FOREST CONDITIONS

S. OMINÉCA & N. INTERIOR OF B.C.

J. B. MITCHELL, 1912
RECONNAISSANCE

from

NATION LAKE to STUART LAKE.

1912

J.B. Mitchell

Reconnaissance File 302.
Forest Conditions in the Southern Omineca
Country of the Northern Interior of
British Columbia.

CONTENTS

Instructions for Season's Work
Season's Work
General Description
Areas
Topography
Climate
Underlying Rock and Soil
Conditions of Settlement
Forest Species
Forest Types
Quantity of Timber
Area
Estimate of Stand
Location of Merchantable
Burning Over Land
Area
Age of Reproduction
Damage by Fire
Means of Communication
Agricultural Land
Other Resources
Fire Protection
Forest Reserves.
Detailed Description of Area by Sections:
- Lower Tatla Lake & Portage to Nation Lakes
- Tsaytahar Lake
- Indata Lake
- Upper Nation Lake and First Lake
- Lower Nation Lake & Portion of the Nation River
- Upper Manson Creek Trail & portion Tusana Trail
- Lower Manson Creek Trail
- Tusana Lake
- Lost Trail

Appendices
- Unexplored lands of the Area
- Forest Acreage sheet
- Tabular Statement in Sq. miles of conditions obtaining on 1500 sq. miles of Nation Lake country.
- Thermometric Readings
- Barometric Readings.
Forest Conditions in the Southern Omineca Country of the Northern Interior of British Columbia.

Instructions for Season's Work:

From instructions received on July 12, 1912, I was to find and attach myself to the party of F. O. Swannell, B.C. I.S., then already in the Northern Interior engaged in a triangulation and exploratory survey of the Omineca Country. I was to accompany him on his explorations, give whatever assistance was possible in his triangulation work, and to report on forest and agricultural conditions in the country explored.

Season's Work:

Leaving Victoria on July 14 I arrived at Mr. Swannell's camp on North Tatla Lake on August 13th. After a week's work on the lower end of the lake, we back-packed across country to Upper Nation Lake, having to cut trail for about 15 miles, and arrived there September 3rd.

After two weeks spent in cruising the country around the north end of Upper Nation Lake, we split up, three members of the party taking a canvas boat and proceeding to the two most northerly of the string of lakes -- Traytabat and Indats-- while the other three were sent out bringing up provisions and to cut trail in from Lower Nation Lake to Ingana Lake. After a month's work on the two northern lakes, in which their position and that of the country around them was thoroughly fixed, we proceeded south again, and discovered that the three originally sent off had failed to find Ingana Lake owing
to the inaccuracy of the Government map. They were accordingly sent out to Fort St. James to get provisions and pack-horses and ordered to penetrate to Insana Lake from the Manon Creek Trail. We continued the exploration of the Lower Nation Lake and surrounding country until the pack-horses arrived on October 28th.

Between that date and November 8th, the day of our arrival at Fort St. James we made a pace traverse off about 63 miles of trail, and a fairly accurate triangulation of Insana Lake.

The day after our arrival at Fort St. James a fall of snow made further work with pack-horses unfeasible. Leaving Fort St. James on November 14, and making use of pack-horses we finally arrived in Victoria on November 28th.

I may here mention that I am very much indebted to Mr. Swannel for a great deal of the information necessary to the completion of topographical forest maps, and for the photographs he has so kindly lent me to illustrate the present report.
-3-

GENERAL DESCRIPTION.

Areas.

The areas under investigation were situated between 64° and 68° 30 North Latitude and 124° 15'—126° West Longitude. They are bounded on the south and west by Stuart Lake, Tatsha River and North Beach Lake, on the north by the Nation Lakes and on the east by the Mabsen Creek Trail; altogether approximately 5000 square miles.

Of this area some 1600 square miles were investigated sufficiently to make a fairly detailed map. The remaining 1400 square miles consists of land too far away from the main lines of communication to be reached in the short time at our disposal. Information gleaned from reliable local sources, or observations taken from high mountain peaks have had to be relied upon greatly in the summary treatment of this land section of country.

Of the 1600 sq. miles examined in detail there are 110 sq. miles or 70,400 acres of water, and 1490 sq. miles or 954,000 acres of land. Approximately 54,000 acres of the latter consisted of barren mountain ranges, leaving 890,000 acres of forest and agricultural land. Under the assumption that these data will hold good for the whole area of 3000 sq. miles there will be:

Water 131,000 acres.

Land 1,769,000 "

of which 1,669,000 acres would be forest and agricultural land.
Topography.

The country is mountainous, especially in the N.W. section, but broad valleys, usually occupied by long, narrow lakes, divide the ranges, and towards the east the country tends to flatten out into large, comparatively level areas. North of the Nation Mountains the country has more of the plateau formation, and a lightly timbered plain some thirty miles long is reported.

The general trend of the mountains is from E. E. to N. W.; around the Lower Nation Lake, however, they assume more E. to W. direction.

The elevation of the lower land ranges from 2200 to 2600 feet, while some of the mountains reach an altitude of 7000 feet. Except in a few cases the lakes are deep, the shores shelving rapidly down in overfalls to a depth of several hundred feet.

The Arctic Divide crosses the entire length of the area investigated, running from She-She-wedji Lake on the Old Munsion Creek Trail and skirting the north shore of Insana Lake, it turns W. N. W. to the head of First Lake, finally running out of the territory along the great barren range which flanks the north shore of Tekla Lake.

Climate.

The winter is long and severe lasting from October until May. Snow sets in about the middle of October; the last traces are not gone until well on in May, and in the woods it has been known to linger until June. From records kept at the nearest
maternological station, Fort St. James, the thermometer registers below zero for considerable periods, and has gone to 88° below. The highest temperature recorded was 96.5° in 1895. The mean annual temperature is 33.33°.

Summer, though short, is fairly warm, the average temperature about the middle of the day being in the neighbourhood of 70°. The summer frosts which are so frequent in the Rechace Valley, much further south, were here, owing perhaps to the large bodies of water in the vicinity, reduced to four—one in July (very slight), one early in August, and two at the end of the month, and none were serious. Indian summer commences in September and lasts until the middle of October.

The annual precipitation is fair. At Fort St. James the average is 10.95" of rain and 69.49" of snow, or 16.81 inches mean annual precipitation.

