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SELECTION THINNING IN YOUNG-GROWTH DOUGLAS-FIR
(A 6-Year Progress Report)

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During the spring of 1949, an experiment to compare the effects of selection thinning and low thinning was established on the King Creek holdings of the St. Paul and Tacoma Lumber Company in Pierce County, Washington. Although the study was designed primarily to test selection thinning, effects of a modified low thinning and no thinning under comparable conditions were also provided for. The complete study consists of three separate blocks, each of which demonstrates one of the above treatments. However, data are as yet generally insufficient for significant comparisons; consequently, the scope of this report is limited to current progress on the selection thinning block.

The study, a cooperative project between the company and the Forest Service, seeks primarily to show the pattern of stand development following application of a thinning system recommended by the Danish forester, Flemming Juncker. 1/ Essentially, the system dictates light periodic thinnings, which concentrate on the removal of trees in the dominant crown class. Though such thinning closely approximates the "selection" or "Borggreve" method described by Hawley and Smith, 2/ it differs in both intensity and frequency of application. Juncker

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1/ Moller, C. M. & others. Thinning problems and practices in Denmark, comp. by Svend O. Heiberg. New York State College of Forestry, Syracuse University, Tech. Pub. 76, 92 pp. illus. 1954.

2/ Hawley, Ralph C., and Smith, David M. The practice of silviculture. 6th edition. 525 pp. illus. New York. 1954.

advocates very light cuts, conducted annually if possible; whereas the classic interpretation leans toward more infrequent cuts (10 or more years apart) with greater volume. However, repeated selection thinnings rigorously applied under either interpretation would have the same ultimate effect of promoting trees in the suppressed and intermediate crown classes to a dominant position.

Selection thinnings may be applied commercially much earlier than other methods since cutting may begin as soon as the largest trees reach merchantable size. Proponents of the selection system maintain that the final stand resulting from removal of only the largest trees will be of comparatively high quality since the trees with clean boles and small knots have been favored from the start. The method automatically eliminates poorly formed dominants from the stand during initial stages of application. On the other hand, there is a distinct possibility that continued elimination of the larger, fast-growing trees may ultimately reduce total yield and disproportionately lengthen the rotation. Favoring currently less vigorous trees as a source of seed for the next generation may, also, be unsound from the standpoint of genetics and long-term economics.

THE STUDY

A stand of 27-year-old Douglas-fir, established about 1922, was selected for the thinning experiment. The site, classed as a low III, is characterized by a gravelly to rocky soil and generally level topography. Though the stand is predominantly Douglas-fir, the understory contains a limited amount of western hemlock and western redcedar.

The selection thinning block contains 4.7 acres and is inventoried by means of 10 mechanically spaced concentric plots of 1/40 and 1/5 acre. The former sample trees in the 2-, 3-, 4-, and 5-inch diameter classes, while the latter sample trees 6 inches and over.

Four thinnings, applied at approximately 2-year intervals, have been made to date: Spring of 1949, fall of 1950, fall of 1952, and spring of 1955. In accordance with Juncker's recommendations, trees marked for cutting were chosen so that no residual tree was freed on more than one side in any one thinning.

Logging was done by small crews, which employed substantially the same techniques in each thinning operation. Trees were felled and bucked with a 1-man power saw. Logs were skidded by horse and

loaded by means of a truck-powered gin pole, except that a mobile fork-lift loading device was employed in the 1955 operation (figures 1 and 2). This type of loader, which handles several logs at a time, demonstrated greatly improved efficiency in small-log loading. Felling and limbing in the first operation (1949) were particularly arduous due to generally heavy crowns, which caused many hangups and required excessive limbing. Skidding was comparatively easy, and skidding distances did not exceed 600 feet. The four thinnings produced smelter poles, pulpwood, and short sawlogs. Average production for each thinning was about 2.7 cords per acre.

RESULTS

The number of trees 6 inches d.b.h. and greater is currently increasing, chiefly because ingrowth to the 6-inch class occurs rapidly in stands of this age (figure 3). Thinning has held the average diameter of trees 6 inches and over nearly constant during the 6-year period (figure 4). This effect is the result of removing the largest trees only in each operation. Under selection thinning, basal area and cubic volume of the stand have increased slowly (figures 5 and 6), and annual growth during the 6-year period has averaged 6.5 square feet, or 172 cubic feet per acre. Approximately 34 percent of the cubic volume growth represents ingrowth to the 6-inch diameter class. Thinnings have removed approximately two-thirds of this net increment, while

Figure 1.--Logs are skidded by horse and bunched along road preparatory to loading.

