236
STUART LAKE
R. A. FISHER
1924
RECONNAISSANCE

of

STUART LAKE.

--- 1924 ---

R.A. Fisher.

Reconnaissance File 236
Correspondence File 053023
Also File 051181.

Maps:
See Page 38.

3 Soil Types
20 Chase = inch

Mape
2 Type and Topographic
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Looking up Stuart Lake from
Ft. St. James.

Country looking north from Ft. St. James
Pack train in foreground.
THE PROJECT

South-east of Stuart Lake in Central British Columbia is a large area of comparatively level land with good soil and forming, judging from the tree growth, one of the most promising agricultural districts in British Columbia. This area was surveyed in 1913 and 1914 when some preemptions were taken up, but no extensive settlement took place and it was reserved in 1918 for soldier settlement purposes. Some further settlement took place in 1919 and 1920 under the direction of the Soldier Settlement Board, but most of these holdings have been abandoned. As there were still a considerable number of applications for preemptions coming in from private individuals for lots in the area, it seemed desirable that a thorough investigation should be made into the agricultural possibilities to determine whether further efforts should be allowed at settlement at this time; and to set the boundaries of land that should be devoted to timber production for this purpose a reconnaissance has been made of the whole Stuart Lake area and all the land in the large reserved area south-east of the lake along the Stuart and NecoSlie Rivers. This work, while of an extensive nature, definitely sets the limits of good soil and for a large area in the south-east of the reserve a semi-intensive examination has made possible the preparation of cover maps. A complete report is herewith submitted:
Subdivision of the Area:

Before beginning this report it would be well to acquaint the reader with the nomenclature used in describing the various areas in the vicinity. For convenience, a reference map has been attached and if the reader will refer to it now, I will endeavour to acquaint him briefly with this.

J.H. Gray, who subdivided and reported in detail on a large part of the reserved area immediately surrounding Fort St. James in 1913, divided the land he covered into three groups for convenience, which we have adopted with one addition in this report. All unalienated land west of the Stuart River and as far south as Lot 2309, he called Group A (colored yellow on the map). All the land east of Fort St. James and, roughly, north of a mountainous hill running south-east from Fort St. James he called Group B (colored green on the map). Land south of Group B, which he mapped he called Group C (colored purple on the map). Other land in the reserve south of Area C has been designated Group D (coloured buff on the map).

For convenience we have referred to these groups of lots as areas, viz.: A, B, C, and D. On the reference map all lots alienated at the time the party took the field are left uncolored.
Hudson's Bay Post, Ft. St. James, looking north-east.

Movements in the Field:— (intensity)

Just previous to leaving headquarters it was decided that the semi-intensive mapping done by J.H. Gray was all the information we required on the area it covered from a Forestry point of view. So it was decided that areas A, B & C should be covered only in an extensive manner to serve as a check on his information on soil.

On moving in to Fort St. James the party spent the first three days, prior to the arrival of the cook-packer and pack horses from Vanderhoof, in making an extensive examination of Areas B. We had been forced to go on without him owing to the fact that the arrangement to
rent horses at Engen made by the District Forester had fallen through. We were therefore forced to leave to Mr. Reid, the cook-packer, the obtaining of our horses. He had some difficulty in obtaining even promising pack horses at a reasonable price at such short notice. It might have been better business to have arranged with Louis Cohzy in the first place (at Ft. St. James) to get reliable horses from him even at his higher price, considering the trouble and expense two of these hastily obtained horses cost us. He does all the packing for miners going into the country and his horses are well known there.

The examination of Area B consisted of a "pace" traverse of a hay road running in a north-easterly direction from Ft. St. James and returning through the southern part of this area. The traverse is shown as a dotted line on the reference map. Three strips were run up survey lines at needed points where we were doubtful of the extent of the first class land. One more strip could profitably have been run through the north-east corner of the area, but time did not permit.

The evening of our return Mr. Reid, the cook-packer, arrived with the horses and the following day we set out to make an extensive examination of Area A, having
as a secondary aim the sizing up of our pack horses and getting a little practice before moving down into Area D where we would be fifteen to twenty miles from our base of supplies. A very suitable camp site was obtained in lot 1956.

As a result of the information gained it was decided to cover area A intensively later on if time permitted. To make this possible a second compassman was engaged locally. Because of the scattered nature of Gray's work in area C and the rather extensive information supplied as indicated from the work carried out, it was decided to cover all the unalienated land in the area with a two-strip-to-the-mile examination before proceeding to Area D. The party, therefore, moved down to Lot 1264 and made examinations of most of the lots in the area. Some were left to be done on our return, as it was calculated that the horses could not make the full trip back to Lot 1666 in one day, and it would, therefore, be just as well to camp in the vicinity a day or two on our return.

The party then moved down and camped at various sites in Area D until all the first class land had been examined with the exception of some inaccessible areas along the Stuart River.

The first class land in the area was covered by a two-strip-to-the-mile examination, the remainder in an extensive manner.
On returning to Lot 1656 after completing the work in Area C, it was found that Mr. Held of the Land Settlement Board was making an examination of Area A, running four strips to the mile to set the boundaries of light poplar and willow land that could be easily cropped. Although he was making no soil type or topography map, it was thought inadvisable to examine this area further, and as soon as the pack horses could be satisfactorily disposed of and a suitable boat obtained, the party commenced the extensive work on Stuart Lake, winding up the season's work by a trip down the Stuart River to examine inaccessible areas along the shore. All the areas of promising land around the Lake were examined and mapped extensively to a distance of four or five miles from its shores.

(C)LI(MATE.

(1.) Field Methods:

To one who is familiar with the conditions in the interior of British Columbia the total precipitation is the climatic characteristic of first importance. Meteorological records at Ft. St. James for over ten years give an average total precipitation of only 15.75 inches, of which only 2.56 fall in June and July. In the beginning I was, for this reason, rather doubtful of the economic possibilities under present conditions. However, it was considered that this
rainfall might be of local application only, and the economic possibilities would, in the final analysis depend on the soil in any case. It seemed very desirable, however, to gain all the information possible as to local climatic characters at the various camp sites. It was therefore decided to record all appreciable showers and the daily extremes of temperature for comparison with the records at Ft. St. James.

