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DIAMETER GROWTH OF PLANTATION-GROWN DOUGLAS-FIR TREES UNDER VARYING DEGREES OF RELEASE

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As an ever-increasing number of young Douglas-fir stands in the Pacific Northwest come under intensive management, development of better tree-marking techniques based on sound scientific principles becomes essential. For this reason, two experiments have been established at the Wind River Experimental Forest near Carson, Wash., to measure the effect of different degrees of release on the growth rate of dominant, codominant, and intermediate trees. The initial test in a 41-year-old natural Douglas-fir stand has been previously reported.[1/] A second test in a nearby Douglas-fir plantation, 30 years old from seed, permits a comparison of early results.

The Experiment

The second test, a "spot thinning" similar to the original test in experimental design, was installed in a Douglas-fir plantation

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1/ Staebler, George R. Effect of controlled release on growth of individual Douglas-fir trees. Jour. Forestry 54: 567-568, illus. 1956.

at Planting Creek. Plantation trees are from 2-0 stock planted in 1929. The plantation is site V, whereas the natural stand is classed as site IV.

Four treatments were tested: Removal of 0, 1, 2, or 3 competitors of individual dominant, codominant, and intermediate trees. A competitor was defined as any dominant, codominant, or intermediate tree closer to the subject tree than D+4 feet, where D equals d.b.h. in inches of the competitor expressed as feet.[2/] The number of competitors to be cut was assigned randomly, and the trees cut were those judged to be the "chief" competitors.

The inclusion of 10 trees in each treatment (total 120 trees) was originally contemplated; however, to allow for mortality and breakage, 27 additional trees--divided irregularly among the 12 treatment classes--were included. Study trees were spaced 40 by 40 feet, with approximately 4.5 acres included in the experimental area. For convenience in analysis, the number of trees in each class of treatment was reduced to the number in the class containing the fewest surviving trees (nine). This was done by discarding randomly selected individuals.

Since only three growing seasons have elapsed, the conclusions in this report are preliminary.

Results

As might be expected, growth rate of dominants exceeded that of codominants and growth rate of codominants exceeded that of intermediates in the 3 years following treatment (table 1). Of greater interest, a progressive increase in diameter growth with increased release was indicated only in the case of the dominants. Some decline in growth rate of released trees is indicated for both codominants and intermediates by the figures in this table.

Analysis of variance, however, shows that although differences in diameter growth between crown classes were highly significant (1-percent-level test), differences due to competitors cut were

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[2/] D+2 was used in the natural stand. The wider limit in the second test was necessitated by the initial 8- by 8-foot spacing in the plantation.

Table 1.--Average annual diameter growth of planted Douglas-fir for 3 growing seasons following treatment, by crown class and number of competitors cut[1/]

(In inches)

Crown class	Treatment (number competitors cut)				
	0	1	2	3	Average
Dominant (1954 average d.b.h. = 6.0")	0.21	0.25	0.27	0.27	0.25
Codominant (1954 average d.b.h. = 4.7")	.21	.17	.16	.21	.19
Intermediate (1954 average d.b.h. = 3.2")	.18	.15	.14	.14	.15
Average	.20	.19	.19	.21	.20

[1/] Trees 27 years old (from seed) at time of treatment.

nonsignificant (5-percent-level test). Also nonsignificant was the tendency for treatment effects to vary from one crown class to another (interaction). Thus, no significance can be attached to the apparent response of dominants to release.

Discussion

Dominant trees are often thought to grow at near the maximum rate possible for the site, and statistical analysis of the plantation data provides no evidence to refute this theory. In contrast, results from the earlier test in a natural stand had shown release to increase growth rate among dominants (table 2).

Table 2.--Average annual diameter growth of naturally established Douglas-fir for 4 growing seasons following treatment, by crown class and number of competitors cut[1/] [2/]

(In inches)

Crown class	Treatment (number competitors cut)				
	0	1	2	3	Average[3/]
Dominant (1952 average d.b.h. = 10.6")	0.17	0.18	0.23	0.26	0.21
Codominant (1952 average d.b.h. = 7.3")	.11	.14	.12	.12	.12
Intermediate (1952 average d.b.h. = 5.6")	.05	.07	.08	.08	.07
Average[3/]	.11	.14	.15	.16	.14

[1/] Trees 38 years old at time of treatment.

[2/] Data derived from table 1 of reference cited in text footnote 1 and corrected to 4-year growth.

[3/] Averages weighted by the number of trees represented in each crown and treatment class.

Reasonably valid growth comparisons can be made between trees of both tests despite the 11-year difference in stand age. However, relative densities and sites of the two stands should be kept in perspective. Though crowns of the plantation trees were just beginning to close, the natural stand was dense and trees were already crowded.

When crown class data were combined, results in the natural stand showed that the more a tree was released the faster it grew. Removing the first competitor caused the largest increase in growth; removing the second and third competitors also increased growth rate, though the removal of each successive competitor had a progressively lessened effect. Statistical analysis showed that differences in growth rate between crown classes and between numbers of competitors cut were both highly significant.

In contrast, when crown class data from the plantation stand were combined, no significant change in growth rate could be attributed to release. The lower site and wider original spacing may be factors slowing response in this stand.

Intermediates and codominants in the plantation have indicated some negative (though nonsignificant) reaction to degree of release, although shade before treatment was not severe. This may be a "shock" effect similar to that described by Staebler.[3/] Comparison of table 1 with table 2 shows a generally higher growth rate for the plantation trees. The difference is especially marked in the intermediate crown class, and may be indicative of the more severe competition in the natural stand.

3/ Staebler, George R. Evidence of shock following thinning of young Douglas-fir. Jour. Forestry 54: 339. 1956.