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REPORT, FOREST SPECIES

TOBA, HOMOLKO & KLENE-A-KLENE VALLEYS

C. S. COWAN, 1914

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Toba, Homolko &
Klene-a-Klene Valleys.

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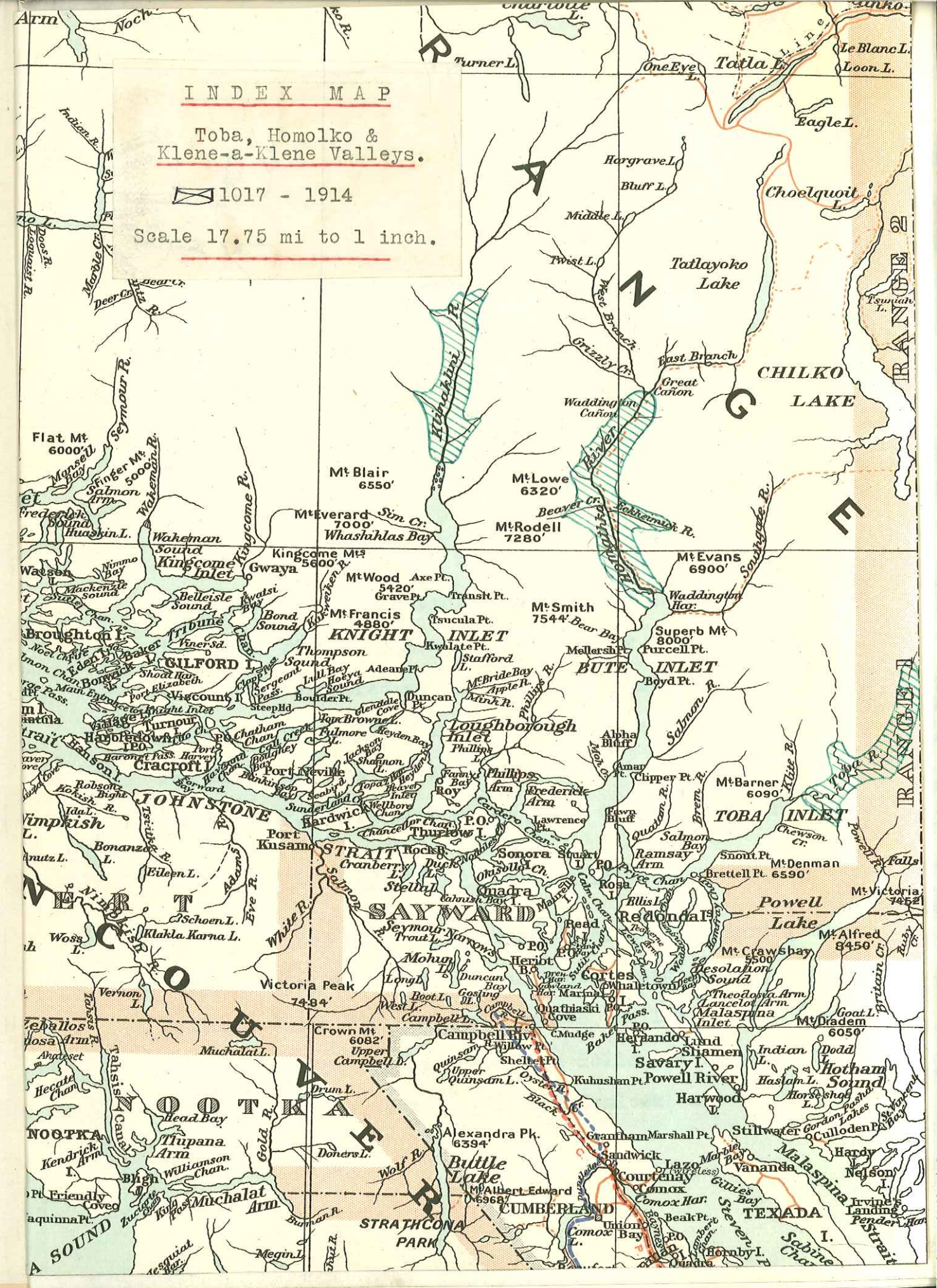
Scale 17.75 mi to 1 inch.



REPORT ON THE FOREST SPECIES OF THE TOBA, HOMOLKO AND KLEME-A-KLENE VALLEYS, VANCOUVER FOREST DISTRICT. 1914

GENERAL DESCRIPTION, FOREST DISTRICT:

The field covered by the season's work, comprised of three important river valleys of the Coast Range, the Toba, Homolko and Klene-a-klene Rivers. These rivers discharge into the Toba, Bute and Knight's Inlets respectively.