Over the Arctic Divide the precipitation will be heavier, the winter snow being 4 to 5 feet deep as shown by marks on the trees, and a heavier summer rainfall was encountered this year than occurred at Fort St. James.

Winds are strong around the lakes, but are local and do not affect the country further back.

Underlying Rock and Soil.

The prevailing type of rock is of igneous formation—mainly granite, but the more basic diabases and dolerites also occur. Slates and schists cover large expanses especially on Indata and Tsaytbat Lakes. Limestone occurs on Stuart, Tremblay and
Upper Nation Lake. There is a stratum of blue brick-clay at the head of Indata River, and an interesting hot-water spring found at the head of Upper Nation Lake was making deposits of impure alabaster. The soil varies with the underlying rock. Over the granite, schist and slate formations it is poor and thin.

Where diabases and dolerites occur it is a deep, rich black loam. Over the limestone it was light but fertile. Along the rivers and main creeks the soil was unusually rich and deep. The soil of the flat areas on the Hanson Creek Trail varied from almost pure sand to red loam. Except on the higher mountains there are very few places where the bare rock lies exposed, but above a certain elevation the rock is never far beneath the surface. There is practically speaking no real muskeg in the district and the few wet meadows could be very easily drained.

Conditions of Settlement.

Up to the present no real effort has been made to settle this country. There are Indian villages and a Hudson Bay Post at Fort St. James, Indian villages at Pinchi and Tatchi on Stuart Lake, and on the Tatchi River and Tremblay Lake. A few pre-emptors have taken up land on Stuart Lake, but mainly for purposes of speculation. The country along the Hanson Creek Trail as far as Tesson Lake and Lookout Mountain, on both sides of Stuart Lake, Tatchi River, Tremblay Lake, Middle River, and Tatla Lake has been bought up by speculators.

On May 5th, 1910, a Reserve was placed on the country as
far north as a line which practically coincides with the Arctic Divide going west to a point about 50 miles west of the Hanson Creek Trail, and then runs over to Middle River. The past summer a survey was made of some 29,000 acres on the Nation Lakes for private purchase, and of 30,000 acres for the Government.

The Nation Lake country itself is uninhabited, and only visited by Siwash trappers and hunters in the fall and winter, who have erected a few cabins and smoke houses for the sake of convenience.

Labour supply is uncertain and expensive, but the completion of the new Grand Trunk Pacific line, with the influx of settlers it will bring, will speedily alter conditions.

Forest Species.

The following are the species of trees occurring on the area explored:

- Englemann Spruce
- Black Spruce
- Douglas Fir,
- Jack, Black or Lodgepole Pine.
- Poplar or Aspen
- Cottonwood
- Birch

besides various willows, alders, and junipers.

The Englemann Spruce, the most important species of the old coniferous forest is pretty well ubiquitous. It runs up to 180 feet in height with 30 inches as the maximum diameter. The
The average height, however, would be from 75 to 80 feet. This tree is usually found growing in mixed forest with Jack Pine and Balsam. On north aspects the balsam predominates; on dry sandy soils the Jack or Lodgepole Pine is more numerous, but on south aspects and flats the Spruce is the prevailing species. The tree runs up to about 4200 feet on mountains. This tree although apparently as sensitive to fire as the Jack Pine has not the regenerative properties of the latter, and in consequence is taking a comparatively insignificant place in the newly regenera- ted areas.

The Black Spruce is confined to dry muskeg and meadows and is always small and poorly developed reaching a diameter of perhaps 5 to 6 inches in a century.

The Balsam Fir is found growing under various conditions of soil and locality, but it seems to thrive and reproduce better on north aspects. The Balsam grows at a considerably higher altitude than the Spruce. On Nation Lake Mountain and other mountains the dwarfed tree was found growing above the 5000 foot elevation, and fair sized trees occurred up to 4000 feet.

The Balsams of the old stand were very often affected by heart-rot, and the tree is evidently nothing like as long-lived as the Spruce, which at the same age were found flourishing and quite free from disease. Owing to its great tolerance, and the usually poorly stocked stands, the branches often came very low down on the trunk, which intimates that the timber taken from the tree would be of very poor quality.
Douglas Fir. The northern limit of the Douglas Fir in this part of the Northern Interior can be taken as a line drawn from the McCleod Trail and Lookout Mountain in a N. E. W. direction to embrace the good land along the Lacom Lake trail and thence due west to Tremblay Lake. This was the original northern limit as old stumps bear witness, but fire has forced back the fir until all there is left is a few stumps on Lookout Mountain, a few acres of good timber on Murray Mountain, scattered trees on Stuart Lake, and a few good timber limits on Stuart Lake and one on Tremblay Lake. The tree averages 100 - 110 feet where it is found, and is usually tall and straight with a D.B.H. of 18 inches. On Lookout and Murray Mountains the tree grows up to a 5500 foot elevation.

The Jack Pine, usually known as the Black or Jack Pine, is one of the most useful trees in the north. Reproduction after a fire is instantaneous and prolific and the young stand begins to seed at a very early age. The Jack Pine is asserting itself all over the upper country where burns have been so extensive, and having much better reproduction, and a much more rapid growth in youth than the spruce, is replacing that species. This pine is subject to snow-break, particularly over gravel soils.

The Jack Pine will grow under a great variety of conditions. Apparently the soildictatesful to it appears to be a rich loam, where the seedlings either refuse to come up, or perhaps are suppressed by poplars. Lime stone produces another condition of the soil of which the tree apparently is not fond.
For the rest the tree is found growing where there is barely enough soil to cover the roots, where the soil is a pure dry sand, on muskegs, on well drained mountain slopes, and in swampy depressions. In fact, it seems to be able to adapt itself to any conditions except those obtaining over a rich soil.

The tree attains a height of 90 - 100 feet, and occasionally more, while the diameter runs from 8 - 20 inches, and averages 11 - 13. The wood is coming to be used extensively for railroad ties, and at the nearest saw-mill, Fort Fraser, for lumber.

The Poplar very rarely has a diameter greater than 15 inches. It reproduces well, and on the large burned over areas is found either pure or mixed with the Jack Pine. The northern limit of the poplar was very nearly reached, the trees of that species in the north western portion, especially around Tsaytus Lake being small and stunted.