For this purpose a maximum and minimum thermometer was obtained and readings taken every morning before starting work. This thermometer was left with Mr. Murray of the meteorological station for a week at the end of the season to be read and compared with the tested instruments. It was found that it read from one-half to one degree higher as a rule but was comparatively accurate otherwise, and therefore satisfactory. In computing the light frosts allowances have been made for the slightly high readings accordingly.

(2) Rainfall:

But before beginning a discussion of information obtained in the field it would be well to acquaint the reader with the relation between precipitation and successful farming in Canada. It is very difficult to set the limit of total precipitation at which farming will fail owing to the many variable conditions on which this depends. The chief of these are the nature and time of the precipitation, the humidity of the air, summer temperatures, winds
and their nature, and the physical condition of the soil. While one authority claimed that as little as twelve inches was sufficient if the above conditions were very favorable, most agree that farming is usually comparatively risky if there is under fifteen inches, and is not promising unless there is over sixteen inches.

From precipitation maps compiled by the Department of Interior it is readily seen that an average prairie precipitation for the six months April to September inclusive is 11.2 inches, of which 5.6 fall in June and July. This is an inch more for June and July than the average precipitation in the lower Fraser Valley for this period, and, indeed, would be considered very satisfactory for a large part of the coast, and the prairies are known as dry farm areas. This heavy rainfall during the active growing months helps to make up for the low total for the year, and, in my opinion, is indirectly responsible for the high content of humus in prairie soils. At Ft. St. James there is only a fall of 2.56 inches for the period of June and July, and a total of 7.62 inches for the six months mentioned. It will, therefore, be found very dry in the immediate vicinity of the Fort, but, as will appear later, I believe we can expect a little more rain on the higher ground.

(3) Temperature:

So far we have confined ourselves to a discussion of rainfall. We must now consider the temperature characteristics. On close scrutiny the Meteorological Records
lead us to believe that the season will be three weeks later and shorter than that in the park belt just north of the Canadian prairies. The mean temperatures are five degrees lower at Ft. St. James for June, July, and August than they are at Prince Albert and Edmonton even by the earliest records, and four degrees lower than they are in the Peace River District. As much success with the more heat-loving plants should not, therefore, be expected. Winter lasts from the first of November to the first of May with occasional cold snaps when the thermometer drops to forty degrees below zero.

(4) Field Observation:

After careful study of the figures no consistent or otherwise indicative variation in the maximum temperature were observed at any site in the vicinity, but on certain days there was a difference of as much as fourteen degrees between the reading at camp and at Ft. St. James.

One of the handicaps to be encountered lies in the prevalence of the summer frosts. There were fourteen days on which frosts occurred in the reserved area from May 26th to August 5th as compared to the seven at Ft. St. James, so that generally speaking we can count on twice as much frost on the high ground in the reserved area before it is cleared as around the lake. Only five of these frosts however, were heavy enough to seriously injure
the hardier crops when well established. These occurred on May 27, June 9, 21, 23, and August 4 in the reserve as compared with the four on May 28, June 21, 23, and August 4 at Ft. St. James. Thus we see that there were four widespread killing frosts.

While it is realized that the information on rainfall is rather meagre, I am giving it for what it is worth, as this feature is going to be the controlling factor in the vicinity. It was found that a heavy rain struck Ft. St. James on June 1st that did not fall on Lot 1656. On the 5th and 6th rain fell on Lot 1656, but only on the 5th at Ft. St. James. Up the Nescalie River Valley information tends to show that there were fewer showers which were of a heavier nature than at Ft. St. James. In the first part of July there were two showers at Ft. St. James, while at Lot 898 this rain fell on the 7th, 8th and 9th and was of a heavier nature. Around the lake no difference in rainfall was noted, there being none from the middle of July to the middle of August.

(5) **Possibilities of Irrigation:**

As the area is very dry irrigation would be desirable. But the lie of the ground and the small number of brooks does not promise much for help from this source. The land is usually much above all sources of water.
Summary:

From field observations I would expect 16-17 inches total precipitation in Group A and for a large part of the reserved area, but in a small area in the vicinity of Lot 4035 in the upper Necoslie Valley I would expect between 17 and 19 inches. However, there will be some shortage of rainfall and with the summer frosts the climate is not over promising. However, it should allow of successful dairy and mixed farming if the settlement was sufficiently well planned and carried out. Haphazard scattered effort, however I believe will fail at this time.

TOPOGRAPHY.

(a) Method of Examination.

In the Stuart Lake project several departures were made from the usual method of tabulating topographical information. It was considered that a contour map in such extensive work would be of little use, and, at the suggestion of Mr. St. Claire, it was decided to depend largely on arrows to indicate the general slope. These were to be obtained and mapped by the aid of the Abney Clinometer at every eight chains. They were put in for the purpose of showing general slope and not short individual slopes except where no confusion would result. It was considered, however, that some information on elevation was desirable
both from the view of air drainage and from that of soil type, so that I decided to make the best contour map we could by the use of Aneroid barometers.

Above photo gives an idea of the level nature of the country looking south from Ft. St. James in Area A.

Contours as indicating the lie of the ground with regard to its suitability to various cultural operations have always, however, in my opinion, left something to be desired, and even the use of slope arrows does not give the boundary of the steeply sloping land accurately, I, therefore, decided to take arbitrarily as a topographical type all land with a gradient of over 12% slope, and map it on soil type maps by the use of cross hatching. It is interesting to note that the steeply sloping type corresponds in
many cases with a gravel outcrop. Along the Stuart River it is largely confined to steeply sloping river benches that are usually much steeper than 12%. The topography was mapped on all strip lines run, but in the extensive work not all this information could be connected up.

(b) **Nature of the Country:**

The land in the reserved area is of a very level even surface as a rule once you get away from the Lake and the rivers and streams with the exception of mountainous hills along the borders of the surveyed land. The streams have all cut deep channels into the soil.

Just east of Ft. St. James in Area B is a steeply sloping valley as is shown above in the photo looking north across Lot 4762. The land gets flatter as you travel east. Note the mountain bordering the area on the
north. The photo was taken from the southern hills.