The Toba was traced to its source, approximately 48 miles from Tide water. The Homolko, notorious as being the scene of the Waddington massacre by the Chilcotin Indians, was explored as far north as Waddington Canon, which proved to be an effective barrier to our further progress. The Klene-a-klene Valley was traced out as far north as Canon Creek, where high water put a stop to further progress.

IMPORTANT FOREST SPECIES

The important forest species noted during the field season, were Western Red Cedar, Douglas Fir, Western Hemlock, White Fir (Balsam), Spruce, Yellow Cedar. These various growths may be divided as follows:- Lower slope type, comprising Cedar, Douglas Fir and Hemlock; and the Spruce,

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Balsam and Hemlock Type. The middle slope type from 700' to 2400' comprises Hemlock, Balsam and White Pine. The Alpine type, Jack Pine, Mountain Hemlock and Yellow Cedar. Of these types the most important commercially is the first names. The geographical range (so far as it affects the district covered by the season's work) of the Lower Slope type covers all the bottomlands up to an elevation of 2,000' above sea level and continues up the side hills to 700'. The ubiquitous Hemlock obtrudes itself under all conditions and can always be figured on no matter what conditions obtain. The Cedar and Douglas Fir on bottom lands, are generally found attaining a good size in a well drained mineral soil where moisture requirements are favorable.

On the Toba, the best growth of this type is found on the lower slopes; the bottomland is evidently unfavorable to their best growth, being extremely liable to flood during the hot summer months.

The bottomlands of the Homolko, especially on the lower reaches adjacent to tidewater, and extending on the East bank to Cedar River, and on the west one mile north of Beaver Creek are well covered with a splendid growth of Cedar, Douglas Fir and Hemlock; the bottom being some three to six feet above high water level, and consequently less liable to flood than the Toba bottoms. The side hills are, however, less

favorable to the growth of this type, and it rarely occurs above 400'. A distinct Cedar and Fir stand was encountered on a flat between Waddington Canyon on the north and Palmer Creek on the south of the Homolko, being situated on the west bank.

The Klene-a-klene Valley does not offer any favorable conditions to the maturing of the type most prevalent in the Toba and Homolko Valleys. Some good scattered timber occurs on the Lakes, Third, Fourth, Fifth and Sixth, which extend in the form of a chain between a low range of hills on the East Bank, and the Main Range. Third, Fourth and Fifth Lakes are connected by creeks into the main river, emptying about five miles from Tide water. Sixth Lake empties to the north, entering the river about twenty miles from the mouth. On the southern shores of Third Lake on both East and West Banks, the Lower Slope Type is prevalent with this difference: On the West side, hemlock, Douglas Fir and Cedar grows in the order designated, while on the East, Cedar, Douglas Fir and Hemlock are the prevailing types. In this vicinity the side hills are steep, lightly covered with soil and are exceedingly rocky and so are not favorable to the growth of this type. It was, however, on these lakes that the stands of spruce, hemlock and balsam were noted. While occasional spruce and balsam (Abies Amabilis) were noted in the valleys of

the Toba and Homolko Rivers, no distinct stands were encountered till the lakes were explored. On the East banks of Fourth Lake, a distinct stand of balsam, sitka spruce and hemlock was noted. The balsam and hemlock continue to an elevation of 3,200' where both growths become scrubby, averaging 8"-10" by 30' to 60' in height, while the spruce does not continue above the actual lands.

For the different species the soil and moisture condition vary considerably:

Western Red Cedar: This tree is generally found in the bottomlands, where the soil is moist but well drained. On dry rocky soils, it apparently is soon affected by heart rot. It was found growing up to the elevation of 700' above river level, but never attained the size that it reaches in the lower elevations.

Douglas Fir: This grows to greatest advantage in a well drained mineral soil and reaches its full size up to an elevation of 500' above river level. It favors, apparently, a western aspect, but if other conditions are favorable it is very tolerant.

Western Hemlock: This tree thrives on any soil if there is abundant moisture, but is also to be found growing with varying success under almost all conditions. While it attains its best growth under the same soil and moisture conditions as those of Douglas Fir, yet it continues to grow up to an elevation of 4000' above sea level. At this altitude it degenerates to a scrubby crippled growth measuring 6" - 8" in diameter with a height varying from 30' - 60'.

Mountain Hemlock: This was found inhabiting the loose, coarse mineral soil of the Upper slopes. It rarely attained a diameter greater than 16" with a height of 40'.

White Fir: (Abies amabilis) This was found under widely varied conditions of soil and moisture. It was found in conjunction with the western hemlock and sitka spruce on the lower slopes of Third, Fourth and Fifth Lakes in the Klene-a-klene Valley, where the soil was a gravelly, sandy loam and continued to an elevation of 3000' above river level. Above 500' it became a poorly nourished growth, seldom exceeding a foot in diameter and 80' in height, while at the higher elevations it becomes a poor, scrubby cripple. This may be consequent in part on the poor soil afforded on the higher slopes; in this region the side hills are very thinly covered with soil.