Cottonwood occurs as isolated trees along the water front of the big lakes, or at rare intervals on the hills behind. Trees occur 90 - 100 feet high, and up to 30 inches in diameter. The main use for the tree is for Siwash dugout canoes.

The Birch is mainly found in the extreme northwest, and is a very small insignificant tree.

Alders and Willows are found on all swamps and wet meadows and along most creek bottoms.

Forest Types.

The following are the principal types of forest growth encountered:
1. North Aspect  
2. South Aspect and Flats of Virgin Forest  
3. Mountain Slope  
4. Mountain Top  
5. Lodgepole (Jack) Pine  
6. Poplar  
7. Muskeg  
8. Fir.

Virgin Forest.

Originally the Virgin Forest consisted of Spruce, Jack Pine and Balsam Fir, with a sprinkling of Poplar and a few Cottonwood. This Virgin Forest, of which some 278 square miles remains, may be classified as North Aspect Forest and South Aspect Forest, according to the preponderance either of Balsam or of Spruce found in the mixed woods of lower elevations, and as Mountain Slope Forest at the higher elevations.

North Aspect Type.

The North Aspect Forest has been so called because it is on the slope which obtains the least direct sunlight - the northern one - that the Balsam is enabled to out the Spruce to a certain extent, and become the predominant species. It covers altogether some 67,800 acres, and is fairly evenly distributed throughout the different sections in which the Virgin Forest appears.

The percentage the different trees show in this mixed
wood will be Balsam 50, Spruce 30, Jack Pine 20. As most of the Virgin Forest is over-ripe, the Balsam which has a comparatively short healthy life as compared with the Spruce, is much diseased, and this with the additional fact of the tendency of the branches to come down low on the stem, renders a large part of the timber worthless for commercial purposes.

There are 57,800 acres of this type of forest in the area examined, which, at an estimate of 2000 feet merchantable timber to the acre, would give 115,600,000 feet.

**Southern Aspect and Flats.**

The composition of this type is in general Spruce and Jack Pine 75%, Balsam 25%, the Spruce or the Jack Pine predominating according to the nature of the soil. This type at present covers some 86,800 acres, and at one time formed the main forest of the country. Where conditions are favourable this type includes some good timber. Of the 86,000 acres there are 18,000 which average from 5,000 to 10,000 feet per acre, or 129,000,000 feet. The remaining 68,000 acres would average 4000 feet to the acre, or 272,000,000 feet. This type is usually found to be in a more flourishing condition that the preceding one, and often forms a dense canopy under which no regeneration is possible.

**Mountain Slope Type.**

Beyond a certain height which may be taken as about 5500 feet the tree life begins to have no commercial value, not only owing to its inaccessibility but also because the trees
become stunted, with heavy branches coming low down on the
trunk. Moreover, the balsam, which is never a desirable timber,
replaces both Spruce and Jack Pine, finally forming a pure stand. This type may be taken as stretching from the 3500 foot to the
4500 foot mark and in ravines up to 5000 foot. But towards its
upper limit the trees are so stunted as to be mere bushes. There
were some 25,500 acres, or more, of this type in the area under
examination. Commercially the value of this timber may be regarded
as nil, but in the preservation of the physical characters of the
country its presence is of the utmost importance.

Mountain Top Type.

Beyond the 4500 foot mark the Balsam becomes less and
less until replaced by dwarf Juniper and mountain grasses, and
finally, at an altitude of 5000-6000 feet vegetation ceases almost
entirely, and snow is to be found in crevices or ravines where there
is the slightest protection from the sun.

Lodgepole Pine Type.

In the original virgin forest the Lodgepole (or Jack
Pine, as it is called in the North) existed in the proportion of
one to three. By means of its rapid reproduction powers, and the
capacity with which it adapts itself to various conditions, it at
present covers a tremendous acreage (285,000 A., or approximately
2/5 of the burnt area), in which it is either pure, or else pre-
dominates in a mixture with Poplar. There is about one per cent of
Spruce scattered about.

The age of this forest of Jack Pine ranges from 10 to
50 years, but whole sections are practically even aged. I have very little doubt that as time goes by Spruce and Balsam will force itself in amongst the Jack Pine, and eventually, if unhindered by the hand of man, the original forest conditions will be attained. It is noteworthy that snow-break is very common amongst this pure pine-crop, whereas the mixed stand is hardly affected.

The pure Jack Pine is usually found mainly on gravelly to sandy soils. As the soil improves the admixture of Poplar becomes greater, until on rich loams and limestone soils the poplar is found nearly pure.

The different phases of the Lodgepole Pine type were noted: that in which the young Jack Pine was coming up in dense masses almost impossible to penetrate -- this, on the poorer soils and, on better soil, park-like expanses through which it was possible to ride a horse in any direction. This later phase was to be noted along certain sections of the Manson Creek Trail, and was reported to occur on the previously mentioned level plain to the north of the Nation Lake Mountains, and outside the district.

The older Jack Pine areas will, in a short time, be able to meet an extensive and continuous demand for pulpwood.

The Poplar type

This type is mainly confined to the good soils of the lower Manson Creek Trail and the Inzane Lake Trail, the limestone soils of Stuart and Bramley Lakes, and the limestone ridges at the head of the Upper Nation Lake. The Poplar has a very rapid height
growth averaging over a foot each year, and the boles are straight
with an average diameter of 5" for 50 year old trees.

The young pure stands, as yet, shows no signs of the
decoloration and disease of the wood to be found in the older
trees in the spruce forest.

The poplar type occupies about 66,000 acres.

The Muskag Type.

There is very little real muskag in the area, but land
approaching that condition may be divided into:-

Dry Muskag
Willow and Alder Swamps

Wet Meadows.

altogether about 2 1/4% of the total area.

The dry muskag usually has a hard silty-soil on which
is growing a scanty stand of dwarfed spruce and Jack Pine, which
can never be of any practical use.

The Willow and Alder swamps usually occur along the
borders of creeks or lakes. With a little draining and clearing
they would, as a rule, form good agricultural land.

The wet meadows are generally found around the edges
of ponds near their outlets, and are very generally due to the
damming up of small creeks by beavers. They could very easily be
converted into good grazing land.

The Fir Type.