Above is a natural meadow in Area B on Lot 961 looking north. The broken country just east of Ft. St. James will likely delay the development of area B slightly beyond that of Area C. This is of comparatively even surface with the exception of the promontory on the north shown on the soil type map and the deep valley cut by the Necoslie River.

Around Stuart Lake the mountains usually come almost to the shore with the exception of the land in the reserve, some lands between Pinchie and Tache, and some land opposite this latter area on the south shore.

The lake is extremely picturesque and is bound to become a very popular campers' resort with its many wooded islands. The southern hills along its slope give the impression of being of volcanic origin and resemble
pictures of landscapes in the Mediterranean.

The lake was taken as being 2200 feet above sea level, and on this basis most of the good land in Areas A and B is between 2400 and 2500 feet above sea level, while in areas A and C part is between 2300 and 2400 feet. A further discussion of this point will be taken up under soils.

Before passing it would be well to call attention to the general beauty of the country. All members of the party were struck with the beauty of the Nesolsie Valley, with its winding course choked with waterlilies and flanked occasionally with grassy meadows. And the whole country has more colour than many interior sections in British Columbia. It is perhaps for this reason that accounts have often been a little too rosy concerning the agricultural possibilities of the area.

FOREST COVER.

(a) Timber.

The land in the reserved area south-east of Ft. St. James is covered with lodgepole pine, poplar, and spruce in pure and in mixed stands, almost all of which are thirty-five to fifty years old. The spruce, however, is usually younger. One mature stand of spruce occupying about 180 acres was encountered in Lot 4087, this being the only mature timber in the area. It consists of 85%
spruce, 10% lodgepole pine, and 5% poplar. The survival of this stand seems to be due to a slightly heavier local precipitation, the contour, and the fact that at the time of the fire the stand was in a young and thrifty condition.

A forest cover map has been prepared for Area D, but due to the fact that, even in this semi-intensive work, the cruise lines were placed forty chains apart it was difficult to set the limits of small areas of the various types as they were very irregular in outline and no distant vision was permitted. A four-strip-to-the-mile examination would have been very desirable for this and other reasons, as I pointed out last spring before leaving headquarters, but it was thought that the added cost involved was too
great.

The cover over the whole reserved area is very similar in quality from the forestry point of view to that disclosed by the maps of Area D except that in Area D is the only large heavy recent burn.

Typical gravelly burn west of Margaret Lake

Around Stuart Lake the cover is of much the same quality except that there are more pockets of timber that have escaped fire. There is one small patch of about three acres in Lot 2311 just east of the north-west corner post that would be statutory if it covered much area. The extent of this stand northward is not known, but is presumed to extend eastward part way into Lot 2309. Some good spruce was encountered in this lot, but it was of a more scattered nature on the one strip run.
A sample of the poplar-spruce type, but in which the spruce is a little too far along to be typical.

A clearing at Vanderhoof and in the background a stand of poplar typical of the lighter stands in the reserved area.
There also appeared to be some mature fir in the south half of Lot 4711 and extending eastward up the small mountain to the east. No other timber of merchantable size was encountered around the lake other than that enclosed in the timber licences.

(b) Cost of Clearing.

The cost of clearing is a variable quantity according to the methods used. I have endeavored to obtain figures on the labor required to clear land at Vanderhoof by the various methods on different types, but few settlers kept any record of the labor involved. Most had an idea that the poplar land cost $50.00 per acre where broadcast fire was not used. Mr. Pick at Vanderhoof showed me an average acre of poplar land he had grubbed out in twelve days. This would require another day or two at rootpicking. I believe it is safe to say that most of the poplar land could be grubbed in fifteen days and for the initial area I believe this is the best method unless the organic layer is deep.

The land on which the illustration station is situated was cleared by two successive broadcast burns and the "Outlay" was only $12 to $18 per acre.
This was heavy poplar land, the organic layer was deep, and the fires were put through when the soil was moist. Ninety-five bushel oat crops have been raised on this land and it accounts for the popularity of fire in clearing there.

Personally I would recommend grubbing, piling and burning for the land that is to be cleared at once if the trees are not too big. I would recommend that a big slash be made, cutting as low as possible, and the area pastured until the stumps loosen. Poplar stumps do not last over two years if they have not been burnt and are usually loose in one. Land could be cleared very cheaply in this way, almost as cheaply as with fire, and it would conserve the soil.

The pine land should not be cleared while there is any poplar-spruce land left unless the pine is very scattered or small. The spruce reproduction is small and will be a minor part of clearing. Average pine stands will cost between $75 and $100 per acre to clear at the present time.

For success settlers should make a big slash as soon as possible in spare time to give the stumps a chance to loosen.

(c) Fodder in the Country:

Samples of all the plants encountered in quantity were taken and identified. Practically no vetch
or peavine was encountered in the Reserved area, but there was red top and brome grass in odd meadows as well as some bunch grass. Generally speaking, however, forage will be limited to fireweed, pinegrass, and small bushes. Some areas of sedges will yield a coarse quality of hay. Two very fine meadows were encountered on Lots 898 and 320 in which there was a slight admixture of peavine. These, however, are unfortunately alienated at the present time. A list of plants encountered is attached.