Spruce: (Picea sitchenses) Spruce is found occasionally throughout the region covered this season, mostly in swampy bottomlands, where it grows with the branches low. It was found on the Lake portion of the Klene-a-klene Valley in a stand with Red Cedar. Moist alluvial soils with a heavy rainfall are necessary to the commercial growth of this tree. It rarely grows above 700' on the side hills and is generally crippled and stunted on rocky soils.

Yellow Cedar: This was found on the higher slopes, ranging from 2000' to 4000'. This apparently requires very little soil, and on the gravelly, rocky, high slopes it does well.

It was generally found in association with hemlock, western, white pine and jack pine.

FIRE HAZARD AND EFFECT OF FIRE

The region covered by the season's reconnaissance was all in the Coast Wet Belt, and as a result the fire risk is not great. The Toba and Homolko Valleys have less than 1000 acres of burn of recent (up to twenty years) date, evenly divided between them. On the Klene-a-klene there is, a big burn on the west side, covering approximately 1500 acres. On the east side, north of Mussell Creek, and south of the Third Lake Divide, another burn exists. In the latter case, the fire ran along the timber on the rivers edge, while in the former, it destroyed a well wooded hill. In both cases, the fire was approximately helped by a high wind, both fires culminating in a heavy growth of merchantable timber. In my opinion, however, very ordinary care in this district would prevent forest fires as the undergrowth is dense and sappy and not very susceptable to fire. The inference is that the fires noted were the result of carelessness. The effect of the Toba and Homolko fires is the partial extinction of the virgin growth in favor of jack pine and hemlock. The same result was noted on the Klene-a-klene River, jack pine coming in thickly with scatterings of hemlock and cedar.

NATURAL REPORDUCTION ON DIFFERENT SITES AND UNDER DIFFERENT CONDITIONS:

The reproduction noted in the Toba Valley showed a decided tendency of the western hemlock towards the supercedence of the other species. This was noted throughout the Valley from the mouth to 38 mile point. Above this the timber is practically all contained on the east bank, and the tendency is towards the reproduction in about the same proportions as the old forest growth.

Where douglas fir made up a fair share of the stand, indicating a sparsely covered rocky side hill, the reproduction was decidedly poor. This was noted to apply to the portions with an eastern aspect.

In the Lower Homolko, when the timber is fully matured there is not sufficient top light for a healthy second growth. As a result, the timbered lands situate between the mouth of the river and extending to a mile south of Beaver Creek, show a decidedly small amount of reproduction, the only species tolerating these unfavorable conditions being the Western hemlock. On the lower slopes of the side hills, however, the reproduction is in proportion to the existing species, with perhaps a slightly larger percentage in favor of the hemlock. This also applies to that area denoted on the accompanying map, as lying south of and adjoining Cedar River, a Branch of Ice or Eickheimick River. The various other timbered portions of this valley, which are very

scattered, have the reproduction characteristics of the district; that is, where the growth is mature, as it is in these cases, the size and thickness of thelarge growths depreciate the chances of reproduction on a scale commensurate with the forest growth already existing. It may then be stated that reproduction on such sites as would ensure the profitable regeneration of the forest is practically nil.

The Valley of the Klene-a-klene is of such a widely variant formation from the two valleys previously dealt with, that the change of reproduction habits is not surprising. The rocky nature of the soil is against the chances of the rapid growth of the better qualities of commercial lumber, and about 25% of the second growth is hemlock; cedar, jack pine, balsam and spruce coming next in order of precedence. On the rocky side hills of the canon, the slopes above 800' are sparsely covered with jack pine. On the lake portion of the Valley, hemlock, spruce, and balsam are coming in, but such reproduction is in no wise commensurate with the mature forest growth.

PROPORTION OF TYPE ON AGRICULTURAL LAND.

With regard to the agricultural area of the Toba Valley, the land may be said to be timbered only with alder and cottonwood, with occasional stands of cedar, fir and spruce on higher areas. These stands are from three to six acres and

cannot be said to form any appreciable percentage of the valley.

But where these small stands are existent Cedar forms 35%, Douglas Fir 30%, Hemlock 25%, Cottonwood 10%. Of the lower lands Alder makes 80% of the growth, Cottonwood 15% and Cedar 5%. The agricultural area of the Homolko is covered by the best type of Commercial timber in British Columbia, i.e. Red Cedar and Douglas Fir, with some Hemlock. The area under mention is that extending on the West Bank, and the Cedar and Douglas Fir may be fairly said to comprise 50% and 40% respectively with 10% of Hemlock. The area on the West Bank previously noted as being heavily timbered, and adjacent to, Cedar River where a larger percentage of Hemlock appears, with occasional Spruce. The proportion of type is here 35% Cedar, 35% Douglas Fir, 25% Hemlock and 5% Spruce.