This particular type is at present only found on Lookout
and Murray Mountains in the East of the district. A rich, Fraserian type.
Fire has run through both areas and thinned out the stand considerably, also making it patchy.

In places where the trees are left practically intact there will be 12,000 to 15,000 feet per acre; elsewhere there may be an average of only five trees to the acre left. Altogether there would probably be about 2000 acres averaging 6000' to the acre (12,000,000 feet).

The sections of fir timbers privately owned on the Warm of Stuart Lake are reported to be equal to Coast Timber, while a fair amount of unalienated Fir lies in behind these limits.

Quantity of Timber.

There still remains under virgin forest 154,600 acres, of which ultimately some use may be made, 2000 acres of partially burned Fir, and 23,500 acres of the mountain slope type, which can never be exploited commercially. In addition there are thousands of acres of second growth Poplar and Jack Pine around Stuart Lake which are hastening towards maturity and which in another twenty years will supply a considerable quantity of building timber and cordwood.

Estimate of Stand.

On the 67,800 acres of North Aspect Type, there are estimated to be 135,600,000 feet of timber and 271,200 cords of pulpwood.

Of the 36,800 acres of South Aspect and Bowland Type 18,600 acres would yield 129,600,000 feet, and the remaining
66,200 acres 272,000,000 feet of merchantable timber and 344,200 cords of pulpwood. There will probably be another 20,000 cords of pulpwood amongst the second growth in the neighbourhood of Fort St. James.

**Location of Merchantable Timber.**

It must be confessed that in the Nation Lake country proper, there is very little timber which could be easily and profitably logged. The one area of really good timber there, lies on an average 10 miles back from the lake, along a creek quite unsuitable for driving big stuff. Again to the natural outlet of the district the Parsnip and Peace River Districts there stands in the way the serious obstruction of the rapid, shallow Nation River with a box-canyon and falls about half way down.

The main body of timber within easy reach is on the south side of Stuart Lake and of the west arm of Tatla Lake, and of that portion bordering on Stuart and Tremblay Lakes; the greater part has been taken up in timber limits. On Pinchi Creek and Tezzeron Lakes the major part of the timber is privately owned, only on Tatla Lake are the forest lands unalienated.

On the Nation Lakes about 12,000 acres of land under forest, but forest with less than 5000 feet B.M. per acre, was surveyed this summer; most of it for private people. That is, of 45,000 acres of Forest Land within reasonable distance from the shore of these lakes, nearly a quarter is held privately.
Burned Over Land.

(a) Area.

Probably no district in British Columbia has been more devastated by fire than the one under consideration. The prospectors in the sixties, the gold-diggers in '71 and those again of '91 were responsible for the majority of the fires, partly through carelessness, partly of set purpose in order to clear the country and so make prospecting easy. Since then various fires have been set by Indians and Whites to clear the country of windfalls, and a couple of instances were noted in which deliberate attempts had been made to set fire to the woods, to uncover the bed-rock for purposes of prospecting.

A few thousand acres of green timber on the higher hills overlooking the bottom of the Upper Nation Lake were swept by fire this summer, and may be put down to the carelessness of prospectors.

In the area under consideration (1600 sq. miles) out of 1890 sq. miles, or 890,000 acres, of agricultural and forest land, that is land which at one time was practically all under virgin forest, 1080 sq. miles or approximately 691,200 acres has been swept by fire.

This is nearly 30% of the possible stand as regards acreage. As regards the quantity of merchantable timber burnt the percentage would be still higher as the fire-swept area embraces that part of the country which at one time contained the best stand of timber.

(b) Age of Reproduction.

The age of the second growth naturally varies with the
age of the burn, but it may be stated as a generality that no reproduction has, as yet, followed in the wake of the fires which have burnt within the last twelve years. A second fire, following in the wake of the original burn has, especially in the north western end, played havoc with the young stand, and, even large areas, has stripped the surface soil of much food material that it refuses to support even the least exacting of trees, the Jack Pine, and lies quite bare to the deteriorating influence of sun and wind.

On the whole, however, regeneration has been rapid and effective, and it is a safe estimate to say that fully 50% of the burnt area or 352,100 acres is under a thick covering of young growth, while another 20 to 30% has a light regeneration.

Of this 25% is Poplar, 75% Jack Pine, while Spruce and Balsam are each represented by one per cent.

Around Fort St. James the age of the 2nd growth is about 60 years. Further to the north along the Nansen Creek Trail there are two distinct stands of Jack Pine, one 40 - 50 years old, and the other 50 years. The older stand must once have covered nearly the whole burnt area, but a second is amongst the young growth but in a younger stand which at the present time occupies perhaps a larger area than the original regeneration. This regeneration is very uniform and dense and forms a very efficient protective covering for the soil.

On these areas on which neither Jack Pine nor Poplar have appeared, willow and alder have taken root, and are of some use in preserving the soil factors of the locality.
Damage by Fire.

Taking the average stand of timber burnt as 3,500 feet per acre, the direct loss due to fire would be 2,485,000,000 feet. This estimate is a very conservative one, as the fire-swept land had an average stand of nearly 5000 feet.

The indirect loss, that is the loss of work and capital which the timber industry would have brought into the country is enormous, and it has not even had the advantage of clearing the land for agriculture, for much of the country burned is too broken for farming land, and the very areas most suitable for agriculture are those which have seeded up the quickest.

Means of communication.

The main pack-horse trails, both leading to Manson Creek from the east and west boundaries of the district. The Babine route crosses North Tatla Lake at the East and West Lendings, and runs north past the headquarters of the Nation Lakes; the Fort St James route runs north from Fort St. James in a fairly straight east of north line to where the Nation river runs out of the Lower Nation Lake.

The middle of the district is opened up by a Siwash trail which branches off the Fort St. James route, at the half-way point, for Inzana Lake.

From Inzana Lake a poorly defined foot-trail runs to Cache Bay, Lower Inzana Lakes; from the bottom of the lake another follows the creek to Kaz-chek Lake, from where one trail leads to the bottom of Tremblay Lake, while another leads from one chain of lakes to another, and finally across country to Middle River.
a foot-trail cut out this year, joins Tatla Lake to the head of Upper Nation Lake. From the head of Tsaytabat Lake a pack-horse trail runs due west and probably strikes the Babine route, Manson Creek trail, a short distance from the East Boundary.