**List of Plants encountered in the Stuart Lake Area.**

<table>
<thead>
<tr>
<th>Bunch Grass</th>
<th>Meadow rue</th>
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<tr>
<td>Brome</td>
<td>Beard tongue</td>
</tr>
<tr>
<td>Red top</td>
<td>Artemisia</td>
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<tr>
<td>Canary Grass</td>
<td>Virgin's bower</td>
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<tr>
<td>Fine grass</td>
<td>Rumex</td>
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<tr>
<td>Carex canescens (sedge)</td>
<td>Sanicle</td>
</tr>
<tr>
<td>Carex exicicata (sedge)</td>
<td>Solomon's seal</td>
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<tr>
<td>Triglochin pelustrus</td>
<td>Queen's cup</td>
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<tr>
<td>Heartleaved arnica</td>
<td>Mother's bedstraw</td>
</tr>
<tr>
<td>Sasparilla</td>
<td>Cinquifoil</td>
</tr>
<tr>
<td>Various orchids</td>
<td>Poison parsnip</td>
</tr>
<tr>
<td>Common bushes:-</td>
<td></td>
</tr>
<tr>
<td>High bush cranberry</td>
<td>Wild rose</td>
</tr>
<tr>
<td>Alder</td>
<td>Willow</td>
</tr>
<tr>
<td>Soopolallie (Soap Colalie)</td>
<td>Saskatoon berry</td>
</tr>
<tr>
<td>Fly honeysuckle</td>
<td>Flowering dogwood</td>
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The commonest underbrush is composed of soopolallie, high bush cranberry and rose bushes. But in the thick stands of trees there is little brush except near the Lake.
SOIL

Methods of Examination:

Soil type maps have been made of the whole Stuart Lake Area, and numerous representative samples taken and examined physically, and four representative samples analyzed completely chemically. We are therefore in a position to set the boundaries of the types positively and give considerable information concerning their value.

Before launching into a discussion of the soil types it might be well to discuss our field methods. This year the magnitude of the work necessitated the employment of a third year student of Agronomy at the University to assist in soil mapping. In Area C and on the promising land on
Area D strip lines were placed at forty-chain intervals, run in cardinal directions, shallow soil examinations at every four chains on these lines and deep examinations at every eight chains. In this way we have a definitely located series of points at regular intervals all over the area at which soil examinations and notes have been made.

Soil survey as carried out in other parts of the world is not of one standard of intensity, it being left to the judgment of the soil man as to how many strips are needed to set the boundaries of the types. This will depend, as in the case of the geological survey, on the heterogeneity of the types. Our intensity seemed to be as great in most cases from a broad soil type point of view as the increased efficiency would justify on the area covered. But it would have been desirable to have had strip lines at every twenty chains in order to accurately set the boundaries of the areas of poplar, willow, alder and cottonwood lands, which were well supplied with organic matter and nitrogen and comparatively easily cleared. The greater intensity would permit of a finer division of the soil types also. Forty chains is quite an interval to connect up type lines on such level ground, and increases the office work considerably.

In the extensive work we used the method used by other workers running strips just often enough to set the
types but at no regular points. Our aim in this work was to group the soil into broad physical types only. All strips were run in cardinal directions and plotted on a map to show their locations and intensity. The work accurately fixes the limits of the agricultural land, gives much information as to the average quality, and perhaps will be more popular in the future owing to the very small cost.

Origin.

The heavy soil in the Stuart Lake area is a still water deposit. Stuart Lake seems to have occupied a greater area at one time than it does at present and extended at least as far south-east as areas A and C. These areas may have some individual characteristics for this reason, although I believe that when the soils were deposited the lake extended much further south-east. I would not be surprised if considerable volcanic dust were present in the deposit. It would help to account for the rich mineral content. But no definite indications were found to this effect.

The soil appears to be of largely glacial origin and on large areas in the upper Necoslie Valley considerable gravel was deposited. It also appears to have originated from a diversity of rock materials that would require the full time of a geologist to investigate and which we had
not much time to consider. Considerable rock rich in lime was encountered however and I believe has been a considerable constituent of the soil.

Types Encountered:

(a) The Clay Types:

Most of the comparatively level land in the Stuart Lake Area is covered by one type of soil but of a quality modified to a large extent by the number and severity of forest fires. This is a heavy clay soil that at the time it was deposited seems to have been very fertile indeed, but at the present time is not usually very rich in humus. Its average physical content is $\frac{3}{8}$ sand, 10% silt, 30% clay, 60%. In places, however, it is almost unrecognizable from the result of burning. The badly burnt areas have been separated as a type on the soil type maps of Area D. They have more the physical appearance of silt than clay and seem to have largely lost their water-holding capacity temporarily. The burnt soil usually does not go down over two feet on these areas and except for the absolute lack of humus and nitrogen the soil might be all right. In Areas A, B, and C the soil seems to have partially recovered or the burn was not as severe. In area A the soil is most promising. Although three analysis unitedly indicate that the type will be rich in potash and in most cases rich in phosphoric acid, there will be some variation in this
constituent. A sample from Lot 1655 was very rich in phosphoric acid while one from Lot 2788 was moderate in the constituent. A sample representative of the type at Pinchic was low in that constituent varied also. Time has not permitted an extensive investigation into this constituent which we believe will be found quite satisfactory in the reserved area. The lime content is good and the lime magnesia ratio, while it varies considerably, should give no trouble.

The content of humus and nitrogen over the whole area is low, but by plowing over the litter on poplar land a fair content can be obtained in the surface soil, as disclosed by an analysis on Lot 1655. A table of analysis follows.

(b) **Loam and Light Clay Loam:**

This type whose physical limits we have not set very definitely occupies a limited area in the river valleys and being of alluvial origin is usually richer in organic matter than the heavy land. It varies a little in different places, but is fundamentally a very desirable soil from the physical standpoint. It is neither too light nor too heavy. No chemical analysis was made of the type, but judging from other analytical work it will be rich in minerals and usually fair in organic content.
(c) **Sandy Loam:**

All the sandy soils of fairly fine texture have been grouped into one class "Sandy Loam" for ease in mapping, but there is considerable variation in this type. However for general farm practice it will all have the property of being light in working and without seepage rather dry accordingly. It is usually confined to the river valleys and is of alluvial origin.

Only one sample of the type was analyzed chemically. It was very rich in phosphoric acid, comparatively rich in potash and good in lime and magnesium contents. The organic matter content however was low in this sample. Under the dry conditions it will often be found best to clear the heavy land first, depending on the cover.

(d) **Gravelly Burnt Clay:**

This type is of varying quality, it being impossible to subdivide it further in this extensive work. Generally speaking it would give good pasture, but for some time likely not justify intensive tillage. In physical and chemical qualities it will likely resemble the other clay types but be slightly lighter in working and poorer in organic content.

(e) **Muskeg:**

Considerable areas of old bog or beaver swamp are now covered with sphagnum moss, stunted spruce, and associated plants. Vegetable deposits are gradually being built up and
are of varying depths. In these deposits the particles are large and have only begun to decay. The moss is still very loose and usually very wet. This type will be useless except as a means of holding moisture for some time to come.

