CRUISE
of
KITIMAAT & CLEARWATER VALLEYS.
1921 and 1922.
T.A. Clarks.

Reconn. File 824.
Corres. 029849.

1 Key Map.
2 Tracings 4 inches = 1 mile
INDEX MAP
Kitimaat & Clearwater.

Size 824 --- 1921-22
Scale 17.75 mi. to 1 inch.
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CRUISE OF KITIMAAT VALLEY

by T.A. Clarke, 1921.

Reconnaissance No. 824.

(1) CRUISING & SURVEY METHODS.

The following report, with appended statistics and tables, is based on the information secured by an intensive reconnaissance and cruise of Crown lands and timber in the Kitimaat Valley and valleys tributary to it during the summer of 1921. Actual field work on the project commenced on June 16th and continued till October 12th. Establishment for the following crew was provided:

1. Chief of party.
2. Assistant chief (in charge investigative work)
3. Estimators.
5. Draughtsman.
6. Assistant for Investigative work.
7. Cook.
8. Canoe-men

Total 13

This was the largest number employed at any one time, and for a greater part of the period only eleven men were engaged in the work.

A 5% strip cruise was applied to the entire area of Crown lands (approximately 22,000 acres) as described elsewhere in this report, trees being tallied by 2" diameter classes--minimum 10"--and 32 ft. log lengths and half logs. The tally sheet used was F.B. Form 109, on which also sylvical conditions and logging chances relating to the stand were described by the estimator. A topographic map-scale 4" to the mile--was prepared and completed in the field as the work progressed, information for this being secured from the compassman's field notes and sketches which he entered on F.B. form 110.

The map which is submitted herewith, shows types, 100 ft. contours, streams, base lines, surveyed areas, alienated land, etc.
The unit of area for estimating was the "forty", tally sheets being changed every 20 chains on the strips. If more than one type was encountered within a forty, separate sheets were used for each type, so that figures are available for compiling the estimate by types, if so required. The appended detailed estimate is by "forties" regardless of type.

Check Strips  Towards the end of the work some time was given to running check strips, each crew being checked on strips selected at random. Comparative figures showed 10% as the greatest difference in volume, and 0% the smallest. Differences in number of trees were in all cases negligible.

Volume and Growth Tables.  The estimate was based on volume tables constructed in the field under the direction of Mr. Alexander. These tables were made for Hemlock, Balsam and Spruce, the general Coast tables being used for Cedar.

Mr. Alexander also carried out growth studies on a large number of representative trees and reproduction in the different types, and the results of these studies along with the volume tables are being submitted by him as well as the plan of management recommended for the valley.

Levels.  As the greater part of the area had been previously surveyed, certain of these existing lines were used as base lines for horizontal control. Vertical control was secured by carrying levels up from sea level along the river bank or via survey lines, and frequent bench marks established for the strip crews to check on. In unsurveyed localities levels were run in conjunction with staff compass base lines or traverses.

Elevations.  Elevations along the strip were secured by use of the new topographic Abney Hand level and 2 chain topographic tape with half chain graduated trailer attachment. For the first time used these instruments proved highly satisfactory, and improved the quantity and accuracy of the contour map.

Transportation.  Moving camp and supplies was done by "dug out" canoes which were poled and lined up the rivers. This phase of the work took a great deal of time owing to the large number of camps established, due to the absence of trails and the consequent decrease in the area that could be covered from one camp. The amount and weight of equipment and supplies coupled with the swiftness of the rivers usually necessitated two or three days to accomplish a move. In all 12
main camps were established and four "fly" camps for the more inaccessible areas. To cover the area on the Little Wedeene River full equipment and supplies had to be back packed three miles over a trail cut by the party. The above unavoidable delays limited the total area that could be covered.
11. **DESCRIPTION OF THE AREA.**

This description will apply to the valley and tributary valleys as a whole. Any feature peculiar to the timber and topography of the different areas will be mentioned under the respective headings later.

**Location and General Topography.** The Kitimaat valley drains via the Kitimaat Arm at the extreme head of Douglas Channel. It extends northward approximately 20 miles to a low, almost imperceptible plateau like divide (elev. 600') which separates it from the Lakelee Lake drainage system. The width of the valley averages between three and four miles, being bounded on the west by the Coast range proper, and on the east by hills that are probably subsidiary to the Cascades. The valley is really a part of the great trench or depression which extends northward as far as the Nass River, its continuance north of the Skeena, being evidenced by the Kitsumgallum valley. It evidently represents an old, partially abandoned valley of erosion possibly robbed by the Skeena.

The topography of the valley proper shows very little relief, being unusually flat and broad for the northern coast region. The lower reaches of the tributary valleys are similar in nature to the main valley, but all become typically narrow and steep sided some three miles up from their mouths, and the rivers are confined in places to deep box canyons.

The mountains to the immediate west have an approximate maximum elevation of 3000 ft. with 2000 ft. a conservative average. Timber exists to the latter elevation but 1000 ft. is the extreme present merchantable limit, with average M.T.L. at 600 ft. Steep rock bluffs are in evidence as low as 300 feet on the slopes and on the whole they are precipitous above 600 ft.

The hills forming the eastern boundary are not generally as high and rugged. Maximum height would be 1600 feet with average of 800-900 feet. Merchantable timber was found as high as 1200 feet, but would average 800, there being mostly rock bluffs higher than this. The eastern slopes are mostly covered by Timber Licences and time could not be found to map the topography of these areas.
Rock outcrops in the valley do not show much below the 200 ft. contour. The rock consists of the coarse batholithic granitoids and gneissoids typical of almost the entire coastal mountains.