Both Manson Creek trails are under Government inspection, and are in very good condition, as are also three or four of the shorter Siwash trails. The trails opening up the interior of the district assume the name by courtesy. They are generally speaking, winter routes by which the Siwashers get to their hunting grounds, and can only be distinguished by the blazes on the trees.

The water-ways nevertheless, make up for any deficiency in the way of roads and trails. The Nation Lakes, including the connecting creeks, represents a stretch 60 miles in an E. and W. line; and the whole of this is navigable by boat or raft, except perhaps the upper two creeks in the low water at the end of the summer. To the south of the district, Tatla Lake, Middle River, Tremblay Lake, Tatchi River and Stuart Lake form a continuous waterway for over 100 miles, which has been navigated by a small steamer, the remains of which are still to be seen at the head of Tremblay Lake.

In addition the long, narrow lakes in the interior would lend considerable aid to getting over the country.

Other Resources:

Water Power: The country, unfortunately, is deficient in the falls and rapids necessary for the cheap utilization of water as a power. On the Finch River, 25 miles from Stuart Lake, there is reported to be a fall large enough to run a
saw-mill. Again, at the Grand Canyon, half way up the Tachi River, there would be no difficulty in developing sufficient power for a fair-sized mill. The Nation Lakes are particularly lacking in water-falls, and the building of flumes or penstocks from the mountains would be a very costly undertaking.

The Nation river is reported to have one fall, and from the size of the river, this could well be the site of a large saw-mill. Outside the district, there are reported to be two falls along the MacLeod Trail—one on the Muskeg River 150 feet high—and a second one nearer Fort St. James, also over 100 feet.

Mineral.

Considerable limestone areas occur on Stuart and Tremblay Lakes, and on Tsaytbat and Inata Lakes. A brick-clay deposit occurs at the lower end of Inata Lake. All the creeks and rivers of the area have panned for gold, but, presumably, with no results.

Good building, store, and road-metalling material are also to be found in many places.

Fire Protection.

At present there is only one fire warden in the district, stationed at Fort St. James. His patrol is supposed to run in as far as the Arctic Divide, but, on account of the big brush in that direction his watch is mainly confined to the big masses of timber on Tatla Lake and the Drift-wood River. Up to the present no patrol has been attempted of the Nation Lake country.
I should recommend in the first place more efficient patrol of the Stuart Lake to Driftwood river district. At the present time it takes the fire warden from 2 to 3 weeks to make the round-trip in a canoe with an Indian. A small one-man launch, or at any rate an oil engine which could be fitted in a canoe, would cut the time in half, leaving the fire warden free to attend to other and more eutying parts of his district. Increased expense, if any, would be more than repaid by the better watch kept in the wooded areas.

I would recommend the establishment of three look-out stations, one on Pope Mountain, near Fort St. James, another on one of the Tremblay Lake Mountains, and the third on Mount Blanchet at the junction of the two arms of Tatla Lake. These mountains are all within an easy day's climb of the water, and command a view not only of the basin in which they occur, but also of a portion of the Nation Lake country.

As regards the Nation Lakes. There are at present no inhabitants in the country, and the transient visitors have been confined mainly to Indian Trappers, prospectors and land stakers. The danger from fire, therefore, is only occasional. Further, the major part of the green timber lies some distance back from the waterways, and so would be fairly free from danger. The greatest difficulty would be found in guarding the areas of thick, young Jack Pine which lie along the Manson Creek Trail, and it would need more than one or two men to cope with a blaze there, and to procure men from Fort St. James would take a week.
Little danger is to be feared from the Indians, who are desirous of preserving the forest on the few hunting and trapping grounds left to them. I should recommend, therefore, that a close watch be kept on all prospectors and land-stakers going into the Nation Lake country, that they may be warned that an explanation will be required from them of any fire occurring while they are in the district.

I should further recommend that the fire warden at Fort St. James be sent into the Nation Lake country, at least once in the season, preferably towards the end of the summer, and he should report on any violations of the rules and regulations of the Lands Department which may hereafter take place.

Two look-out stations should be established; one on a high hill just above Cariboo Camp on the Manson Creek Trail, which commands a view of the flat country of the Nation River down towards the Parsnip; another on the Nation Lake Mountain at the head of the Upper Nation Lake from which the country for many miles around can be seen.

The trails are good, and occupy all the strategic positions. No extensions, therefore, are at present necessary, but it would be advisable, perhaps, to cut out and thoroughly blaze the trails to the lakes of the Interior.

Forest Reserves.

At the present time, as previously mentioned, land to the south of a line joining Inzana Lake to Middle River is under a Government Reserve, which means that land can be acquired pri-
vately only by conforming with the pre-emption laws. North of this line the land is still open for purchase, and, practically, all the agricultural land, and some by no stretch of the imagination could be called agricultural land, abutting on the two lower Nation Lakes has been taken up.

The ultimate object of establishing a forest reserve in this country would be to secure a steady water supply for the rivers and lakes, to preserve the soil factors of the locality, and to make possible the conservation of a quantity of timber sufficient to meet the demands of the population which this section of the country will sometime, and a time not so very far distant, have to support.

This future increase of population is at the present time hypothetical, but none the less certain, but the other two objects are very real and pressing.

Lack of water the past summer had a very deteriorating influence on the crops around Stuart Lake, where the hay crop has been the smallest for years. Much of the potential agricultural land is a sandy soil which requires plenty of moisture, and often times irrigation. Whatever water is required will have to come from the mountains and higher hills, and if the winter’s snow disappears too rapidly in spring, as is bound to be the case when there is no forest cover, these creeks will either dry up or else run very low, at that time in the summer when their services are most needed. Furthermore, in the slackwater of the middle of summer, navigation is rendered incomparably more difficult, and log jams are formed which even the unduly high water of spring
cannot remove. The lakes also suffer.

Stuart Lake, which is naturally shallow at the lower end, has this summer receded 100 yards, leaving the long Hudson Bay Company's pier there, on which they rely for disembarking their goods, high and dry.

Soil erosion and deterioration is also a very real problem. Not only does the original fire, especially where twice repeated, burn a great percentage of the humus and mineral soil, but sun and wind combine to dry up and blow away much of what is left, and the freshets of spring cut great gashes through the hills. This is particularly noticeable around Tsaytbat Lake, where scattered stunted willows and alders are the only growth on country which was once timbered with, small sized, it is true, but none the less valuable spruce, jack pine and balsam.