(f) Peat:

This type is confined to more mature vegetational deposits that are compact and usually better drained. A study might reveal a slightly different early cover, but time did not permit us to investigate this point. The type will be tillable and samples tested are only slightly acid. There is good limestone in the district. One very good sample was taken on Lot 1631.

(g) Coarse Sand, Gravel, and Rock:-

This type is of practically no agricultural use and would be best used for timber production where it needs clearing.

(h) The extensive Types:-

In the work around Stuart Lake the clays, clay loams, and loams are taken as a type and the sandy loams and gravelly burnt clays as another.

Summary:-

In the main the soil in the area will be a heavy clay rich in plant food minerals and of good quality, but of an organic content depending on the type of cover. On
the poplar land the organic content will usually be fair in the surface soil and clearing easy. At the present time, however, it would not pay to clear land densely covered with pine, as the soil will not yield good crops immediately and the clearing is high. The presence of spruce reproduction indicates a healthy condition of the soil which is usually of moderate organic content and moist as the area goes. There is no land in the area with the exception of small areas of alluvial soil that could be called good or rich in organic matter or nitrogen for any depth. However, the soil is of good quality otherwise, and will likely be needed before a crop of timber can be grown. It would, therefore, be desirable to prevent the easily cleared areas from growing up to bush. But in planning settlement in the area we should realize that farms on the prairies both in Canada and the United states have been abandoned when the humus content became depleted.

RESULT OF ANALYSIS %

<table>
<thead>
<tr>
<th>Lot</th>
<th>Type</th>
<th>Organic Matter</th>
<th>Nitrogen</th>
<th>Potash</th>
<th>Phos.</th>
<th>Lime Acid</th>
<th>Magnesia</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Surface Soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1655</td>
<td>Clay (poplar)</td>
<td>9.4</td>
<td>.12</td>
<td>.80</td>
<td>.42</td>
<td>.80</td>
<td>.70</td>
</tr>
<tr>
<td>1655</td>
<td>Subsoil Clay</td>
<td></td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2786</td>
<td>&quot;</td>
<td>6.1</td>
<td>.07</td>
<td>.71</td>
<td>.16</td>
<td>.50</td>
<td>1.11</td>
</tr>
<tr>
<td>3023</td>
<td>&quot;</td>
<td>5.0</td>
<td>.05</td>
<td>.51</td>
<td>.05</td>
<td>.56</td>
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</tr>
<tr>
<td>4065</td>
<td>&quot;</td>
<td>2.4</td>
<td>.05</td>
<td></td>
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<td>2786</td>
<td>&quot;</td>
<td></td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1868</td>
<td>&quot;</td>
<td>4.2</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2781</td>
<td>Sandy Loam</td>
<td>3.5</td>
<td>.04</td>
<td>.32</td>
<td>.31</td>
<td>.40</td>
<td>.31</td>
</tr>
</tbody>
</table>
N.B. (A check run through at the same time worked out satisfactorily except that it was considerably lower in magnesia than given by Shutt.)

<table>
<thead>
<tr>
<th>Silica</th>
<th>Iron &amp; Aluminum</th>
<th>Lot</th>
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</thead>
<tbody>
<tr>
<td>73.2</td>
<td>16.2</td>
<td>1655</td>
</tr>
<tr>
<td>74.4</td>
<td>16.3</td>
<td>2788</td>
</tr>
<tr>
<td>77.6</td>
<td>14.8</td>
<td>3023</td>
</tr>
<tr>
<td>85.7</td>
<td>8.8</td>
<td>2781</td>
</tr>
</tbody>
</table>

Muskeg on Lot 4751, Area B
Looking South.

Experience with Crops.

While no real farming is done in the district at the present time, it has been found that all the common vegetables do well. Mr. Rosetti at Sauchi has grown tomatoes, beans, and cucumbers successfully in the open but there is not enough heat to fully ripen tomatoes. He has also grown oats quite successfully for feed as
has also Mr. Fraser of the Hudson's Bay Co. Frosts influence the development of crops very markedly and their ultimate growth at the end of a season perhaps will depend on the occurrence of frosts.

Looking up the north arm of Stuart Lake.
MARKETS

The markets for agricultural products are very limited at Stuart Lake at the present time and it costs 1½¢ per pound to bring freight up or take it out to Vanderhoof. The only products that could be produced and sold in quantity at the present time are butter, cheese, pork, and some poultry products. But under normal times it would likely pay to run a few head of beef cattle. It would cost 2¢ more per pound of butter to ship cream to Vanderhoof to be churned. But as all the expenses of shipment within a certain radius are pooled at the Vanderhoof Creamery this would make no difference to the settler.

The Vanderhoof Creamery established in 1920 made good progress up until the end of 1922, but during 1923 showed a slightly smaller total output. The plant is capable of handling much greater quantities of milk than are available. The overhead charges are high accordingly and it would greatly assist the farmers in the district if the production of milk could be increased.

The value of this market to the farmers will depend however on one thing,—the turning out of a consistently good quality of butter. This depends on the men placed in charge of the creamery. Although the price realized has been rather low as compared with prices in other parts of the province, they have meant a reliable source of income
Country south of Tache on south shores of Stuart Lake.

Tache Village and country looking North.
to farmers in the district and enable them to make steady progress.

There are seven months in the year when teams will be the only means of communication with Vanderhoof, as the road is impassable to cars owing to the snow and the soft condition after the thaw. This is a great drawback and doubles the cost of freight. However, it corresponds to the period of low dairy production and will soon be remedied when settlement has been proven successful.

Areas B and C have rough roads connecting with the Vanderhoof road near Ft. St. James, but area D is entirely isolated except for trails. A road in this area near the Stuart River would be very costly owing to the steep benches and numerous deep canyons. When this area is opened up a road will likely have to be built direct to Vanderhoof from the old ferry point at Lot 2786.

ECONOMIC POSSIBILITIES.