The soil of the valley, which is deep and very little broken by rock outcrops will be described under agricultural possibilities and with reference to timber types.

Rivers. Three tributary rivers of importance—all of approximately the same size and velocity—enter the Kitimaat, namely the Clearwater which evidently heads in the Cascades to the east and joins the Kitimaat seven miles from the mouth of the latter, and the Little and Big Wedeene Rivers whose junctions are respectively eleven and twelve miles from its mouth. The two latter rivers rise in the main axis of the Coast mountains to the west.

Normally the width of the Kitimaat averages about 7 chains, but has a high water area (not flood area) in places of half a mile in width, averaging a quarter miles. Its normal velocity is between 7 and 8 miles per hour and 10 to 11 miles during flood season. Normal depth would be hard to ascertain, as it is continually broken up by shoals and gravel bars. Seven feet for average depth and twenty feet for greatest depth are conservative figures. It is navigable for heavily laden dug-out canoes as far north as the Big Wedeene River. From here north the volume or water decreases and progress with heavy loads becomes more and more difficult. Bad log jams occur from here northward, but with a light load a "dug-out" can be taken at least as far north as the forks. Gas boats cannot be taken up the river at all. The dug-out is the only feasible craft for this river.

High tide water is effective for approximately a mile from the mouth.

The Clearwater, Little Wedeene, and Big Wedeene are really not navigable streams. They all have an average velocity of 3-10 miles per hour, normal width of 3 chains, and high water area of 10 chains across. Canoes can be lined up the Clearwater and Little Wedeene for two miles or so but with great difficulty and risk and even this is impossible during high or low water. These rivers should not be attempted without expert canoe men.
Climate. The climate of the valley does not show great extremes either Winter or Summer. Zero weather commences in December, with lowest extreme for the winter of 20 below, this being unusual. Mean winter temperature would be about 150° above zero. The main river generally freezes solid enough for dog teams, but the tributaries remain open in places.

Extreme summer temperature usually occurs in early August or late July. The past Summer (evidently a normal one) had 85 F. in the shade as maximum—one day only. Summer on the whole would average 60 F. in the shade.

Forest growing season would be from May 1st to the middle of October, and a month later and earlier respectively for field crops. There is little danger from frost after the first of June till 1st of September.

Average yearly precipitation is 81 inches. The rainiest months are April, May, September and October, during which times the rivers are in flood and destructive freshets frequently occur. The banks of the Kitimaat being low and of loose soil, easily give way during these freshets and a large amount of timber is washed away each year. In places missing posts on survey lines show as much as four chains having been washed away during the past eight years. These freshets would hinder logging operations in the River bottom timber.

Total average snow fall is 12 feet. The depth and weight of the snow would prevent winter logging.

Agricultural Possibilities. From the following figures it will be seen that a considerable area of the valley possesses agricultural possibilities. At present with the long distance to outside markets and consequent high freight rates the farmer could not make his produce pay for the cost of clearing the land. All the land with agricultural possibilities is heavily timbered there being no open meadows on grass land in the entire valley—with the exception of beaver meadows and open muskeg, too wet for farming.

The figures that follow confine themselves to the area in the valley actually covered by the cruise as shown by the map, not including the block
shown on the Little Wedeen River, none of which is considered agricultural. For the time being only lands classified as River bottom land, and Lower Bench land will be considered as agricultural, so that the figures are conservative. Full description of such areas will be found under the heading "Forest Description". The River bottom lands are considered the best for agriculture, lower benches ranking second. Crown Grants and Pre-emption Records are not included. Areas of land suitable for agriculture if cleared.

River bottom land (includes Alder bottom) 2220 acres.
Lower Bench land 4730 "

Total 6950 "

This total forms nearly 33% of the area cruised.

Bottom land soil is a rich alluvial silt and fine sand of fair depth, overlying coarse gravel and sand. It is fairly well drained.

Low bench land soil is generally a rich brown sandy loam, in places clay loam, 3 to 4 ft. in depth, overlying coarse gravel and sand. It is very well drained.

Cereals cannot be grown successfully in the valley, it being too wet during growing season and there is not enough hot sun to ripen. Good hay is harvested on the open meadow land along the tide flats at the mouth of the river, but difficulty is often experienced in getting it in before it is spoilt by the heavy rains of late August and early September.

Potatoes of beautiful quality are grown and good crops of these are usually secured. Cabbage also does well. With available markets, strawberries could be grown profitably. They do well and are of excellent quality.
III. FOREST DESCRIPTION.

The following merchantable timber types were recognized in the valley, and designated as such on the map.

1. River bottom type. (Spruce)
2. Low bench type—Hemlock, Balsam, Spruce with a few large scattered Cedar.
3. Upper bench type—Balsam, Hemlock.
4. Side hill type—Hemlock, Balsam, Cedar.

The types are broad ones and are based on site as this was generally found to be the determining factor influencing the quality, density, and admixture of the stand.

River Bottom Type, covers a comparatively small area in the valley. This is essentially a pure Spruce type and yield on the average the greatest volume per acre. The trees—Sitka Spruce (Picea sitchensis) and of large diameter as stand is open and many trees retain limbs quite close to the ground.

