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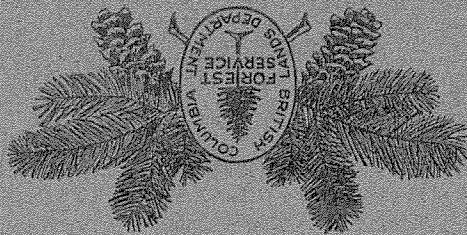
Report of 1940 examination

Natural Regeneration  
on Timber Berth "W"

HISTORY MAP STUDY

ALOUETTE

BRITISH COLUMBIA FOREST SERVICE



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*E.H. Garmann*  
*Asst. Forester.*  
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History Map No. 287-29

E.H. Garmann  
Assistant Forester.

1940 Re-examination

HISTORY MAP STUDY  
FOREST REGENERATION ON  
TIMBER BERTH "W", ALOUETTE LAKE  
New Westminster Land District

Project 45 File 080747

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GARMAN, E.H.  
FOREST REGENERATION ON  
TIMBER BERTH "W", ALOUETTE  
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ABSTRACT

Timber Berth "W" lies to the west of Alouette Lake. The Abernethy-Loughheed Logging Company operated there between 1921 and 1931 in a cedar-fir-hemlock stand of 61,000 f.b.m. per acre.

The study of 5,000 acres of logged-off land partly burned in 1925 and partly in 1931 shows that the earlier burn is restocking satisfactorily because seed trees were on and around it for several years. The later burn is destined to be unproductive for many years because the seed supply is too far away for natural seeding. The 1925 burn has been restocking at the rate of 2.5 per cent annually. In contrast, restocking on the 1931 burn averaged 0.7 of one per cent of the area.

Sites burned in 1925, both before and after the timber was cut, regenerated at similar rates, but the sites burned after logging have a greater proportion of cedar, and those burned before logging have more hemlock, some of which germinated under the mature stand and survived fire and logging. On unburned settings regeneration was much slower than on the burns; according to a previous report this condition was due to the competition of an abundant groundcover developed by a moist climate.

A comparison of the amount of restocking on the two main burn types shows that forty-nine per cent of the 1925 burn was restocked in ten years, but after a similar period the 1931 burn was less than four per cent restocked.

The early logging on this operation left a good seed supply, and both burned and unburned areas regenerated rapidly.

Compared to the original stand, there is much less Douglas fir in the reproduction following logging. Cedar comprised over half the seedlings on single burns but was replaced by hemlock on double burns. Hemlock now forms a much greater proportion of the reproduction than it did in the mature timber.

The topography and location of seed trees with respect to prevailing winds on this site now present poor conditions for regeneration on all types. Sufficient trees were left on the 1925 burn or remained adjacent to it for several years to adequately disseminate seed to that type, but practically no seed is being disseminated to the 1931 burn. On four out of five typical transects adjacent to marginal timber and groups of seed trees satisfactory restocking increased in distance with increase in calculated values of the combined effect of seed supply and seeded, in the other case the depressing effect of young seed trees and a double burn were not fully anticipated in the estimate of the seeding value of all factors. These examples showed that slope has considerable effect on the extent of seed dissemination.

Case History of a cut-over area in the Lower Fraser Valley.

The results of this study are based on  $\frac{6}{7}$  miles of reproduction tallies composed of plots 0.10 x 1.00 chain (500 plots each 1/100 acre in area) on a site from which a good stand of cedar-fir-hemlock was logged. Rainfall during the growing season is relatively high, but the site is moderately dry because it is exposed to the south on well drained slopes.

The history is as follows:

- A Region is the land lying between Alouette Lake and Pitt Lake. Total area of forest land.....10,270 acres
- B Logged area, 1921 to 1932..... 7,610 "
- C Fire-killed timber..... 580 "
- D Total area denuded to date..... 8,190 "
- E Timbered area remaining..... 2,080 "
- F Of a total of 3,610 acres logged and burned in 1925 the areas satisfactorily restocked in 1935 amounted to..... 1,770 "
- G For several years after the fire in 1925 seed trees were plentiful; result, area restocked in ten years was..... 49% "
- H In 1940 adequately restocked areas on 4,000 acres logged, and burned in 1931 were..... 140 "
- I As a result of clear-cutting and removal of the marginal timber by logging before the 1931 slash-fire, there was no adequate seed-supply to 4,100 acres after the fire. On this burn the proportion satisfactorily restocked in nine years was..... 3 $\frac{1}{2}$ % "
- J At the indicated progress on the 1931 burn the type will be at least forty years old before ten per cent of its area will be occupied by trees old enough to start seeding the adjacent vacant soil.
- K Ten years after the fires on these cut-over lands there were 5,700 acres not satisfactorily restocked (3,610 minus 1,770, and 4,000 minus 140 acres); and in addition 580 acres of fire-killed seed-tree groups without reproduction, a total of 6,280 acres (or 77 per cent of the total denuded) of good forest soil still practically idle.