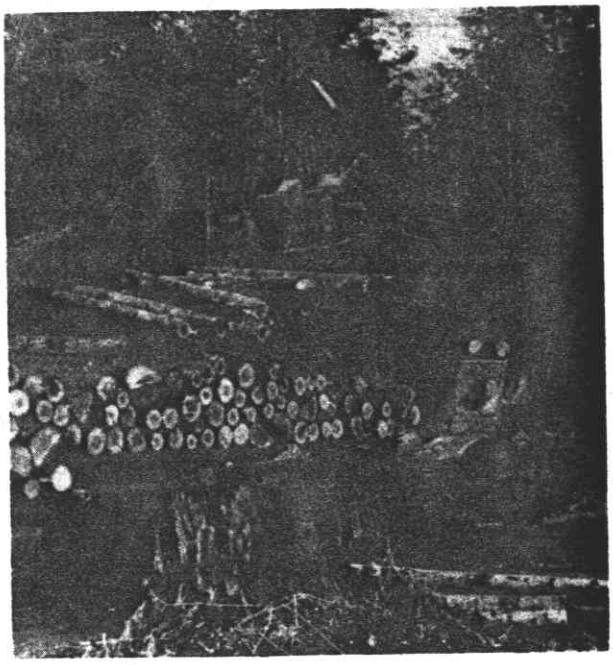

Figure 2.--Wagnermobile fork-lift loader loading 8-foot Douglas-fir pulpwood. Logs are loaded over rear of truck bed.

one-third has been added to growing stock. Total growth capacity of the site appears to be effectively absorbed by the residual stand, and later comparisons with the unthinned stand should establish whether or not this is true.

Tree mortality was not great enough to be of particular significance, principally because losses were due mostly to normal suppression and confined to the smallest trees with little volume. No significant logging damage occurred, and natural mortality averaged only 0.5 percent of gross increment during each 2-year growth period.

After allowance for all direct costs, none of the four selection thinnings left any substantial margin for stumpage and profit (table 1). Net returns ranged from a loss of $3.69 per cord in 1950 to a profit of $0.56 per cord in 1952. Even a borderline operation in a stand from 27 to 33 years old is remarkable on Site III in this area. Such an operation would ordinarily not be possible except under the selection system, which removes only larger trees. Although the thinnings were distinctly marginal, earned rates of $1.40 to $2.13 per man-hour should certainly be attractive, particularly to small owners doing their own work.

It should be noted that the third and fourth thinnings were conducted under contract, whereas the first two were paid for on an hourly wage basis. Cubic-foot production per man-hour was apparently more efficient under contract logging (average of 17.0 cubic feet) than under the hourly wage arrangement (average of 10.7 cubic feet). It is possible, however, that part of the difference may have been due to easier operating conditions in later thinnings.

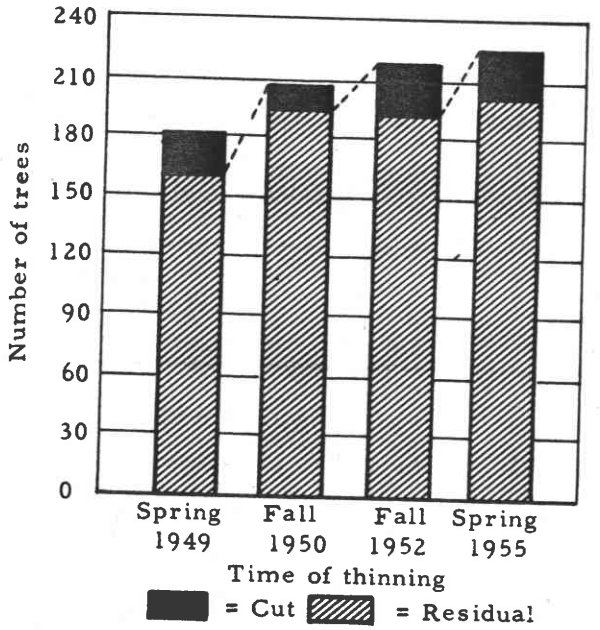

Figure 3.--No. of trees per acre
(Trees 6" d.b.h. and larger)