The type occupies areas but slightly raised above normal river level and subject to inundation at times of flood. The soil is light, fertile, and moderate in depth, consisting of alluvial deposits of silt and fine sand overlying coarse gravel and sand. It supports a rank almost impenetrable growth of dogwood, elder-berry, wild crab, salmon berry, devil's club, and vine maple (acer circinatum). The density and quick growth of these shrubs effectively prevents tree reproduction.

The greater part of the River bottom land in the valley is covered by Alder with a few scattered cottonwood intermixed. It was noticed that whenever cottonwood occurred there was some Spruce reproduction coming in, as underbrush is comparatively sparse in these stands.

Fungus infestations noticed commonest in the living Spruce were the common bracket fungus causing heart rot (Fomes pinicola) the speckled heart rot (trametes pini) and brown heart rot (Polyergus Schweinitzii). Practically no insect infestations were noticed.
Lower Bench Type. The commonest type in the valley occupies the first benches raised a few feet above high water level. Species are Hemlock (Tsuga heterophylla), Balsam (Abies amabilis and A. lasiocarpa), Spruce and Red Cedar (Thuja plicata) in order of their frequency. The Cedar is very scattered. The trees are smaller, straighter and cleaner than in the River bottom Spruce type, although there are some areas of Low bench bearing very large decadent Hemlock, Balsams and Spruce, similar in character to the River bottom trees. These usually occur in local patches of low lying poorly drained ground within the Low or Bench type.

Low Bench soil is generally a good grade of brown sandy loam three to four feet deep, overlying coarse gravel and sand. It is well drained. Humus quantity is high and first two inches of surface soil appear black in consequence.

Underbrush is not so dense and rank as in the River bottom. Principle plants are devil's club, huckleberry, and in local wet patches -- skunk cabbage, dogwood and elder berry.

Reproduction in the type averages fair, being equally divided between Hemlock and Balsam, with an occasional Spruce.

Hemlock suffers most from fungus infestations, especially large trees -- 36" and over. Three species of fungi were noticed on Hemlock -- viz:-- Common bracket fungus (Fomes pinicola), Indian Paint fungus (Phellodon phythorium) and the Powdery Quinine fungus (Fomes officinalis). All cause varying heart rots in the living hemlock. Blind cork is very common. The most frequent rot in Balsam is the common Bracket fungus (Fomes Pnicola) causing heart rot. Trees 60" and over are especially affected. Spruce is affected as in River bottom, whilst Cedar is practically all suffering from heart and butt rot, and a large percentage are Spike tops. No insect damage to amount to anything noticed.

Upper Bench Type Essentially a balsam hemlock type, spruce and cedar being scattered. Trees are generally smaller, straight and cleaner bored than in any of the other types, and defect less noticeable the stand being on the whole thrifty with only scattered large and decadent trees.

The type occurs on elevated benches, usually above the 100 ft. contour, being separated from the lower benches by low but abrupt side hills, or
small rock bluffs. They are in reality local plateaus, and may be either quite flat or considerably dissected by small stream ravines or coulees.

The soil is moderately deep with occasional local rock outcrops, is a brown sandy loam overlying coarse gravel and sand, and is very well drained. Ground is comparatively clear of underbrush, sparse huckleberry being practically the only shrub. Reproductions varies from sparse to dense, Hemlock and Balsam being about equal.

**Side Hill Type.** A Hemlock-Balsam Cedar type, occupying the slopes of the surrounding mountains to timberline. It is a merchantable type to an average height of 600 ft., but persists in places to 1200 ft. This type contains the majority of Cedar in the valley, and its presence differentiates the type from the Balsam-Hemlock of the Upper benches. A few scattered Spruce occur on local, wet, poorly drained ground, but are not a component part of the type as a whole.

The timber average of poorer quality, than the Upper bench type, as the site is less favorable. Defect in all species is comparatively high and trees are inclined to be stunted and scrubby. This tendency naturally increases at the higher elevations with a corresponding shallowness of soil and steepness of slope.

The soil, which varies from a sandy to clay loam, is moderately shallow in depth with frequent and rather extensive rock outcrops and bluffs, which generally become precipitous above 600 ft., thus forming the average limit of merchantability. Drainage is good, but run off is not excessive owing to density of undergrowth—huckleberry is principal species. Reproduction, Hemlock and Balsam being equal, is usually plentiful.

**Non-Merchantable Type.** The following non-merchantable timber types were recognized and so designated on the map. Alder bottom (previously described). Cedar swamps on which are found stunted and defective Cedar with dead tops, along with small mountain Hemlock (Tsuga mertensiana) of no commercial value.

Soil is acid, wet, and poorly drained, as is evidenced by the dense growth of low ericaceous shrubs.
Old Burns Reproduction. Scattered areas of small extent which have restocked very densely with Hemlock and Balsam, the competition being so keen that a few trees have as yet become dominant, the remainder being densely massed together in the nature of a thicket with stems 3"-4" in diameter. Some of these thickets are 75 to 150 years old.

Scrub Hemlock Type. Often occurs on areas of apparently good soil physically, but the timber is small stunted, a scrubby Hemlock, badly diseased with many dead. The soil is probably too acid to grow thrifty timber.

Floating Muskeg. Non-timbered with exception of small scattered Jack Pine. Ground is made up of spongy masses of mosses, grass, and heath plants, there being no solid bottom, and traversed by a net work of deep sluggish sloughs.
4. DESCRIPTION OF TIMBER.