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 10 III 1945.

DESCRIPTION OF ALOUETTE HISTORY MAP STUDY

Timber Berth "W" lies to the west of Alouette Lake, within Garibaldi Park, and contains 10,640 acres. The Abernethy-Lougheed Logging Company operated in this holding for ten years from 1921. The timber averaged 61,000 l.b.m. per acre, composed of 55 per cent cedar, 30 per cent fir and 15 per cent hemlock.

In 1928 the Forest Branch decided to include this operation in its History Map study and Gertman made the study from the logging company's camp at Alouette. He recorded the condition of the cutover areas with the object of noting by a series of examinations in this type, the rate of regeneration after logging, and conditions governing it. Using the company's operation maps for control, the areas and dates of logging and burns were noted. Strip lines were located to sample all conditions of site and ages of logging. The reproduction strips comprised a continuous series of plots, each 0.10 by 1.00 chains or 0.01 acres in size, and permanently established for repeated examination. All reproduction on the plots was tallied by species and height, and other vegetation was tallied on one milliare quadrats located at the end of each series of five reproduction plots. The details of railroads, spar trees, logging, burns, strip lines, and density of reproduction were transferred from the field map and notes to a history map.

Additional areas were examined and sampled each year until 1932. In all, five hundred plots are being maintained, representative of 5,200 acres of logged and burned land, on two-thirds of the area of the Timber Berth.

In 1931 a summer fire went through 3,000 acres of unburned slash. The plots within this burn were re-established in 1931 by Gertman and in 1932 by MacFayden & Saunders. In 1935 J.C.H. Robertson re-examined all plots. In 1940 Gertman made the third complete examination, and found a few plots reburned by a small fire in 1937, the third burn on this part of the area. During the summer of 1940 Timber Berth "W" was also included in Compartment 20 (Map 5, R. 78) of the North Shore Forest survey.

Since the 1940 re-examination a revision of the 1935 map has been made on a Kodatrace overlay and has been incorporated with a new office copy of the 1930 map, made to standardize the form of the map with present practice. For the sake of clarity in presentation, as type changes multiply with the

In 1943 the B.C. Government leased to the University of B.C. a portion of Garibaldi Park for forestry demonstration purposes. It includes the use for 21 years of approximately 3,760 acres and 123 plots along the western side of the area covered by the History Map Study. It is recommended that an agreement be made with the Department of Forestry at the University to ensure the continuance of natural conditions on this area during the period of joint occupancy.

ALOUETTE HISTORY MAP STUDY

Condensed Summary of Areas X

Timber Berth "W"

Type	Year of Examination		acres		acres	
	Sampled Areas	All Areas	1930	1935 & 40	1930	1935 & 40
Logged	1345	252	3792	252	252	252
Unburned	3084	5039	3577	5039	7355	7355
Logged & Burned	4429	5271	7369	5271	7607	7607
TOTAL LOGGED	856	621	2688	621	2083	2083
GREEN TIMBER	361	524	589	524	955	955
OTHER TYPES	5646	6416	10646	6416	10646	10646
ALL TYPES						

X Detailed Summaries in Appendix A.

passage of time, a second transparent overlay carries the changes occurring between 1935 and 1940. Careful planimetric measurements of the types now established indicate some changes from the previous estimates of areas.

Twenty per cent of Timber Berth "W" is still occupied by hilltop timber, ten per cent is non-productive, the remaining seventy per cent cut-over is nearly all burned. Of the five thousand acres of logged and burned type now in the study (see table opposite) 104 acres have been burned three times, 1,267 acres burned twice, and the remainder burned once as shown below:

Area of Burns at 1940

Distribution of Burns in Logged Area		Year of Fire					Number of Burns	
Net area	Gross area burned	1922	1925	1926	1928	1931		1937
		104	1791	66	--	1707	--	3668
		228	31	1006	27	1211	31	1267
		104	64	--	--	74	70	104
		436	1886	1072	27	2992	101	5039
Area of each fire								

In the report on examinations in 1928-29 Garman noted that nearly

half the plots established were unburned. Eighty-three per cent of them

were understocked four to five years after logging. Hemlock was the main

species in the new crop, but the reason for this may have been that the

unburned areas were on slopes unsuitable for survival of cedar. On the

burn, as will appear later, there was about as much hemlock as cedar in

the crop. Compared with seven other localities in the History Map study,

reproduction on the burns at Alouette Lake was better than average at that

time, while there was a higher proportion of failure on the unburned areas.

The condition of the unburned areas was principally caused by residual

shrubs from the previous stand, such as huckleberry and salal, taking possess-

ion of the ground. On the burns uneven distribution of the seedlings in 1928

indicated that these areas had not recovered from the effects of the fires.