(a) Agricultural

Having examined and studied the evidence at hand it appears that there is a good likelihood that dairying and mixed farming will be successful. Farming would be of a fairly extensive nature and to make a living I believe seventy or eighty acres of cleared land will be needed by each family. It will be necessary that each family have some capital in order that the farm may be
got into a producing state as soon as possible. Under the last heading, "Settlement in British Columbia," I will discuss means that I believe would succeed here and elsewhere in B.C. It should be borne in mind however, that improved land can be bought on the prairies and in Ontario for $50. to $60. per acre, and at Vanderhoof often for $25. to $30. It would therefore not pay to clear land costing over $50.00 per acre if the settler had money.

However, and this is a point too often overlooked, if the settler has no capital he must be content to capitalize his labor and put up with the more isolated conditions in a new district. These would soon improve if settlement was close and the settlers were willing to make the effort.

(b) **Silvicultural:**

The immediate economical lumbering possibilities are almost nil in the Reserved Area south-east of Stuart Lake at this time, there being only one stand of mature timber. Around the lake however there is some good timber, but there is a very small local market and it is impossible to ship manufactured lumber. However the Stuart River is driveable and before long it will likely be found profitable to drive the logs down to the present mills. There are however considerable shoals and rocks in the course and driving will be rather expensive.

The future forest possibilities are much brighter. There are large areas of pine forty years old and six inches in diameter that will make good tie stands in
thirty years' time. In Area B some stands were encountered that are almost tie size now. It will not pay to clear land heavily forested with pine at present, so that if the fires can be kept out we will have a wealth of tie timbers here before long.

**Recommended Policy for the Land:**

The land in the reserved area should be subdivided for settlement purposes into four groups. In the north-east portion of the reference map is shown an area enclosed within pencil lines that should be devoted to permanent timber production. I would recommend that Areas A and C be thrown open for preemption under certain restrictions hereinafter described designed to prevent speculation. When all the good land in these areas is farmed, Area B should then, but not until then, be thrown open. Area D should not be thrown open for preemption for some time and may best be held in reserve for one crop of timber. We do not know exactly how much land there is in Area B that is easily cleared, as I had no authority to make an intensive examination of the area except on the basis of soil variation. In Area C we do know that there is not a great deal of easily cleared land still left unalienated.

When Areas A, B and C are farmed the land between Pinchie and Tache will likely have as much value as land in Area D, as an expensive road and ferry will have to
be built for this area, while motorboats from Pinchic and near points will connect with the railway spur at Ft. St. James.

I do not think it desirable to hold up the whole of Area A for the Oesthonians unless they come in greater numbers than at present. This whole area should be settled before we go further afield. If we cannot prevent speculation in this area, settlement will fail.

I would for this reason recommend that free title to land in the area be not granted until forty acres is in crop.

Cost of Examination:

<table>
<thead>
<tr>
<th>Total Expenses</th>
<th></th>
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<tbody>
<tr>
<td>Wages</td>
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</tr>
<tr>
<td>Travel</td>
<td>411.96</td>
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<tr>
<td>Food</td>
<td>687.20</td>
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<td>Board</td>
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<tr>
<td>Equipment</td>
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<td>Horses</td>
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<tr>
<td>Boats</td>
<td>101.70</td>
</tr>
<tr>
<td>Chemical (analysis)</td>
<td>19.00</td>
</tr>
<tr>
<td>Incidentals</td>
<td>$33.20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$3120.16</strong></td>
</tr>
</tbody>
</table>
Cost per Acre:-

During the summer the men put in 510 man days in the field. In area D they put in 189 of these days. In this area approximately 43,810 acres were covered with a 2 1/2% cruise. If we neglect the large areas in this area whose soil characters were accurately mapped but which received no intensive examination the cost of this 2 1/2% work was 2.6¢ per acre.

There was no large area of concentrated work elsewhere in the reserve on which we could get useful figures on cost and around the Stuart Lake it is hard to determine what acreage to figure the cost on. However, when it is taken into consideration that we have positively set the limits of all the good soil in the reserved area and within four miles of Stuart Lake for $3130.00 it seems a very reasonable figure. The extensive work on the lake outside the Reserved Area cost on the above basis $650.00.

The cost of food supplies per man per month in the field was $40.40.

When I returned to Victoria Mr. Manning asked me what I thought the 2 1/2% work cost per acre and I expressed the opinion that it was between 5 and 6¢. "Not bad," was his criticism of the figure. For 5¢ per acre the 5% examination I recommended for Areas A, B, and C could have been made.
List of Maps Accompanying this Report:

(1) Reference map 2 copies
(2) Soil Type Map No. 1.
(3) " " " " 2.
(4) " " " " 3.
(5) " " " " 4.
(6) Forest Cover Map No. 1.
(7) " " " " 2.

N.B. (On map No. 5 the draftsman has tried out four different means of showing topography, but I hope this will not give the information the appearance of being fragmentary.)

List of reports by section accompanying this report:

**Area A**
1639, 1647, 1649, 1650, 1651, 1653, 1655, 1657, 1663, 1664,

**Area C**
1264, 1615, 1616, 1617, 1618, 1619, 1620, 1621, 1622, 1623, 1628, 1630, 1631, 1647, 2397, 2398, 2399, 4027, 4028, 4029, 4031,

**Area D**
2381, 2385, 2394, 2395, 2779, 2780, 2781, 2782, 2783, 2791, 27919, 2792, 27929, 2793, 27939, 2794, 2795, 27951, 2796, 2797, 2798, 2799, 2800, 2801, 2802, 2803, 2804, 2820, 2821, 2822, 2823, 2824, 2825, 2826, 2827, 2828, 2829, 2830, 2831, 2832, 2833, 2840, 2951, 2952, 2953, 2954, 2955, 2966, 2967, 2968, 2969, 2970, 2971, 2972, 2973, 4032, 4033, 4034, 40349, 4035,
4026, 4037, 4038, 4039, 40389, 4040, 4043, 4044, 4046, 4047, 4051, 4052, 4053, 4056, 4057, 4066.

**Sample Lots.**

**Lake Area.**

1365, 3027, 3028, 3029, 4011, 4079.