COMMERCIAL DESCRIPTION

The average stand of timber on covering the Toba Valley is 25,000 B.F. per acre where timbered. The average stand of the timbered land in the Homolko is 35,000 B.F. The large well timbered flats referred to would average 45,000 B.F. but these areas are not a good average. The Klene-a-klene Valley has an average stand of 20,000 B.F. on the timbered area.

PRESENT AND PROSPECTIVE UTILIZATION.

There are not, at present, any logging operations carried on in these valleys. Logged-off areas in both the Toba and Homolko Rivers denote previous activities. Two years ago, the Toba River

Licence holders had surveyed 16 timber licences, showing that it was their intention to commence operations in the near future. The Manager of the Southgate Logging Company, Mr.Traft Bernard, also informed me as to the intentions of the Tide Water Company, which control the best tract of timber on the Homolko River. It was supposed that at an early date a logging railroad would be constructed, and that operations would begin in the near future. An old booming ground at the river mouth would help them considerably in keeping down expenses, besides the fact that there is hardly a better or cheaper site for a railroad to be had. The ground is level and silty, so there are no engineering difficulties to be encountered. Added to this, the timber under control of this Company is mostly Cedar and Douglas Fir, and runs high. The timber in the Valley of the Klene-a-klene offers very few opportunities for cheap logging facilities: the timber is scattered in small stands, and rocky bluffs and huge slides mitigate all chances of extensive logging during the present conditions and prices. The Lakes may be logged by constructing straight open dykes to connect them up, instead of the present winding creeks that carry the run-off. From the Southern end of Third Lake, a skid road could be constructed, with three donkey engines to haul out the timber to the main river, from where the logs might be driven to the river mouth and boomed. But at the best, the Valley does not offer any feasible opening to cheap logging, and the booming grounds are by no means of the best,

and in view of the many other timbered areas in more favoured locations, it does not appear as if this valley would come under the lumber operators' notice for some little time to come.

SILVICAL STUDY OF SPECIES.

Western Red Cedar Thuja plicata

(a) Botanical Range This tree is found on all the well drained bottomlands covered by the season's reconnaissance. It was noted up to the head of the Toba River; dying out when a mile from the glacier from which the river emanates. It grew to maturity as far north as Waddington Canyon, on the Homolko River, while wherever soil and moisture requirements were at all favourable in the Klene-a-klene Valley this tree grew to a favourable size.

(b) Commercial Range. So far as present prices and accessibility of this species is concerned. The Toba and Homolko Valleys offer by far the best opportunities to the logging of the Western Red Cedar. On the Toba it can be readily logged up to an elevation of 500' above river level, and it continues up to the mouth of the Canyon adjoining Summit Creek. It also carries up the Little Toba to a point six miles from its confluence with the Main River. The bottomlands of the Homolko, where not subject to an annual inundation of glacial water, are eminently suitable for the maturing of this valuable tree, attaining as it does an average diameter of 30". It grows on the lower slopes up to 300' above river level, but never attains the size of the bottomland tree. On

the Klene-a-klene there is but little opportunity for its favourable development, but the lower soil-covered slopes carry a good type of this tree; on the lake shores, never above 300'; on the Canyon up to 600'. Adjoining Canyon Creek it attains a good average diameter, but tapers rapidly. Just in this portion of the valley the average side hill slope is 27° but there is abundant loose, black soil.

(c) Soil and Moisture Requirements. This tree favours a moist but well drained mineral soil. On dry rocky soils it is soon affected by heart rot.

(d) Average and Maximum development on varying sites. The Western Cedar attains its maximum growth in the moist alluvial bottoms, with good drainage facilities. Trees with a diamater of 10' are not uncommon, but generally these big trees branch into several independent boles 10'-20' from the ground. Under good soil and moisture conditions such as occur on the lower slopes of the Toba and Homolko Valleys, the average diameter was 38". In the logged off areas of these two valleys, stumps of cedar 5' in diameter showed clear and sound.

(e) Rate of Growth. Studies of 170 measurements showed growth of 10" in 70 years, 20" in 115 years and 30" in 180 years.

(f) Relation towards associate species. The Cedar is very tolerant towards its general associate trees, the Douglas Fir and Western Hemlock. It is, in general, the most tolerant of its type.

(g) Reproduction habits. A prolific seeder, with heavy seed years at irregular intervals. Moist organic soils are best suited to the germination of the seeds.