I should recommend, therefore, that the greater part of the area explored be placed under a temporary Forest Reserve—temporary, in that such agricultural land as occurs within its boundaries be released when taken up by pre-emptors; but permanent, in that such land unfit for agriculture as occurs within the area be kept under forest reserve for all time.

The knowledge that a forest reserve has been established will tend to make people more careful, and so even if no more protection is given than at present the danger of fire will be lessened.

The recommended boundaries are as follows:

"Starting at a point on Stuart Lake S.W. of the triangulation signal on Pope Mountain they follow a north-westerly
course to the base of Tohán-Tsut Mountain; thence due east to a point one mile north of Middle River; thence in a northwesterly direction paralleling Middle River and Tatla Lake a mile inland, touching Tatla Lake at the 126th meridian; thence due north to latitude 55° 30' north; thence in an easterly direction to follow the watershed of Tsatatabat and Indahta Lakes to the triangulation signal on Nation Lake Mountain; thence in an easterly direction to the north of Lower Nation Lake and to Milligan Peak on the Nation River; thence southerly to include Horse-shoe Lake Mountain to a point due east of Nas-klo Mountain; thence due west to the base of Nas-klo Mountain; thence south-easterly to include Tazzen Lake, Lookout Mountain and Murray Mountain; thence N. of E. to the starting point on Stuart Lake, in all 3247 miles."

In addition there could be added to this reserve about 416 square miles, including the mountains south of Middle River and Tatla Lake, and a portion of the green timber to the south of Tatla Lake, together with Mount Blanchet.

Agricultural Land.

There are 544 sq. miles which may be called agricultural land, but it will be a very long time before the greater part of this is even put to use, and some of it will be too isolated ever to be used.

Half of this land lies along the Manson Creek trail, the remainder is fairly equally divided between the different sections of the area.
The greater part of the agricultural land lies along the numerous creeks which empty into the lakes. Along Ina and Tsayabat Rivers the soil is especially good, being a deep loam underlaid by a strata of clay.

Meadows in the western end of the district are neither so frequent nor so good as they might be. There are a number at the head of the Upper Nation Lake, and grazing could be obtained almost anywhere along the creeks.

On the trail from the head of Tsayabat to Tatla Lake there are a number of wet meadows. At the bottom of Lower Nation Lake there are extensive meadows, as also along the creeks running into the Nation River. Along the Manson Creek Trail areas suitable for grazing purposes occur at regular intervals, while 15 miles from Fort St. James, Grand Prairie, a bunch-grass country some 7 miles long by 2 to 3 broad is used by the Siwashes for wintering their horses.

Climatic conditions will prevent this country from ever being able to compete with the great wheat areas of the prairies, and the long winter in which the feed is covered with snow makes will eliminate cattle-ranching. Its agricultural future lies more in the raising of field crops, and in dairy farming.

The stable-fed cattle around Fort St. James were in very fine condition this summer. The crops, however, were not so successful, being very much affected by drought. In addition to the ordinary field crops, potatoes, turnips, beets, etc., they were raising Russian wheat, oats and hay.
Detailed Description of Area by Sections.

The district has been divided, more or less arbitrarily, for convenience of description and mapping into nine sections.

Lower Tatla Lake and Portage to Nation Lakes.

This section covers some 100 sq. miles of country. The north shore of the lower portion of Tatla Lake has been completely burned at different times. The oldest burn was from 25-30 years ago, and where the original timber, Spruce, Jack Pine and Balsam has been replaced by a fast growing crop of young Jack Pine. In the case of most of the latter burns the dead timber is either still standing or has fallen to form almost impassable windfalls. Regeneration of Jack Pine is also taking place amongst these, but not to the same extent as in the earlier burns. The land rises in an easy slope to the mountains.

The south side of the lake rises rapidly to the mountains 6000 feet high, which parallel this portion of the lake about six miles back.

The burn extends about 3 miles up the shore from the end of the lake, and cuts inland to the west shoulder of Crater Peak. This burn is from 10-12 years old, and the resulting windfalls have made the country most difficult of access. The green timber Balsam, Spruce, and Jack Pine, is apparently continuous for a long way up the lake, and, according to Mr. Swannell, stands back a long way towards Babine Lake. On the south shore of the Lake about four miles from the bottom there is a triangular area of 140 miles which averages 7000 feet B.M. to the acre.
The rest of the timber observed was on unfavourable situations, and in consequence mainly pulpwood size.

The portage to Nation Lake leads through 4 miles of burnt, broken country, after which green timber, of a kind, is fairly continuous, except for patches which the fire has invaded, right up to First Lake.

The trail, following the creek for the major part of the way, has very good grades, and it would be a matter of ease to connect the Nation Lake country with attila Lake by a road through here. The creek is quite unsuitable for driving.

In this section there are 1800 acres of virgin forest, divided as follows:

South Aspect Type,

140 acres with 7000 ft. to acre 980,000
640 " " 4000 " " 25,040,000

North Aspect Type,

9400 acres with 2000 ft. to acre 16,800,000
43,620,000

Mountain Slope type 2000 acres,

About two-thirds of this is practically inaccessible.

Wasaytabat Lake:

This section includes the country around Wasaytabat Lake, to a point 8 miles from the head of the lake and including the lands around Wasaytabat Creek, altogether about 156 sq. miles. Practically three-quarters of the area has been burnt over.
Two fires have been at work; one about 45 years ago cleared up most of the north shore, and was followed by heavy regeneration on the part of the Jack Pine. A second fire 25 years later burnt up a large portion of this regeneration, and crossing over to the south side of the lake, swept away practically all the timber there except on the higher hills and the mountains. The original timber was good along the shores of the lake as shown by the few sticks of Spruce and Balsam left, but higher up nearly every dead stick shows either shake or special growth.

The south shore is for a long distance precipitous and everywhere rises rapidly to the hills, which shut in the lake on this side. The north side as a whole has a gradual ascent. The hills above form an extended series of hogbacks, with their long axes towards the lake.

At the head of the lake a trail leads due west presumably to Fatla Lake. It passes through a broad, broken valley timbered with Jack Pine as far as the eye would reach. This pine was all pulpwood size, 8 to 10 cords to the acre.