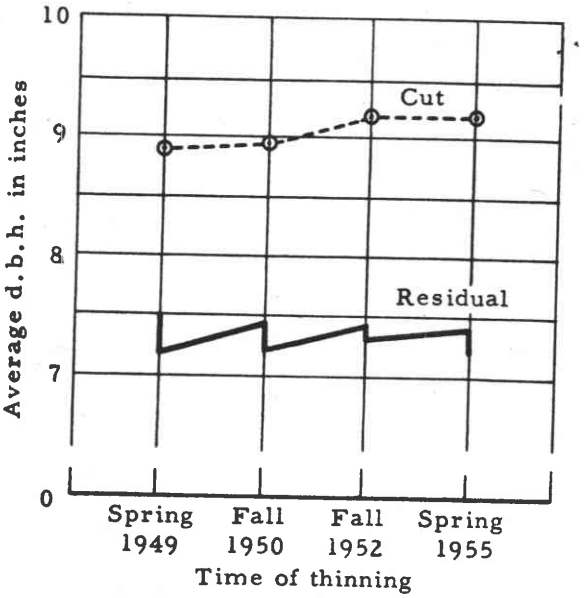

Figure 4.--Diameter of average tree
(Trees 6" d.b.h. and larger)

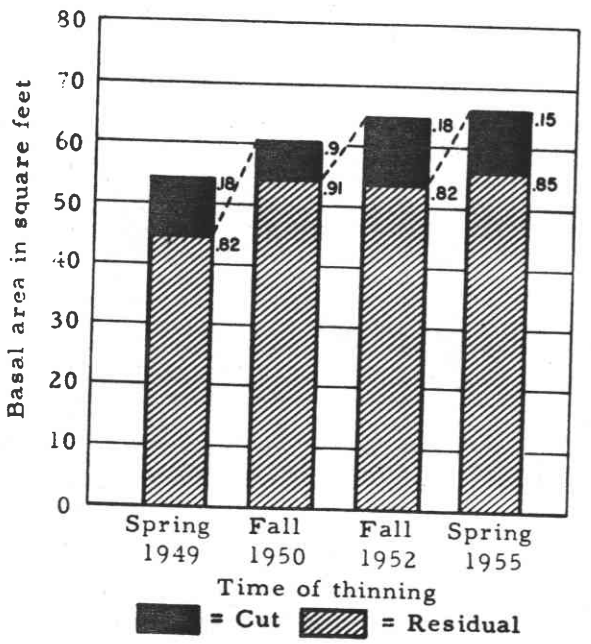

Figure 5.--Basal area per acre
(Trees 6" d.b.h. and larger)

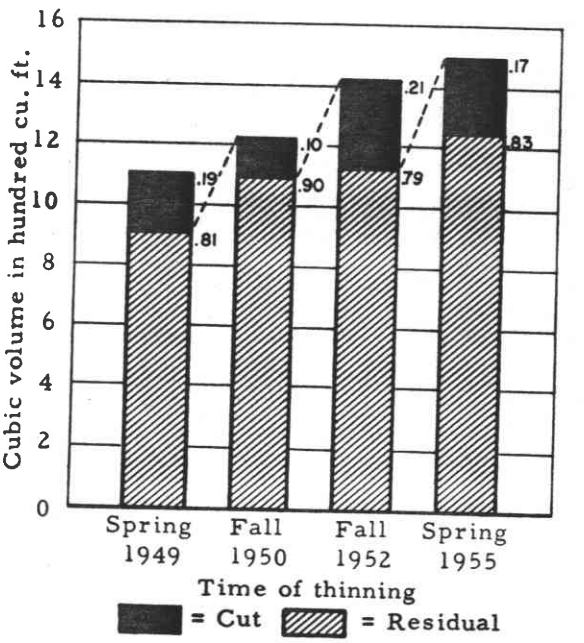

Figure 6.--Cubic volume per acre
(Trees 6" d.b.h. and larger)

Table 1.--Financial analysis of King Creek selection thinning

Item	Selection thinning			
	Spring 1949	Fall 1950	Fall 1952	Spring 1955
Financial operating basis	Hourly wage	Hourly wage	Contract	Contract
Average diameter of trees cut - inches	8.8	8.9	9.2	9.2
Production per acre - cords	2.6	1.5	3.6	3.1
Production per man-hour - cubic feet	11.6	9.8	17.4	16.5
Value per cord, f.o.b. truck	$12.39	$13.03	$11.50	$11.96
Cost per cord, f.o.b. truck	12.17	16.72	10.94	12.17
Profit or loss per cord	.22	-3.69	.56	-.21
Earned rate per man-hour 1/	1.58	1.40	2.13	2.08

1/ After allowance for all other costs (no allowance for stumpage).

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