(h) Liability to damage, from fire, insects, fungi and wind. Its thin bark and its general tendency towards dryness render the cedar extremely liable to damage from even fast fires. It is free from fungi of all kinds, though on dry soils it is generally afflicted with heart rot.

(i) Present uses and future possibilities. The timber in greatest demand in B.C. is, of course, the Red Cedar, which has been termed the "Superlative Lumber Overcoat". Being almost impervious to weather, it is in great demand for outside finish, shingles, poles etc., Where not subject to hard usage it also makes a splendid inside finish. It is extensively used in the construction of small power boats, and being moth-proof, closets, linen boxes etc. are manufactured from this wood. Beyond an extension of its present uses, the future possibilities of Cedar do not readily commend themselves. It may be that if Cedar poles were treated with creosote at the point where they protude above the ground it would prolong their life beyond the present average of 17 years in the untreated state.

(j) Present Utilization and Possibilities of Improvement. Cedar, on account of its general "buttressy" formation of the butt, is generally cut fairly high to prevent the tree splitting when felled. Even with all these precautions, a great many of the main

logs are so badly split as to cause the operators to treat such lumber as useless and leave it in the woods. However, the prevailing prices of Cedar greatly mitigate all unnecessary waste. There is no doubt that in the near future shingle mills will clean up all the present lumber left in the woods, and as the Cedar does not readily decay, when the time comes for the erection of such mills there will be little loss from this cause.

(k) Range of stumpage value. Stumpage value varies in ratio to the accessibility of the timber and stand per acre. The Toba River can be "driven" and the timber is fairly easy of access, and the stumpage is worth $1.00 per thousand. The timber adjacent to Beaver Creek as well as that lying south of Beaver River, can be valued at $1.25 per M., ranging down the scale till at Waddington Canyon it is worth 50¢. This also applies to the Upper Klene-a-klene Valley, while the timber to the south of Third Lake may be valued at $1.00

(l) Value of chief manufactured products. Graded Cedar used for launch and boat building averages $31.20. Cedar used in the manufacture of barrels and water tanks $26.50. Sash and doors, $37.35. Rough lumber $14.00.

Douglas Fir. Pseudotsuga taxifolia

(a) Botanical Range. Its general altitudinal range is up to 6000' above sea level, but slope conditions are not favourable to the maturing of this species above 500' side hill elevation. On benches where there is sufficient soil to justify its growth

it continues up to 2000', as in the case of Beaver Creek, in the Homolko Valley.

(b) Commercial Range. The Botanical range designated above fairly well covers the commercial range in this district. Fir on the Toba seldom grew successfully above 700' of side hill elevation; 300' on the Homolko, and rarely above the immediate bottoms in the Klene-a-klene Valley, except along the Canyon, where numerous draws and benches afforded sufficient soil for the commercial growth of this tree.

(c) Soil and moisture requirements.

A tree favouring a well drained mineral soil. It finds favourable conditions existing on the lower slopes of the Toba and on the Bottomlands of the Homolko, where not subject to flood. The fringes of the Lakes in the Klene-a-klene, as well as the numerous draws of the Canyon, also afford the moisture and soil conditions demanded by this tree.

(d) Average and Maximum Development on varying sites:

On well drained soils, the maximum growth of this tree was 64"; on steep soil covered sidehills, 48"; and where the soil was shallow, or saturated, the maximum was 22". The average tree of this species measured 36" by 100' in height.

(e) Rate of Growth. Observation of 75 trees in the Toba Southgate and Homolko Rivers showed that this tree grows rapidly and persistently, averaging 10" in 55 years, 20" in 100 years and 50" in 180 years, attaining an age of 500 and a maximum of 68".

(f) Relation towards Associate Species. Douglas Fir requires plenty of top light, and is in general a very intolerant tree.

(g) Reproduction Habits. A prolific seeder, it germinates to greatest advantage on a moist, mineral soil. Throughout the Toba Valley, it was noted that this species was gradually being superceded by Hemlock. In the Homolko and Klene-a-klene Valleys the Fir is holding its own, and reproduction is fair.

(h) Liability to damage by fire. The heavy bark on this species protects it against a fast fire. As a tree, it is remarkably free from disease and is not easily damaged in its habitat by wind.

(i) Present uses and future possibilities. Without doubt the greatest structural timber in the world, being 25% lighter than any other lumber of equal strength employed for this purpose. It is extensively used for studding and inside finish, besides making an excellent veneer. Piles and poles of Douglas Fir are also in general use, and barrels of this timber are coming gradually into use. A profitable form of future utilization may spring from the distillation of this lumber. Acetates of several kinds, wood alcahol and turpentine are also among its by products.