For this purpose the land in the valley will be divided into four areas, to conform with the estimate which is shown by these areas. The areas are as follows:

#1. Situated east of the Kitimaat, west and south of the Clearwater.

#2. East of the Kitimaat and north and east of the Clearwater.

#3. West of the Kitimaat and south of the Little Weacon.

AREA NO. 1.

Definite boundaries as follows:

South--- Minnette Bay.
West---- Kitimaat River.
North--- Clearwater River.
East---- Clearwater River, T.L. 9472p, and vacant crown lands on mountains to south of latter.

Total area within above boundaries 7685 acres
Alienated C. G' s and Indian Reserves 1295 "

Crown land cruised.................... 6390 "
Merchantable area...................... 3986 "
Non " " " " 2402 "

Note--P.R.'s were cruised.

Estimate by Species. M.F.B.M.

Balsam 23210.3
Hemlock 21055.3
Spruce 13080.5
Cedar 3210.9

Total 60557.0
These figures are with cull deducted. They give an average of 9.5 M. per acre over all and 15.2 M. per acre for merchantable area. Detailed estimate by "forties" in the appendix.

The timber in this area is confined mostly to two types—the Lower Bench and Upper Bench. Large areas of Alder, Cedar swamp and muskeg, and patches of Hemlock and balsam reproduction occur throughout especially in the southern portion. Scattered "islands" of spruce are found along the river bottom to the south and west intermixed with alder.

A low plateau like ridge rising to 400 ft. occupies a great part of the northern half, and extends slightly south of east till it joins with the higher hills forming the eastern boundary of the valley.

This plateau is not what could be called flat on top but is considerably broken up by small steep-sided ravines and coulees which do not show to advantage on a 100 ft. contour map.

Upper Bench Type. The timber on the plateau is almost entirely balsam and Hemlock with scattered Spruce. The stand is not a heavy one, being below average for the valley as a whole, but is fairly uniform throughout. It is mature and reproduction of Balsam and Hemlock is plentiful. Average trees in the type.

<table>
<thead>
<tr>
<th></th>
<th>Balsam 22&quot; - 2½ logs</th>
<th>Hemlock 24&quot; - 2½ logs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>Balsam 34&quot; 4 logs</td>
<td>Hemlock 36&quot; 3½ logs</td>
</tr>
<tr>
<td>Average cull %</td>
<td>Balsam - 12%</td>
<td>Hemlock - 14%</td>
</tr>
</tbody>
</table>

Lower Bench Type. It is rather scattered in this area. The main body of it occurs in a strip along the lower gentle slopes of the plateau to the Kitimaat and Clearwater Rivers. Other patches occur surrounded by non-merchantable types to the north of Minnette Bay, and another occupies a small area on the southern slope of the plateau.
The strip to the east of the Clearwater contains the finest stands in the entire area covered by the cruise. Hemlock Balsam and spruce to as high as 100 ft. per acre occur, but stands reaching this figure do not cover any extensive area. The largest timber was found on the eastern portion of Lot 6181, but the neighboring lots to the north and south average high. Especially fine stands of thrifty, straight, clear Balsam occur scattered through Lots 6035, 6036 and 6033.

Size of trees in type.

Hemlock and Balsam much the same as in Upper Bench.

Spruce - Maximum - 70" - 6 logs. "
Average - 28" - 4 logs. "
Average pull 8%.

Logging Conditions. The presence of the aforementioned ridge covering the northern portion of the area is the main factor that would influence the removal of the timber.

It would be difficult to secure a favourable railroad grade across this ridge. A railroad brought up the west side of the Kitimaat with a spur line crossing the river to Lot 6266, and thence north and east along the banks of the Kitimaat and Clearwater, and following the bend of the latter south, would be the most obvious location, as the grade is even throughout along bench land and road bed construction would be simple. This would serve the timber on the benches along the two rivers, and the ridge could be logged toward it either east, north or west, as the railroad could be placed close along the base of it. This leaves the three small areas of bench timber to the south of the ridge. Two of these are practically on tide water and should present no problem. The third on the south west lower slope of the ridge could easily be served from the railroad on the west bank of the Kitimaat, if a short spur were constructed across to Lot 6035 and thence east along the bench if necessary.

The logging chance on the whole can be said to be fairly good. There are a few rock outcrops on the ridge top, but no precipitous rock bluffs, and grades for logging roads can be found in spite of numerous draws. Water is fairly plentiful except on the ridge top. The Clearwater is not driveable, being too swift and shallow.

Driving the Kitimaat is considered possible but
extensive improvements would be required to keep the logs to the deep channel, and it is doubtful if this would pay when a railroad can be so easily built.

**AREA NO. 8.**

Definite boundaries as follows:-

South - Clearwater River.
West - Clearwater River
Kitimaat River.
T.L. 18119 p.
North - T.L. 8481p.

Total area within above boundaries 3479 Acres.
Merchantable 1735 "
Non " 1744 "
Alienations - nil.

<table>
<thead>
<tr>
<th>Estimate</th>
<th>M.F.B.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spruce</td>
<td>14809.1</td>
</tr>
<tr>
<td>Hemlock</td>
<td>12748.4</td>
</tr>
<tr>
<td>Balsam</td>
<td>10504.8</td>
</tr>
<tr>
<td>Cedar</td>
<td>2099.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40161.3</strong></td>
</tr>
</tbody>
</table>

Cull deducted.
Average over all 11.5
Average for merchantable area 23.1

Detailed estimate by forties in the appendix.