List of unalienated quarter sections in Area C that have enough comparatively easily cleared good land for a farm:--

- S.E. 1264
- N.E. 1615
- S.E. 1615
- S.E. 1616
- S.W. 1616
- N.W. 1616
- N.E. 1616
- S.W. 1617
- S.W. 1618
- N.W. 1618
- N.E. 1618
- S.E. 1621
- S.W. 1621
- N.W. 1621
- N.E. 1621

1622 Whole lot

1628 S.E.

1628 S.W.

1628 N.W.

1628 N.E.

1630 S.E.

1630 S.W.

1630 N.W.

1630 N.E.

1631 S.E.

1631 S.W.

1631 N.W.

2399 S.E.

2399 S.W.

4028 S.W.

The S.E and N.W. quarters of lot 4028 and the S.W. quarter of 4029 have considerable good land but scarcely enough to be used alone.
List of above with light clearing:

S.E. 1264
N.E. 1621
S.E. 1628
S.W. 1628
W.W. 1628
N.E. 1628

1630
S.E. 1631
S.E. 2394
S.W. 2394
S.E. 4028
S.W. 4028

J.H. Gray's Soil Map:—

In Area A it was found that all the land encountered that was designated by J.H. Gray as good bottom land was in reality muskeg. In the south-west of lot 1639 is a steep nontillable hill he does not show and the soil is sandy. Outside of these differences and the location of numerous muskegs he does not give, Gray's map shows in a rough way the boundaries of the good land. But by referring to maps of Area C and noting how the northern promontory lies and how it is placed on his map the general nature of his information is easily seen.

The information on cover supplied by Gray is practically useless from a settler's viewpoint, being in—
sufficient in detail, and the timber apparently having grown up rapidly in the intervening six years.

Re-survey of Lots along the Stuart River:

When Area D is to be settled a re-survey should be made of all lots having frontage on the Stuart River. South of the river the belt of good land is narrow and each farm should start at the river and run back to the extremity of the good land. Otherwise, the men on the high ground might be unable to get a suitable water supply. Besides this, there is the feature of transportation. The river is navigable and will likely be used for transportation. It will serve as a road during the winter.

The number of farms per section will vary and will have to be figured out from the soil type maps but it appears that three per section would be the average. By this subdivision each farmer would have some bottom land and some higher land and would likely have a prettier site for his home. We cannot get away from the fact that people often choose their farms on the basis of the scenery and are more contented when there is beauty in the landscape. Dr. Chas. Galpin (Bur. Ag. Ec. U.S. Dept. Agri.) quotes Washington in a letter to Arthur Young as follows, "I may without knowing it be biased in favor of the river on which I live. No other estate in the United States is more pleasantly situated than this."
Leaving Nanout, Stuart Lake.

Leaving Sauchi Bay,
Stuart Lake
A Water Power Mill at Sauchi,
Stuart Lake.
Memo to Accompany Stuart Lake Report.

Land Settlement in British Columbia.

From time to time as I have had occasion to discuss settlement with other men in the Department I have been appalled by the recurrence of the cold-blooded statement: "The first preemption usually fails, the second often, but by the time the third man arrives there is usually enough land cleared so that before long he has enough to make a living." On looking around, however, it appeared that there was some grounds for the statement.

If it is true three alternative conclusions are derivable: Either that we have been trying to settle our land too soon, or that many are forced to eke out an existence on farms who can do no better, or that settlement has been mismanaged. The fact remains that many are clearing lands who will not live to see them producing farms.

I do not think that the average opinion of the people in British Columbia allows us to stop at the first conclusion in most cases. Since people would not go out and try to farm if they did not expect to make a comfortable living and interest on their money, I do not think many go out to eke out an existence. It seems therefore to usually resolve itself into efficiency in administration not keeping apace with settlement conditions.
I have read the reports of many commissions on settlement in America, Australia, New Zealand, Africa, and Denmark and have also talked with as many people deeply interested in the subject as I met with, to get ideas. I am therefore, not alone in the belief in a few suggestions I am going to make.

Speculation the Curse of Settlement.

It seems that one of the worst curses of settlement in British Columbia has been that of speculation. The Land Settlement Board, realizing this, has struck out bravely to try and make amends for the errors or early governments in encouraging speculation. Their method is that of constituting settlement areas in promising districts and raising the taxes on unimproved lands to a point at which speculation cannot afford to keep them longer idle. This arrangement had not been in operation long enough to draw conclusions but it is bound to assist in getting our land farmed. It is no use to have all our farm land privately owned. What we want are improvements and taxable incomes.

I do not think it at all necessary to give examples of speculation preventing close settlement and co-operation. They are too common and well known. If then we are seriously anxious to assist settlement we should develop a policy that will stop speculation in
the remaining good unalienated farm lands. If this could be done, as I believe it can, I would not be surprised to see the outlying areas free of speculation develop in a much healthier manner than those nearer markets, but cursed with this cankerous growth. What right has a speculator to hold what good land we have in idleness, thereby encreasing the price?

The Causes of Increases in Land Values.

But before considering this further it might be well to discuss the normal causes of increase in land values when speculation is absent, in order to allow the reader to form his own opinion as to whether a lazy preemperor who makes the minimum of improvements and vacates, is entitled to experience an increase in land value that is due to the efforts of the few who stick.

Leading economists are beginning to realize that increases in land values are the result of human labor and social growth. To quote Prof. Ely the leading authority on Land Economy:

"Rent of land according to the strict classical sense is due to social growth and is a product of the life of society."

Again according to Taylor (Agricultural Economics ## page 207):

"Some districts produce more high-grade farmers each generation than do others and the competition in
in the over-populated districts forces the rents and prices which are paid for land higher and higher."

In another place Ely states as follows:

"The longer the time that has elapsed since man contributed his efforts to improving the gifts of nature the more difficult it is to draw the line between what nature has given and what man has done."

In another place Ely says: "Value ultimately is a question of population."

**Increases in Land Value Part of Farmer's Income:**

It has been claimed that none are entitled to experience an increase in land values, but that these should really go to the support of the government, as they are really a product of society. However, under healthy rural conditions I believe that increases in land values only help to make up for the low rates of interest earned by farms. According to farm surveys dairy farms would not yield over 3½% interest in British Columbia. Farmers are willing to accept this low rate because they know that their land will increase in value at least 2% per year.