(j) Present Utilization and possibilities of improvement. Douglas Fir, ranking equal with Cedar in mill price, is logged under the same conditions, and nothing is left in the woods that is capable of being converted into lumber. The existing logging conditions in he west are such, that trees standing on fairly steep

side hills are left, and it will be some considerable time before it would pay to log over the area cut, to collect these scattered stands. There is no doubt that with the rapidly incoming form of aerial logging, that the ground will be cleared in toto of these trees that are at present inaccessible.

(k) Range of stumpage value. Douglas Fir ranks equal with Western Red Cedar in regard to stumpage values and the same values obtain.

(l) Value of chief manufactured products. Graded Fir used for launch building averages $31.20 per M.; for water tanks and barrels $26.50; sash and doors $37.35

Western Hemlock, Tsuga heterophylla

(a) Botanical Range A hardy tree, which is not restricted by unfavourable conditions, it is found existing with more or less success under the most unfavourable soil and moisture conditions, up to 6000' above sea level. It was, of course, very much in evidence throughout the country covered by this season's survey. Requiring abundant moisture it thrives in the valleys covered.

(b) Commercial Range. Its commercial range carries up the three valleys traversed, and up to 1500' above river level. Above this elevation, however, conditions are seldom favourable to its successful commercial growth. On the Homolko it attained its best growth on the well drained flats.

(c) Soil-moisture Requirements. Requiring abundant moisture, it thrives best in well drained mineral soils, but grows under almost any conditions, with more or less success.

(d) Average and Maximum Development on varying sites. The average development under favourable conditions is 26" with a height of 120'. Occasional trees, with a girth of 52" by 140' were noted.

(e) Rate of Growth. It is a slow growing tree, averaging about 20 inches in 140 years.

(f) Relation towards associate species. It is a very tolerant growth, the seedlings thriving under very unfavourable conditions if there is plenty of top light.

(g) Liability to damage from fire. The thin bark and shallow rooting system of this tree, makes it very susceptable to forest fire ramage. While it does not burn as quickly as Douglas Fir or Red Cedar, a fire through a hemlock forest is generally a top fire. Hemlock being a heavy shade tree, the fire danger is reduced by the resultant shading of the ground and the lesser cover of debris.

(h) Present uses & future possibilities. But lately coming into its own for inside finish, it has been in general use for studding, sheeting, boxes and pulpwood. Extensive forests of this timber exist in B.C. but until lately it was not thought worthy of serious attention. With Spruce, it ranks as first rate pulpwood.

(i) Present Utilization and possibilities of improvement. Very little serious attention has been paid by the operators to this

lumber, if it is found in conjunction with the more used timber. The consequence is that in many cases isolated stands of hemlock are to be found on logged over ground. Recent exhibitions of this timber have caused it to be looked upon more favourably by the operators, and, as a consequence, it has been of late successfully employed for fine finish work. Western Hemlock both takes and holds stain well, and there can be no doubt that in the near future it will be extensively used for such purposes as pannelling, veneer etc.,

(j) Range of Stumpage values. Under present conditions hemlock is classified with Douglas Fir and Cedar, except when sold as pulp wood, when it ranges from 50¢ to 75¢.

(k) Value of Chief Manufactured Products. There is no reliable information as to the various products of the Hemlock, but its average price at the mill for rough lumber is $12.00 to $14.00.

Lovely Fir or Balsam. Abies amabilis.

(a) Botanical Range Balsam was found occassionally all along the Tobs, above the Douglas Fir; on the headwaters adjoining Summit Creek it was in a pure stand of approximately 20 acres. It is by no means common to the Homolko, forming a negligeable percentage of the forest stand, but comes in on the Klene-a klene so as to form an appreciable percentage. In general it is found up to 5000' above sea level, but is exacting as to drainage and soil requirements, preferring a sandy loam, but also thriving

in a gravelly sand. On the east shores of Fourth and Fifth Lakes it grows in conjunction with Hemlock, Spruce, Cedar and Douglas Fir, continuing with Hemlock to an elevation of 5000', where it is but a poor scrubby growth, with an average diameter of 8" and a height of 40-60'.

(b) Commercial Range. Balsam, with the exception of the stand of Summit Creek, and the trees found in the spruce, hemlock and balsam type of forest on the west banks of Fourth and Fifth Lakes, is hardly a tree to be reckoned under the commercial range in this district. The stand existing on the Toba, at Summit Creek, can be readily logged in conjunction with the other timber adjoining, and the levels up to 300' above Lake level in the Lake portion of the Klone-a-klene Valley, are also within the scope of the loggers' operations.

