazing land would be found for the disappearing buffalo. This may be true in some cases, but more I believe to the carelessness of the white trapper and the numerous other campers we find within the borders of the forest.

How best to deal with these fires requires more study than I have been able to give it. I would, however, recommend building a fire guard along or near the eastern boundary of the reserve to prevent any settlers' fires from spreading into it. Strengthen the present fire patrol; giving each man a certain definite territory to cover and not more than he can cover in a week's trip. He should be in the reserve at all times during dry seasons. The game and fish guardians should see that the ranger has notice of the whereabouts of all hunting and fishing parties in his territory so that he may keep in touch with them and see that they exercise due care with regard to their camp-fires. As time permits the ranger could be exploring his territory and mapping it, making trails and fire-guards to connect streams and in many other ways preparing to handle a fire should one occur.

I am, your obedient servant,

P. Z. CAVERHILL.

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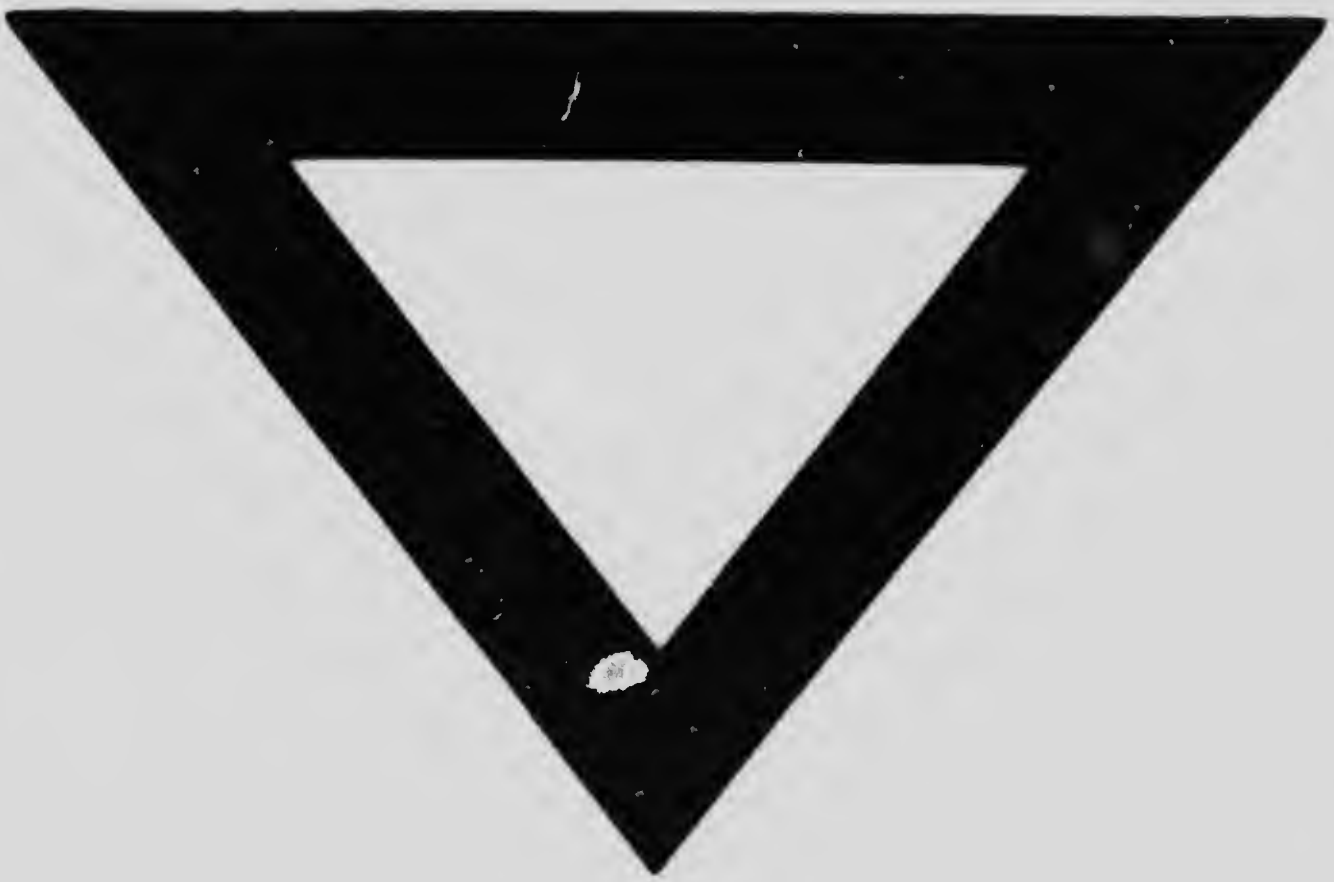
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