At the lower end of the lake there were two small areas of timber, one 700 acres averaging 8000 to the acre, another of 400 acres with 6000 feet to the acre.

Essaytabet Creek runs through country which is fairly level to the north, but rises to hills on the south side. A Jack Pine bench follows the general course of the creek about half a mile to the north. A few green sticks along its course is all that is left of what was once fine timber.
Statement of Timber on the Area.

**South Aspect and Plate Type:**

| Acres | Feet per Acre | Total
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>700</td>
<td>8000</td>
<td>5,600,000</td>
</tr>
<tr>
<td>400</td>
<td>6000</td>
<td>2,400,000</td>
</tr>
<tr>
<td>1200</td>
<td>3000</td>
<td>3,600,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11,600,000</td>
</tr>
</tbody>
</table>

**North Aspect Type:**

- 10,800 acres with 2000 ft per acre
- Total 21,600,000
- Total 22,800,000

**Mountain Slope Type:**

- 9,800 acres
- Total 44,800,000 feet B.M.

Only the 11,600,000 foot of the South Aspect Type is at easy to reach.

### Indata Lake

This section includes Indata Lake and its watershed with a strip about 6 miles wide extending west to the big range of barren mountains.

Here again fires have been very active, and practically the whole of the area back to the base of the mountains has suffered.

On the east shore of the lake there are still 1200 acres of poor Jack Pine and Spruce standing. Elsewhere a fire
of fifteen years ago swept the land in the immediate proximity of the lake. East of the north end a dense stand of 50 year old Jack Pine extends back to the northern limit of Nation Lake Mountain.

To the west of the lake a range of low hills; beyond lies a broad valley, through which flows a large creek. This valley is covered with a dense growth of young Jack Pine and Poplar, but approximately one-fifth of its area is taken up by meadows and willow bottoms.

The mountains which border this valley on the west have their lower slopes still clad with a heavy growth of Balsam, Spruce and Pine.

About one-tenth of the green timber which still remains is within the scope of possible logging operations.

Indata Creek runs through some very good land, covered with young Pines, Poplar and Willow.

Here there are a number of meadows and open prairies.

Statement of Timber:

<table>
<thead>
<tr>
<th>South Aspect Type</th>
<th>1200 acres with 4000 ft. to the acre</th>
<th>4,800,000 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Aspect Type</td>
<td>7100 &quot; &quot; 2000 &quot; &quot; &quot; &quot; &quot; &quot; 14,800,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19,000,000</td>
<td></td>
</tr>
<tr>
<td>Mountain Slope Type</td>
<td>11700 acres.</td>
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</tr>
</tbody>
</table>
Upper Nation Lake and First Lake.

Taken as a whole there is a large expanse of fairly open country around the lake. Only at the extreme east ends of the south shore of the lake do the hills come down to the water's edge, elsewhere the ground rises gently for miles inland. Nation Lake Mountain, about 5,500 above the sea, lies some 4 miles to the north west of the lake. On the other side of this mountain the burns have been extensive, but a large area of land on the hill side is still wooded. Still further back burnt country alternates with wooded as far as the eye can reach. The hills to the south west of the lake rise to from 1000 to 1200 feet above the level of the lake (altitude 3500 to 3700 feet) and run along parallel to First Lake. The mountains to the south east end run back in a southerly direction for from ten to fifteen miles. The only important stand is on the north shore of the lake, about 4 miles from the head. Here Spruce, Balsam and Pine runs for over a mile inland, and for several miles along the shore of the lake. Where the soil is good and spruce predominates the timber is good, and averages 6000 to the acre, but on the larger portion where Jack Pine is almost pure the stand is almost of pulpwood size.

At the lower end of the lake and along the river connecting with Lower Nation Lake green timber occurs again. This runs for about a mile and a half inland to the north and southwards for about ten miles though frequently penetrated by burns.
On first Lake the south end was burned about 25 years ago, and there is now a sparse mixture of Jack Pine with a few spruce, alder and willow growing up.

On the west shore of the lake there is over a section of timber running from 8000 to 10000 feet. On the opposite side the timber is branchy and poor with a much higher percentage of balsam. Nowhere is it in a healthy state, and the majority of the trees are going rusty at the top and dying. The stand here averages 3000 feet to the acre. The creek connecting this lake with Upper Nation Lake can be easily made suitable for driving logs 1040 feet in length.

Growth of the young Jack pine here is about 6 inches in a year.

| 640 acres with 9000 feet per acre | 6,456,000 feet  |
| 1360 " " 8000 " " | 10,800,000 " |
| 13000 " " 3500 " " | 45,500,000 " |

North Aspect.

17000 acres with 3000 ft. per acre 81,000,000

115,760,000 X

113,060,000

About 60% of this could be easily logged over.
Lower Nation Lake and Portion of the Nation River.

This Lake is very much shut in. High hills and mountains parallel both shores at an average distance of from two to three miles back, and at the east end of the lake come down in high bluffs nearly to the water edge on the south shore of the lake.

Three passages lead through the chain of hills; one at the northwest, which leads in a northerly direction for miles; another nearly opposite goes magnetic south to Inza River; and a third which the Manson Creek Trail follows runs in a northerly direction from the east end.

On the immediate shores of the lake there is a greater percentage of green wood than on any of the other lakes. On the north green timber, spruce, balsam and Jack pine, follows the shore about 8 miles and runs back to the hills behind. Along the shore this timber is for the most part poor, but further up on the hills there are some fine sticks of spruce and balsam.

The east end of the south shore of the lake has been burnt up to Lot 2675. From there on the shore is green, and for the forest extends back from one-half to three-quarters of a mile as far as Lot 2678, where it runs back for three and one-half miles.

At the lower end of the lake there are about 600 acres running from 7000 to 10000 feet per acre. For the rest fire has swept the country clean for 20 miles down the Nation River at least.

The Nation River is a shallow, rapid stream at first
about 100 feet wide but five miles down deepens and becomes less swift. Its banks and the country to the north and south are clad with a thick growth of Jack Pine of an age ranging from 15 to 40 years. The greater part of the river basin can probably be classed as agricultural land.

Statement of Timber.