(c) Soil and moisture requirements. Balsam, to attain its best development, requires a gravelly, sandy soil, where moisture is abundant and the drainage good. During the seasons survey it was found to attain its best growth under these conditions.

(d) Average and maximum development on varying sites. In the bottoms, where soil and moisture conditions are favourable, it attained a maximum development of 36" in diameter and 140' in height. It degenerates rapidly with side hill elevation and from 2000' to 5000' it was but a poor stunted growth. The average D.B.H. was 22" by 100' in favourable lands, and on the higher slopes, an average of 8" by 40-60' was noted.

(e) Rate of growth. It was impossible to obtain figures on the growth of this tree in the district covered.

(f) Reproduction habits. Reproduction being from seedlings, the young growths are found near the parent trees, where top light is plentiful, and the soil well drained and of a sandy nature. A rich humus covered soil is also favourable to this tree.

(g) Liability to damage from fire, fungi, insects & wind. The thin bark cover of the Balsam added to the pitchy pockets contained by the bark, render it particularly liable to fire damage. It was generally free from fungi and insect trouble, but a few young trees of 30-35 years of age were noted to be attacked by a species of boring grub. Favouring as it does the sheltered slopes and bottoms, it is fairly free from danger from wind, but on the higher slopes its shallow rooting system renders it an easy prey to high winds.

(h) (i) etc. See under "Sitka Spruce".

Sitka or Tideland Spruce Picea sitchensis.

(a) Botanical range. This tree was found sparingly in the Toba and Homolko Flats, always where moisture was plentiful. Around the headwaters of the Toba River, it formed about 15% of the commercial growth, the remainder being largely hemlock. Only occasional trees of this species are to be found on the Homolko, the moisture required by this tree evidently being deficient in the rocky soil, and as a result the few trees there are stunted.

It is found on the Island of the Klene-a-klene River valley, and while there is not any appreciable stand, yet it forms 30% of the merchantable timber, the remainder being hemlock. A good stand of spruce was found on the Low Divide, between Fifth and Sixth Lakes, the average diameter being 36" and the height 90 feet. This was mixed with Cedar and Douglas Fir, and the spruce covered about 40 acres. A young spruce, hemlock and balsam forest is on the shores of Fourth and Fifth Lakes, on the lower slopes, up to 200' above Lake level; above this it soon degenerates into a crippled, twisted, growth.

(b) Commercial Range. The commercial range of spruce on the Toba pertains only to those trees in the bottom lands. It is very unlikely that the spruce above the canyon will be logged for some considerable time to come. Such spruce as is on the Homolko is within the commercial range, it seldom being found off the flats. The Klene-a-klene spruce, growing on the islands of the main valley, is only fit for pulp wood, the branches growing low, and the tree has a rapid taper. On the shores of Fourth and Fifth Lakes, the spruce is as commercially within the loggers' scope as the other species, such as Cedar, Douglas Fir, Balsam & Hemlock.

(c) Soil and Moisture Requirements. This tree prefers the moist alluvial soils where moisture is plentiful, and drainage good. Swampy soils apparently induce very limby spruce.

(d) Average and Maximum growth. The average size encountered was 34" by 100 feet in height. Its maximum growth was 72 inches by 140 feet in height. This occurred in the well drained bottomland

of the Little Toba.

(e) Rate of growth. The growth is very rapid after the first few years (overtakes Hemlock) and is very persistent.

(f) Relation towards Associate Species. It is generally found associated with Hemlock and Balsam, but a stand in the Klene-a-klene Valley was growing in conjunction with Cedar and Douglas Fir

(g) Reproduction Habits. A prolific seeder, with heavy seed years every two or three years, it should ordinarily have a fair amount of second growth near the parent tree. It was, however, noted that the spruce second growth was decidedly poor, except in the case of some 200 acres on Fourth, ~~and~~ Fifth and Sixth Lakes, where young forests of spruce, 40-50 years old are doing well.

(h) Liability to damage from fire, fungi, insects and wind. Its shallow rooting system renders it liable to damage by fire, but apparently a fast fire does not utterly destroy the tree, in spite of its thin bark. In the swamps it is very liable to attacks by conk, but as a rule, the district covered was singularly free from this pest. Insects do not appear to trouble the spruce tree and its partiality for the alluvial bottoms renders it free from damage to wind.

(i) Present Uses and future possibilities. Spruce, not being distinguished from Balsam at the mill, it is proposed to treat them together. These woods have been used for inside house building studding, water barrels, sheeting and pulpwood and boxes. Spruce has been used in the manufacture of aeroplanes with considerable success. There is no doubt that the excellent graining of these

woods will induce builders to use it in greater quantities for inside finish such as panelling.