The merchantable type in this area is mostly Lower bench with three scattered small areas of River Bottom Spruce along the Clearwater and Kitimaat. Non-merchantable areas are scattered in the southern portion but the northern portion consists almost entirely of swamp, alder bottom and scrub timber.

The slopes to the east are occupied by T.L's. These slopes rise in a series of benches to a general height of 900 ft. and are timbered all the way up. The vacant crown land to the north and east of T.L. 9468 is occupied mostly by an old burn and is reproducing densely with Hemlock and Balsam about 40 years old. The slopes here are, however, quite steep and rocky.
The timber on the lower bench is similar in character to the west of the river but the Spruce do not average so large or tall. Scattered Cedar.

Trees as follows:

**Spruce**
- Maximum 56" - 5 logs.
- Average 23" - 3½ "
- Average cull - 6%

**Hemlock**
- Maximum 50" - 4 logs.
- Average 24" - 2½ "
- Average cull - 10%

**Balsam**
- Maximum 38" - 4 logs.
- Average 22" - 2½ "
- Average cull - 8%

River bottom timber Spruce is large and of good quality. A few hemlock are intermixed.

Trees as follows:

**Spruce**
- Maximum 84" - 5½ logs.
- Average 36" - 4 "
- Average cull - 6%

Logging conditions. The timbered area is mostly on a level low bench and good railroad beds and roads could be easily constructed. Water is plentiful.

Immediately to the east of Lot 6155 is the Clearwater canyon which extends north eastward along the river for some four miles. Walls are steep and 200 ft. high in places. The river has a drop of approximately 300 ft. through the canyon, so that considerable water power could be developed at the lower end of it if required. Data on the water power of this river is available from the Water Rights Branch.

**AREA NO. 3.**

Definite boundaries as follows:

South - C.C. Lots 94, 73 and 187.
East - Kitimaat River.
West - High mountains (vacant Crown land)
North - T.L's 12105p, 12103p, and Little Wedeen River.
Total acreage within above boundaries.

7961 acres.

Alienated within above boundaries.

103 acres C.G.

3 P. R's. not cruised.

223 acres (Lot 6267, R¼ L.6057, L. 6050)

Crown land cruised 7635 acres.
Merchantable 4597 "
Non " 3038 "

Estimate M.F.B.M.

Hemlock 31566.3
Spruce 30411.9
Balsam 26329.2
Cedar 5000.2

Total 93307.6 cull deducted.

Average per acre over-all 12.2
Average " merchantable 20.6

The Lower Bench type predominates in this area, with a narrow strip of timber on the mountains to the west of the side hill type. River bottom Spruce is confined to a small area just south of the Little Wedeene River.

The timber on this side of the river is somewhat disappointing on the whole as it is only good in patches and such a large percentage is non-merchantable.

South of the Sand-hill the stand consists of a very old even aged stand - 300 - 350 years old - of Hemlock, Balsam and Spruce, with scattered Cedar. Trees are generally very large - all species - and the large Balsam are identical in appearance with the Spruce. At a glance an erroneous impression is liable to be gained of the percentage of Spruce in the valley, if the casual observer were to base his conclusions on what he sees in this stand. The two species are so closely alike in size, appearance of bark and form of
bole, that only the closest inspection will determine their identity. The stand being very old is decadent and defect is high, especially in the large Hemlock. North of the sand hill the bench timber becomes generally somewhat smaller with a greater variation in diameters. As it approaches the large areas of swamp and muskeg to the north it gradually becomes poorer in quality and scrubby, merging finally into the unmerchiable swamp and muskeg types.

The River bottom Spruce type occurs in scattered patches amongst the Alder to the north of Goose Creek. The trees here are scattered and inclined to be limby.

A good average stand of this type occurs along the River bank just south of the Little Wedeene.

The best side hill timber occurs on the slopes leading up to the low divide towards "Peggy" Lake. In general the slopes have a very low merchantable timber line, steep rock bluffs usually being common above 300 ft. The best cedar in the valley is found on these slopes, but it is only of fair quality. The lower slopes towards the north have been classified as Upper bench but there is no appreciable difference in the two types except in percentage of cedar.

**SIZE OF TREES.**

**Lower Bench Type.**

<table>
<thead>
<tr>
<th>Tree</th>
<th>Maximum</th>
<th>Average</th>
<th>Cull</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemlock</td>
<td>60&quot;</td>
<td>24&quot;</td>
<td>16%</td>
</tr>
<tr>
<td>Balsam</td>
<td>52&quot;</td>
<td>24&quot;</td>
<td>14%</td>
</tr>
<tr>
<td>Spruce</td>
<td>76&quot;</td>
<td>32&quot;</td>
<td>10%</td>
</tr>
</tbody>
</table>

**River Bottom Type.**

<table>
<thead>
<tr>
<th>Tree</th>
<th>Maximum</th>
<th>Average</th>
<th>Cull</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spruce</td>
<td>64&quot;</td>
<td>32&quot;</td>
<td>12%</td>
</tr>
</tbody>
</table>

**Side Hill & Upper Bench Types.**

<table>
<thead>
<tr>
<th>Tree</th>
<th>Maximum</th>
<th>Average</th>
<th>Cull</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemlock</td>
<td>36&quot;</td>
<td>20&quot;</td>
<td>18%</td>
</tr>
</tbody>
</table>
Balsam Maximum 28" - 3½ logs.
Average 20" - 2½ "
Average cull - 15%

The non-merchantable areas consist principally of areas of Alder in the southern portion. The northern portion is featured by large areas of floating muskeg and Cedar-Hemlock swamp. The most noticeable of these is the floating muskeg starting in Lot 6061 and running north easterly to Lot 6115. The ground becomes more solid towards the northern end of it and is sparsely timbered, but in general no solid bottom can be found.