Concerning this Prof. Ely states as follows:--

*(Land Economy)*

"In future years when the expected appreciation actually accrues to the owner, his rentals increase and he receives the postponed portion of his income. Hardly can he be charged with collecting an unearned in-come
or receiving an economic surplus, unless he shall have received more in value appreciation than he expected." 

From this angle farming in British Columbia is not as poor a business proposition as it is made out to be, particularly when we consider that farm land where speculation is absent is a safe investment while money itself tends to gradually lose its value.

Other Reasons Why Settlements May Fail:

Besides speculation there are three other conditions that have wrecked government settlement in other parts of the world that would apply to the settlement of free virgin lands in British Columbia. These are:

1. Not enough capital to get the farm into a self supporting state.
2. Too high a rate of interest on borrowed money.
3. Lack of experience in the type of farming suited to the area.

Experiments in Land Policy:

In Italy, Denmark, Australia, and the United States more and more attention is being paid to the success of settlement. More and more it is being realized that government land policy is shaping the social and economic welfare of nations. Ever since the first extensive settlement took place in British Columbia we have made little change in our mode of
disposing of farm lands. In Agriculture and now in Forestry for the first time experiments are conducted to disclose the best methods of management. I believe it would pay to try a few experiments in land settlement policy, to disclose the policy that would have the best influence on settlement.

Under its present limitations the Department of Lands cannot lend money, but it could stop speculation and insist on each settler having a certain amount of capital and farm experience. The Land Settlement Board will then loan them money to the extent of 60% of the value of improvements at an interest rate of 7 1/2%. This is a rather high rate of interest and it would be desirable to have it reduced. The government can borrow money at 4 1/2% and it should not require 3% on all deposits to run a government bank. In government settlements elsewhere the rates are as follows: --California: 5 1/2%; Denmark: 4 1/2%; and Victoria, Australia: 4 1/2%. However, the loan facility supplied by the Land Settlement Board will be a real assistance to farmers who have a little capital of their own.

Experiment in Policy No. 1:--

The McBride Townsite has been intensively examined and while it has been rather severely burnt over and the water supply will often give trouble, it adjoins the railroad and offers fair farming opportunities. It
would, therefore be a good site for an experiment in policy. I would like to recommend that the area be thrown open for free settlement in 160 acres blocks with only the following main restrictions:

(1) Each settler must have had at least six months' experience on a dairy or mixed farm in America;

(2) Each must crop 20 acres within two years.

(3) Each must crop 40 acres within six years. When this area is in crop irrespective of other improvements a clear deed is to be issued;

(4) Each man is entitled to one and only one holding.

I have discussed this idea with several men in the Department. Mr. Peterson expressed the belief that it would encourage land trusts. But this only confirms me in the belief that we would get results. In the beginning I quoted several men as stating that the settler cannot stay on his preemption unless he can clear enough land to make him a living. If we know a settler will not stick why should we give him a title to the land and therefore stop more able men from using it?

It has also been claimed that people do not appreciate anything they get for nothing. They would not be getting this land for nothing. They would be getting it for the clearing of it. It is time this point was emphasized to settlers.
However the details can be arranged. My point is that experiments in policy are desirable and would, I believe, be possible under Clause 56 of the Land Act. In the case of the McBride project it would be desirable to get a little more information on rainfall, however, before deciding on the matter.

It has been found that the services of an agriculturist have been very valuable in California and Australia in advising settlers how to get their farms producing as soon as possible, in sizing up applicants for farms to determine whether they have fair chances of success, and in disillusioning the over-sanguine. However, we could not undertake such service unless we had several settlement areas in operation.

I believe, however, that some literature setting out the causes of healthy increases in land values in British Columbia and stating that this Department is going to try and stop speculation in new areas would have a very good effect on agricultural conditions in B.C.

Developing a Farm Without Money:

Few people realize how much money it takes to make a living at farming. It would take a thousand dollars worth of stock to produce a living for a family quite outside of clearing, fencing, houses, barns, and equipment. Too much money should therefore not be spent
on things that are not productive until the farm is self-supporting.

A large number of the settlers in British Columbia are trying to improve lands without much capital. They are, therefore, often forced to work on the roads or at any work available when they might be clearing land. In the Victoria settlement money up to $2500.00 was loaned to each settler as it was felt that no serious losses would result where the money was put into improvements with the approval of a supervisor and the government had the deed to the land. Money is also loaned in other places for the same reason as it is considered that self-supporting settlement is worth the risk. It seems to me that if we are going to encourage men without money to settle on the land that we will have to encourage them to clear it.

I believe this could be done without much cutlay and would form another desirable experiment in policy if we could get the authority to do it on a small area. The method would be to loan money to men to clear more land, the amount being paid in installments as progress was made and being only sufficient as determined by a qualified inspector to keep the settler in food supplies until a given acreage was cleared. Only sufficient for a certain acreage would be allowed each settler per year.
and would not be obtainable unless he had cleared a certain area without government aid. The rate of interest should be the lowest at which the government could break even. No settler would receive a second advance until his first agreement had been complied with. We could lose nothing on this bargain and stand to make a great deal.

Settlement and the problems attached to it are going to become more and more important as time goes on and good land becomes scarcer, and it is for this reason that I may have dwelt rather long on points which do not generally occupy a field man.

R.A. Fischer

Junior Froester.
Reference Map

Yellow - Area A
Green - Area B
Purple - Area C
Ruff - Area D

Note
- Lots coloured red have been subdivided and examined.
- Lots coloured yellow have not been examined.
- Grown lands within red boundaries are under Reserve.
Reference Map

Yellow - Area A
Green - Area B
Purple - Area C
Buff - Area D

Note:
Lots coloured red have been subdivided and examined.
Lots coloured yellow have not been examined.
Grown lands within red boundaries are under Reserve.
Green - Area B
Purple - Area C
Ruff - Area D

Note:
Lots coloured red have been subdivided and examined.
Lots coloured yellow have not been examined.
Grown lands within red boundaries are under Reserve.