(j) Present Utilization and possibilities of improvement. Both the spruce and balsam are logged under the same conditions as Cedar etc. if they come readily within the scope of the loggers field operation. As a general rule, both these species, in common with the Hemlock, are sold to the Pulp Mills. The consequence is, the "by" loggers do not "go after" these trees, except they are profitable timber. The high cost of logging in the West has greatly mitigated the chances of all woods, other than Cedar and Douglas Fir, becoming as well known as they deserve to be, and consequently these trees, the spruce and Balsam, are not logged as extensively as they would be otherwise. With the opening of new Pulp mills this timber will come under the more serious consideration of the operator.

(k) Range of stumpage value. The same rates apply to these woods in a general forest and for pulp the same as hemlock.

SPECIES NOT IMPORTANT COMMERCIALLY.

The mountain hemlock, yew, jack pine, alder, cottonwood, vine maple, yellow cedar and white pine, may be classed under this heading.

The mountain hemlock, which is found solely as an alpine growth, does not occur to any large extent. It is found inhabiting the loose coarse soil of the mountains, where the precipitation is abundant.

Yew. Found rarely in the swampy lands of the three

valleys, no definite opinion as to its habits can be formed from the bare dozen noted. It was seldom found beyond 900' above sea-level. At the best, it was never more than a crooked twisted growth. Used by the Indians for paddles.

Jack Pine. Large stands of jack pine exist near the timber line on the Toba River. In the Homolko and Klene-a-klene Valleys, it is found on all the rocky sparsely soil-covered bluffs, down to river level. This applies especially to the Klene-a-klene, where the side hills are rocky, and sparsely soil covered, and as a result, almost impenetrable growths were met. On the Southern bank of the Grizzly Creek, Homolko River, it was also found in pure dense stands. The average diameter was 4" and 40' in height. The Jack pine of the coast has not as yet been converted to any commercial use. In Eastern Canada it has been used with success as a pulp wood. In the interior of B.C. it has been used for railway ties, poles etc., but the coast Jack pine is too small.

Alder. Practically all the bottomland of the Toba, from the Little Toba northwards, is covered with dense stands of alder and cottonwood. This tree seems to demand plenty of moisture. It occurs similarly on the Homolko and Klene-a-klene valleys, where like conditions obtained.

The silty bottomlands, where moisture is abundant, are apparently eminently suitable for the growth of this tree, often to the exclusion of all other species. When found in dense stands, the growth is straight and clean for 40 - 50 feet of its height, and its average diameter, 6 - 8 inches. Occasionally, trees with a diameter

of 26 inches are found, but invariably, the trunk is twisted and has a rapid taper, with low growing branches.

Vine Maple. Very few trees of this species were encountered. It was invariably found on rock slides, in small pockets of soil. It was encountered in all the valleys examined, though only an isolated specimen was found on the flats. So it may safely be concluded that its habitat is confined to the rich mineral soils of the slopes, where moisture is abundant.

Western White Pine. Found under widely different conditions; on the dry slopes, mountain ridges, and occasionally in the well drained bottoms. It apparently reaches its maximum growth under the latter conditions, for without exception all the lower slope trees were from 36 to 50 inches in diameter, and up to 150' in height. The upper slopes of the Toba River carry a sprinkling of this type at an elevation of 2000-2750 feet, where the maximum diameter is 36". The average noted during the season, however, was much lower, 24' being a fair estimate. The bottom-land cases cited were isolated specimens, with no surrounding second growth. The Toba slopes, however, carry a very fair amount of second growth, especially where benches occur. Two small lakes on the side hills of the Klene-a-klene, occurring at an elevation of 1500' above sea level, carry around their extreme fringes a good sprinkling of White Pine, the average diameter being 16 inches and height 80 feet. Its reproduction in this vicinity is very poor. Occasionally it was encountered in the Upper Homolko

Valley, about 2000 feet above sea level. Conditions do not seem to be favourable to its general growth, but small patches were noted around Glacier Creek. It was generally associated with Western Hemlock and Jack Pine.

It was apparently free from fungi or insect attacks, and having a deep root is secure against wind.

Yellow Cedar. This was met solely as an alpine, or upper slope type, being found above 2500'. No single instance of existence below this elevation was encountered. It is native to all these valleys above this height. It rarely attained a diameter greater than 16" with a height of 80'. Its average growth is 80 feet by 14 inches; its maximum 100 feet by 20 inches in the region covered by this report. It is an extremely slow growing tree, requiring 175 years to attain 16 inches in diameter. It was generally found in association with Jack Pine and Hemlock, and near the timber line as a pure dense stand. Reproduction very good on the 3500 foot contour. It is singularly free from fungi and insect attacks; it also holds up well to the wind in spite of its shallow rooting system.

Respectfully submitted.

G. S. Cowan.

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