Logging Conditions The logging chance on the area west of the river is on the whole unusually good. This side of the river is the natural location for the main railroad line, as an even and scarcely perceptible grade can be secured along the lower benches all the way up. The areas of swamp and muskeg are so situated as not to interfere with construction and there are no "islands" of timber isolated by them. Spur lines could be run west to the slopes. Up to merchantable timber line the latter are not sufficiently steep or rocky to present any great logging problem. Water is quite plentiful throughout the area.

Extensive tide flats at the head of Kitimat Arm would have an affect upon the selection of good booming areas. Logs could be dumped into the sloughs in Lots 73 and 94, after being brought down that far by Railroad and floated out to booming grounds with the tide. The sloughs won't float logs at low water.

Road and Trails. There is a fair waggon road as far north as the sand hill, but beyond that, has been neglected for years and cannot be found now. A trace of a foot trail shows as far north as Goose Creek, but becomes lost in the Alder and Elderberry swamp to the north. What there is of it was newly blazed and cleared by the party this year. A new foot trail was cleared by the party along the river bank from Goose Creek to S.W. Corner of Lot 6069, but would be grown over by next season.
AREA No. 4.

Little Wedeene River. Definite boundaries as follows:

East    T. L. 12105 p.
North   T. L's 3103p, 3093p, and vacant
        Crown land on mountains.
South   Vacant Crown land on mountains.
West    "     "     "

Total area within above boundaries 3610 acres.
Alienated nil.
Merchantable Timber 2665 acres.
Non "     "     "     945 "

Estimate M.P.B.M.

<table>
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<tr>
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<tr>
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<tr>
<td>Balsam</td>
<td>25412.3</td>
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<tr>
<td>Spruce</td>
<td>2301.2</td>
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<tr>
<td>Cedar</td>
<td>575.1</td>
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</table>

Total 53602.8

Average per acre over-all 14.8
"    "    " merchantable 20.1

Detailed estimate by "forties" in the Appendix.

This area occupies the unsurveyed portion
of the Little Wedeene Valley, comprising all
merchantable timber in the valley west of T.L.
12105 p.

Shortly to the west of the west line of the
T.L. the valley which up to this point has been
fairly wide, begins to narrow down, so that a mile
inside the area finds the river running in a deep
box canyon from which the surrounding hills rise
steeply and in places precipitously. Numerous
deep draws occur throughout, especially on the
south side of the river.

On the north side of the river the country
is plateau like, sloping comparatively gently up
from the river. Further west, however, adjoining
the canyon the slopes are very steep. The canyon
is about a mile in length, but above it the steep
slopes persist and the valley continually narrows
down with a consequent reduction in timber area.
In spite of the steepness of the country, it is well timbered as high as 1500 ft. and there are surprisingly few rock bluffs or outcrops up to this height.

Side hill type predominates, especially south of the river and Hemlock and Balsam comprise practically all the stand. A narrow strip of Lower Bench timber occurs along the south bank, towards the east, and this contains practically all the Spruce in the area.

The plateau to the north of the river shows Upper bench type and contains the best quality Hemlock and Balsam in the area. There are some exceptionally fine stands of thrifty, tall, clear, straight Balsam on these benches. Cedar is negligible throughout. Going further west, however, the timber on both sides become scrubbly in character as the valley narrows and slopes and rock outcrops increase, until it finally dies out into a non-merchantable scrub type persisting west throughout the remainder of the valley.

Size of trees. All types.

<table>
<thead>
<tr>
<th>Type</th>
<th>Maximum</th>
<th>Average</th>
<th>Cull</th>
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</thead>
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<tr>
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<td>22&quot;</td>
<td>17%</td>
</tr>
<tr>
<td>Balsam</td>
<td>40&quot;</td>
<td>20&quot;</td>
<td>14%</td>
</tr>
<tr>
<td>Spruce</td>
<td>54&quot;</td>
<td>36&quot;</td>
<td>12%</td>
</tr>
</tbody>
</table>

Not enough trees to obtain a fair average for Spruce.

Logging Conditions. Logging chance is poor on the whole. River is not driveable and presence of canyon would make railroad construction difficult and expensive. An easy grade could only be secured as far as the canyon, preferably on the south side of the River. In general the class of timber along and to the west of the canyon would scarcely warrant the great expense entailed by building a railroad or flume any further along the canyon walls.

Two fair sized streams neither of them driveable and both running through rocky canyons flow into the Little Weeenee - one from "Peggy" Lake to the south, and one from the mountains to the north.
GENERAL INFORMATION AND TENTATIVE PLANS FOR SUCCEEDING WORK.