Garman, E.H. and Barr, P.M., 1930. A History Map Study in British Columbia. Forestry Chron. VI, 4 : 14-24.

RESULTS IN 1940

Rate of Restocking

As a result of the last re-examination on this site, the rate of restocking can now be assessed for the period of regeneration up to 1940. For this purpose all types except the most recent one are available. Re-examination of the large area burned in 1931 now indicates the rate over a five-year period. On the older burns a twelve year period of restocking is available.

A few seed trees were left on the 1925 burn and marginal timber was within seeding distance for several years before it was removed, but after the 1931 burn there were no seed trees within range of any of the plots except the scattered trees remaining on the 1925 burn.

There are indications that the remaining seed trees have been very effective in helping to restock the 1925 burn at the rate of 2.5 per cent annually, between three to fifteen years after the burn, as shown in the table below. On the basis of experience, this rate seems to be as rapid as can be expected under conditions of the site. The table also shows that restocking has been following a course similar to this in the two types burned before logging. As a matter of fact regeneration of the area burned by ground fire fifteen months before logging has pretty much followed the pattern on the adjacent 1925 slash burns, particularly if allowance is made for the hemlock seedlings which survived fire and logging and so affected the initial density of stocking on the pre-logging burn. The main difference between the areas burned after logging and those burned before logging by the 1925 fire is a predominance of cedar seedlings on the former type and a predominance of hemlock in the reproduction on the latter type.

Rates of Restocking on Burns

Based on reduction of area not satisfactorily restocked. x

Type	No. of Plots	Years after Last burn	Per cent N.S.H.	Restocking per cent per year x
1925 burn	138	3	64.7	2.5
1931 burn	263	4	100.0	0.7
Ground fire 1925	20	1	60.0	2.1
Logged 1927	20	13	35.0	2.1
Logged 1927	20	13	80.0	2.1

x Includes all plots having 1,000 or less seedlings per acre on burns. x Based on period between examinations.

In a progress report entitled "Twenty Years of Natural Regeneration on a Douglas Fir Cut-Over Area", Isaac and Dunford (Pacific Northwest Forest Experiment Station, 1938) report on a line of plots on a slash-burned area extending up both sides of the Wind River in Washington. On this area competing cover (when density of brush species gets over sixty per cent reproduction is inhibited), aspect, and distance from sources of seed are controlling factors in establishment. They also found, as we did at Jordan River, (Garman E.P. 30, report 1937), that on well stocked plots the number of trees decreased after the oldest reached fifteen years of age. With regard to aspect and distance from sources of seed they give the results on two slopes at twenty years. Reproduction on a steep slope with southwest exposure was 1000-or-more per acre at 3 to 4 chains from marginal timber, whereas on a gentle northeast slope reproduction was satisfactory at 20 chains after

The Forest Survey in the Pacific Northwest was made in 1932 and 1933 and revised in 1938-1939. Andrews and Cowlin (Forest Resources of the Douglas Fir Region 1940, U.S.D.A. Misc. Bulletin 389) report thirty-six per cent of 3,200,000 acres cut before 1920 were not restocked in 1933. Cowlin (Journal Forestry 38:678) states that 825,000 acres in nine Washington Counties were clear-cut between 1920 and 1929. In 1939 these cuttings were fifty-seven per cent non-stocked. In seven of these counties the area logged between 1920 and 1923 was examined in 1938 when sixty-nine per cent was understocked, carrying less than 400 seedlings per acre by the stocked-quadrat method of survey (Pacific Northwest Forest Experiment Sta. 1935. Research Note 11). In short, the inventory indicated that areas cut on the average 10, 15, and more than 15 years prior to examination were 69, 57, and 56 per cent unsatisfactorily stocked.

By way of comparison with conditions throughout the region, other studies relative to extensive regeneration are here reviewed, followed by the results at Alouette Lake.

#### Amount of Restocking

The rate of restocking on the 1925 burn is similar to the experience of the Forest Survey in Washington. Andrews and Cowlin (Journal of Forestry 38:678) found after a revised inventory of nine counties in 1939 that 286,000 acres of cut-overs prior to 1920 were still non-stocked. On the basis of their 1933 survey, they estimated the rate of recovery on these old cut-overs at  $\frac{2}{3}$  per cent yearly.

Reproduction that survived the 1925 burn is now beginning to bear cones, whereas on the areas slash-burned in 1931, regeneration had not started to restock four years later and has since proceeded at the rate of 0.7 of one per cent, or only one-third of the rate on the 1925 burn (see table above). At the indicated progress on the 1931 burn about ten per cent will be restocked twenty years after the fire; on the fair assumption that these trees will be seeding twenty years later, the type will be at least forty years old before ten per cent of the area is occupied by trees old enough to start seeding the adjacent vacant spots.