South Aspect and Lowland:

600 acres with 8000 ft. to the acre = 4,800,000 ft.
12,100 " " 4000 " " " = 52,400,000 "

North Aspect:

11,300 acres with 2000 " " " = 22,600,000 "

Total = 79,800,000 "

75% of this is within easy reach of the lake.

Upper Manson Creek Trail and Portion Inzana Trail.

The Manson Creek Trail is a good pack-horse trail of some 40 years standing, and it has recently been cut out and put into good shape by various parties who have been over it. It was originally put in to bring supplies from Fort St. James to the Omineca Mines of Manson Creek and Germansen. The trail location was a Siwash, and in consequence it rarely leaves the creeks or ridges.

The making of a few cut-offs would shorten the trail and eliminate some of the worst grades, but on the whole the gradients
are so good that a waggon road could be built without departing very far from the course of the present line of communication.

Of the 1775 square miles included in this section, 170.75 have been burnt leaving 4,300 acres of virgin forest, the whole of which is in the south west portion between Manson Creek and Insana Lake trails.

The rest of the section has been devastated by two fires, one 40-45 years ago, and another 20 years later. The burnt areas are almost everywhere covered by a vigorous young growth of Jack Pine the development of which has been in a number of instances remarkably rapid. Stands 40-45 years of age are 50 to 55 feet in height and show an average diameter of 5 to 6 inches. If the present rate of growth continues another 5 years will see a large quantity of pulpwood and a very considerable number of ties. A thinning out of the stand is necessary.

Tyzana Lake Trail branches off the Manson Creek Trail about half-way between Fort St. James and Nation River. It is 12 miles long, is used entirely by Siwashes, but makes a good pack-horse trail. Regeneration on this portion of the area consists mainly of 40 year old Jack Pine with some areas of very good timber.

**Lower Manson Creek Trail.**

This is the portion of the trail extending from Insana Lake trail junction to Stuart Lake with the country on either side to a distance of from 4 to 5 miles.
This portion of the trail passes through broad, level country divided into three sections by Lookout and Murray Mountains. The first section north of Lookout Mountain resembles the upper portion of the trail in the country, being somewhat broken, and the soil ranging from gravel to sandy loam. The section between Lookout Mountain and Murray Mountain is level with a good loam soil and a fair amount of muskeg. The section south of Murray Mountain is hardly as level as the preceding section, but the soil is everywhere good, and there is no muskeg. This area includes a portion of Tezson, Pinchi and Stuart Lakes.

Lookout Mountain and Murray Mountain rise rapidly to from 600 to 1000 feet above the surrounding country. They are both due to volcanic disturbances, and the basic rocks of which they are formed have weathered to produce a deep, black loam.

The greater part of the green timber in the area is found on Tezson and Pinchi Lakes, and that on Tezson has been mostly taken up in timber limits.

On Murray Mountain there is approximately 2000 acres of fir, but it is only the remains of what was once a fine, heavily-timbered fir stand. Even yet in patches the fir would average 15,000 feet to the acre, and as a rough estimate, the estimate average stand per acre for the 2000 acres may be put at 6000 feet.

The timber area on Tezson and Pinchi Lakes are reported to be well over 5000 feet to the acre.

There is only one other stand of timber, a small one between Bestlay and Chuz-Koop-Ah Lakes on the Manson Creek Trail,
where Jack Pine has a preponderance of about 70% to the Spruce and Balsam's 30. This is about 500 acres in area.

**Insana Lake.**

Two ranges of high hills and mountains circumscribe the eastern and middle portions of the lake, but at the lower end the country opens out to Lower Nation Lake in one direction and to Tremblay Lake in the other. The lake itself is 15 miles long, running in a direction slightly north of west, and from one end it is very nearly possible to see the other. A creek runs west from the bottom of the lake, and eventually drains into Middle River.

Not a vestige of green timber remains on the north shore to mark what was once a thick balsam forest. This burn has been very extensive, going as far south as Tremblay Lake. The fire swept through here from 10 to 12 years ago.

The north shore has also been the scene of two big fires, one from 50 to 60 years ago, which extended back nearly to Lower Nation Lake, and a second one of the same age as the fire which swept the south shore. There are, however, still some areas left untouched by fire—altogether about 3000 acres. Of this area 3900 acres have from 5000 to 10000 feet, while 41000 acres have less than 5000 feet to the acre.

Regeneration on the old burn consists of Jack Pine, Poplar and Spruce in about equal proportions. Very little reproduction has taken place as yet in the younger burns.
Lost Trail.

A trail was cut for 15 miles in a S 50° W. direction from Cache Bay, Lower Nation Lake, in an endeavor to reach Inzana Lake, but had to be abandoned, having gone much too far west. The mistake was due to the misleading character of the old Government map. From the five mile camp on the trail leads through virgin forest for nearly ten miles. Part of this is small Jack Pine, but there are over 11,000 acres of Spruce and Balsam which runs from 8000 to 10000 feet to the acre. Of the Jack Pine there is about 16000 acres. The burn runs around this area, and is generally visible on the tips of the hills which shut in the creek whose course the trail follows. This creek has an average of 15 feet width, and might be used for driving small logs.
Appendix I.

The Unexplored Lands of the Area.

These include:—an area in between Lower Nation and Inzana Lakes and an area embracing the western ends of Teazon and Pinchi Lakes and running in a northwesterly direction along Stuart Lake, Tremblay Lake and Middle River, and running from 15 to 20 miles back from these waterways.

Facts relative to the conditions which obtain in this country have been obtained from surveyors and local guides, and topographical observations have been taken from the two mountains on Tremblay Lake, and from Crater Peak on Fatla Lake. The figures given below then will be only approximate. 50 sq. miles will supply the acreage of timber which is left on the 1400 sq. miles. 100 sq. miles will probably be taken up by water, and the remaining 1300 sq. miles will be the area burnt over, fully half of which will ultimately prove to be agricultural land.

The principal timber areas are located on Pinchi and Teazon Lakes, with a small area on Tatchi River, and are as on the hills near Alexander Lake.

Regeneration on the burnt lands consists of Pine and Poplar, with Poplar predominant, showing that the soil is fairly good. The country is mainly low, the only two mountains of any size being the two on Tremblay Lake. For the rest, the lands along the lakes and rivers are fairly flat, and two large, flat tracts
run north, one from Stuart Lake to Insana Lake, and another from Middle River to Upper Nation Lakes.