If any additional work is to be carried out in the region it will be confined chiefly to some six square miles of crown timber on the Clearwater River above the canyon to the east of T.L. 9471p. This area is at present under Timber Sale Application 1153. A small party of five men, including a cook, with two packers additional, would be sufficient. Equipment for a large party would be too cumbersome to move into the area, which can be best reached by back packing in over the hills from Minnette Bay. A trail would have to be cleared for this. It cannot be reached by river because of the Clearwater canyon. A preliminary examination of the area shows Little Wedeene with probably more bottom land and a larger percentage of Spruce. Work would be commenced from the N.E. corner T.L. 9471. The north line of this licence crosses the canyon almost at its head and is somewhat difficult to locate because of the steepness of the walls. The river above the canyon could be traversed easily at least for several miles for use as a base line. The work might take a month as all moving would be by back packing and there are no trails whatever.

The only other possible work is up the valley of the stream shown on the map as Brinkman River, which enters the Kitimaat at its mouth. There are perhaps three square miles of timber up the valley which is steep sided with the stream running through the canyon principally, with a number of steep waterfalls. The timber is Hemlock and Balsam of fair quality, but small. The logging chance would be a poor one as the stream is not drivable and it would be difficult to locate roads of any kind. The party were about to commence work in this valley early in October, but the country all around the mouth of the Kitimaat became flooded under several feet of water and camp had to be moved to Kitimaat Indian Village.

From here examination was made of three minor watersheds flowing into Kitimaat Arm (as shown by small map submitted) but scarcely any timber to warrant cruising was found.

T.A. Clarke,
Forest Assistant.
Victoria, B.C. Jan. 28, 1922.
<table>
<thead>
<tr>
<th>AREA</th>
<th>ACRES</th>
<th>ESTIMATE</th>
<th>M.B.M.</th>
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</thead>
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<tr>
<td>Total</td>
<td>12983</td>
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</table>
KITIMAAT, 1922.

REPORT ON CRUISE OF THE CLEARWATER VALLEY ABOVE THE CANYON.

T. A. Clarke.

This report, and the detailed estimates accompanying it, can be attached as an Appendix to the Kitimaat Cruise Report made last season. The cruise of this area was a part of the Kitimaat project for 1921, but the party was unable to get into it that year owing to the lateness of the season and inclement weather, when work in the main Kitimaat Valley was finished.

The estimate shows a total of 79 million board feet, of which 52% is Hemlock, 33% Balsam, and 13% Spruce. The remaining 2% is scattered Cedar.

1. CRUISING AND SURVEY METHODS.

The party, in charge of T. A. Clarke, arrived at Kitimaat on May 12th. A cook and two Indian packers were engaged locally, making a total of seven in the party, as follows:

Chief of Party (Estimator)
1 Estimator,
2 Compassmen,
1 Cook,
2 Packers

A route for a trail was immediately located, starting at Minnette Bay, and work commenced cutting it. As the trail progressed, camp equipment was relayed in
at the same time by back packing. Two intermediate camps were established on the way in, the final camp, from which most of the cruising work was done, being placed about 2\(\frac{1}{2}\) miles above the canyon. Considerable deep snow was encountered all the way in, making back packing and trail cutting slow work. The total trail cut to the final camp was approximately nine miles.

Cruising methods used were as outlined in "Instructions for Intensive Reconnaissance," a 5% cruise being made. A map showing 100 ft. contours, timber types, streams, etc., is submitted. Elevation were carried in from Minnette Bay with aneroid barometers to the head of the canyon, the reading obtained being checked four times with sea level. A tie was made with the N. E. corner of T.L. 9471p, and a river traverse run as a base line. No ties were available for the far end of the base line. It was run with staff compass and chain. Levels were carried along the river with Abney hand level and bench marks established at frequent traverse stations.

**Volume Tables.**

Volume tables used were the Kitimaat tables constructed for Hemlock, Balsam and Spruce last year. It was found possible to construct Short, Medium and Tall height curves from the Balsam and Hemlock tables, and accordingly these two species were tallied by diameters only and classified by "forties" or types within forties
as Short, Medium or Tall. These tables were not applied at random and were not accepted as a basis for working up the cruise without first of all securing measurements on representative windfalls along all strips, and by frequent use of the hypsometer. Spruce were tallied by diameters and 32' log lengths as the variation in height and the scattered nature of the species did not justify the use of height curves.

2. LOCATION AND GENERAL TOPOGRAPHY:

The area cruised is the Crown land in that part of the valley of the Clearwater River above the canyon. The head of the canyon is 4 1/2 miles due east of the Kitimaat River, of which the Clearwater is a tributary. The valley which throughout the three miles or so of the canyon slopes precipitously to the river, broadens out considerably above the canyon, so that between the river and the adjacent slopes there are areas of low lying bottom land, varying from half a mile to a few chains in width. The slope to the south of the river, however, in general persists to the water's edge, practically all the bottom land lying to the north of the river. The river is split up throughout into numerous channels by extensive gravel bars. It drops about 40 ft. to the mile and has a velocity of eight to nine miles per hour. Approaching the canyon the drop becomes greater and the water channel narrower. Entering the canyon at an elevation of 600 ft. it drops
approximately 450 ft. through the three miles or so of the canyon's length, numerous waterfalls occurring.

**Climate**

The figures submitted in the main Kitimaat report will apply here also.

**Agricultural Possibilities.**

There are approximately 300 acres of bottom land which, when cleared, should prove fertile enough for agriculture. The soil, however, in the bottom land is inclined to be shallow on the whole, overlying boulders and coarse gravel a few inches from the surface.

The benches and slopes should be considered as "absolute forest land."

3. **FOREST DESCRIPTION:**

Two merchantable timber types were recognized in the valley, namely:

1. Bottomland Spruce type.
2. Hemlock-Balsam slope type.

These are separated on the map.

(1) The Bottomland Spruce type occupies the low lying areas subject to overflow from the river. This type is identical with the Riverbottom type, as described in the main report. The type is practically a pure Spruce one, and outside of this type the amount of Spruce is negligible.
The Spruce does not by any means average as large as the stands in the Kitimaat Valley, nor do individual trees reach the same size. It is, on the whole, of fair quality, little visible defect being apparent. In the more open stands the trees are naturally limby, but these are the exception, the majority carrying their height well.

Average and maximum trees in the type are as follows:

Average - 30" D.B.H. 3½-32' logs. 1225 bf
Maximum - 60" D.B.H. 5-32' logs. 1750
Average Cull 6%

(2) The Hemlock-Balsam slope type occupies the benches and slopes of the valley up to a maximum elevation of 1700 ft., beyond which the slopes are too steep and the timber too small to be considered merchantable. Scattered Cedar occurs in the type at the higher elevations, but in quantity and quality is negligible. The type corresponds closely to the Upper Bench and Side Hill types, as described in the Kitimaat report. Hemlock constitutes 60% of the stand, Balsam 39%, the remainder being Cedar.

The merchantable type throughout is split up by areas of scrub timber and open swamps, and, as a result, the timber might be termed "patchy." The Hemlock is disappointing. It is, on the whole, large and tall, but any tree above 30" D.B.H. is a doubtful proposition from a logging standpoint. Forty percent of the trees above this diameter show visible defect—mostly brackets of various heart rots. On the whole the Hemlock is of poorer
quality than in the Kitimaat Valley.

Balsam, on the other hand, will average better quality than in the Kitimaat. They are, on the whole, tall, clear, straight and thrifty. Up to 30" D.B.H. little defect shows, but trees above this are apt to be defective. Balsam of 30" and up are, however, in the minority, so that defect is, on the whole, much smaller than in the Hemlock.

Average and maximum trees in the type are as follows:

Hemlock:
Average - 26" - 3½ logs
Maximum - 60" - 5 logs
Average Cull - 25%

Balsam:
Average - 24" - 3 logs
Maximum - 44" - 5 logs
Average Cull - 17%

4. **Logging Conditions:**

Logging within the area itself should present no special problem. Whilst the slopes are fairly steep, they are also on the whole even.

The river is not driveable.

An easy route is offered for a railroad along the north bank of the river. Before reaching the head of the canyon it would have to be brought over to the south bank. From here the only practical route is south-west- erly through the timber licences and thence to Minnette
Bay. For more than half of this distance the country is rough, but it would be possible to construct a railroad which would serve both the area in question and the adjoining Timber Licences.

Fifteen hundred feet is approximately the maximum elevation between the head of the canyon and Minnette Bay. Any road or railroad would have to climb to at least 1000 feet.

The topography presents a series of high benches—one rising steeply from another—and dissected by innumerable, unusually deep and steep ravines, some of them quite precipitous. Over the divide to Minnette Bay, however, the slopes are more uniform and a fairly easy route could be secured.
<table>
<thead>
<tr>
<th>AREA</th>
<th>MERCH.</th>
<th>TOTAL</th>
<th>HEMLOCK</th>
<th>BALSAM</th>
<th>SPRUCE</th>
<th>CEDAR</th>
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<td>1154.8</td>
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Grand Summary of Cruise of Kitimaat and Clearwater Valleys.

1921 and 1922.

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<tr>
<th>Tree</th>
<th>Acres (M.B.M.)</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hemlock</td>
<td>132,928</td>
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<tr>
<td>Balsam</td>
<td>110,668</td>
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<td>Spruce</td>
<td>71,060</td>
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<tr>
<td>Cedar</td>
<td>12,040</td>
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Total 326,716 M.B.M. 100%
The Kitimat Valley. From Kitimat Arm

T.A. Clark
View Above Clearwater Canyon, T.A.C. 29/7/21.

Head of Clearwater Canyon.
T.A.C. 29/7/21
Clearwater Canyon
T.A.C. 28/7/21

Above the Canyon.
Country to be curised next year. T.A.C. 29/7/21
Natural Thinning in Hemlock

Fresh Meat.
T.A.C. 22/9/21.
A Normal View of the Kitimat
7 miles from the Mouth.
T.A.C. July 1921

Spruce & Alder in the River Bottom. L. 6200
Kitimat River. T.A.C. Aug. 1921
Balsam  Spruce  Hemlock
Lot 6181 on Clearwater River.
Low Bench Timber  Aug. 3, 1921

Spruce, Lot 6181, Clearwater.
Aug. 3, 1921
Kitimat Valley Looking N.W. from Kitimat Mission, across Kitimat Arm. T.A.C. Oct. 5 '21

Lower Kitimat, Kitimat Arm in distance J.L.A. June '21.
Junction of Kitimat & Clearwater Rivers
T.A.C. 26/7/21.

Transportation
Transportation.
Packed Up.
Key Map
Showing
Kitimat Cruise
1921-1922
Scale 1 Mile = 1 Inch

Legend
Timbered Land shown
Contours shown at 500 Ft intervals.