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RESPONSE OF INDIVIDUAL  
DOUGLAS-FIR TREES TO RELEASE

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To evaluate effects of different degrees of release on individual Douglas-fir trees, a study was started in 1952 in a 41-year-old, site IV stand at the Wind River Experimental Forest. A remeasurement at the end of four growing seasons showed that dominants respond more quickly and positively to the removal of competing trees than codominants or intermediates.<sup>1/</sup> A second remeasurement at the end of seven growing seasons substantiates this initial trend and adds to our understanding of the reaction of Douglas-fir trees to the removal of competitors.

METHODS

Four treatments of three crown classes are involved: the removal of none, one, two, and three competitors around individual dominant, codominant, and intermediate trees. Ten trees were included in each group, making a total of 120 trees in the study.<sup>2/</sup>

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

<sup>2/</sup> Mortality or breakage has since removed 10 trees, leaving a total of 110 trees in the study.

To determine locations of study trees, a 1-chain grid was laid out on a 14-acre area. Crown classes were selected in rotation at consecutive grid points, and number of competitors to be cut was selected at random. At each grid point, the nearest tree of the specified crown class, having at least three competitors, was selected for study and tagged. To qualify as a competitor, a tree had to be of at least intermediate crown class and be nearer to the study tree than  $D+2$  feet (where  $D$  equals the competitor's d.b.h. in inches expressed in feet). Release of study trees was achieved by cutting chief competitors.

D.b.h. and height of each study tree were measured at time of treatment, and d.b.h. was remeasured after the fourth and seventh growing seasons.

## RESULTS

Analysis at the end of the fourth growing season showed that both crown class and treatment had highly significant effects on diameter growth (fig. 1). Diameter growth increased as number

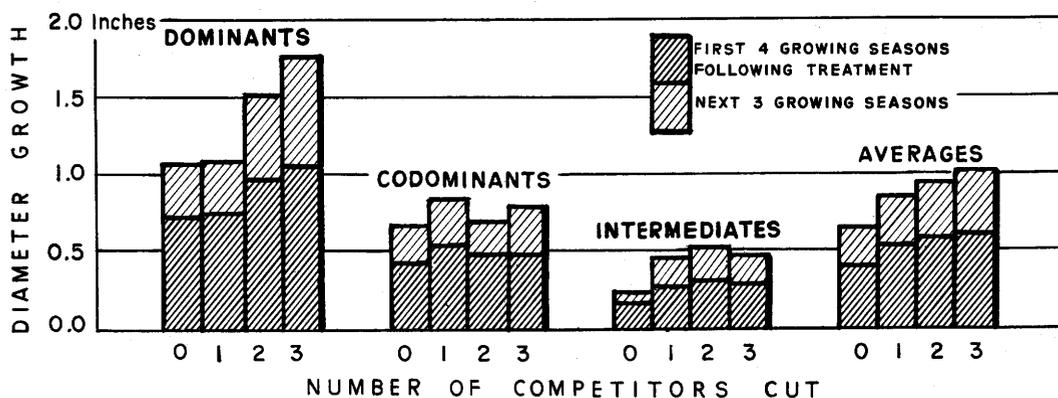


Figure 1.--Average cumulative diameter growth of young Douglas-fir, by crown class, period of growth, and number of competitors cut.

of competitors cut increased from none to three. For all crown classes combined, average differences in diameter growth were greatest between none and one competitor cut, and least between two and three competitors cut. The dominant crown class was the only one that showed a consistent upward progression in growth with degree of release; but for all three crown classes, growth was least

where no competing trees had been removed. Differences in treatment effects among crown classes (interaction) were nonsignificant.

Analysis at the end of the seventh growing season showed that crown class and treatment still had highly significant effects on diameter growth. However, in contrast to earlier results, treatment effects among crown classes (interaction) varied significantly for the last three growing seasons as well as for the total 7-year growth period (fig. 1). Dominants continued to show the greatest response to release, with growth increasing progressively with the removal of two and three competitors. Dominants that had only one competitor cut, however, grew about the same as those not released at all. Co-dominants showed little response to release, with no apparent trend between growth and degree of release. Unreleased intermediates were becoming suppressed and their growth was dropping off rapidly. Among released intermediates, degree of release appeared to have had little effect on diameter growth.

Regression analyses of diameter growth over initial d. b. h. show the effects of degrees of release on trees of different sizes when the crown class data are pooled. When these regression lines for the 7-year period are compared with those for the first 4-year period (fig. 2), several changes are apparent. The difference between none and one competitor cut has narrowed, and the differences between one and two and between one and three have widened. This shows that the heavier release treatments have exerted more lasting influence on diameter growth.

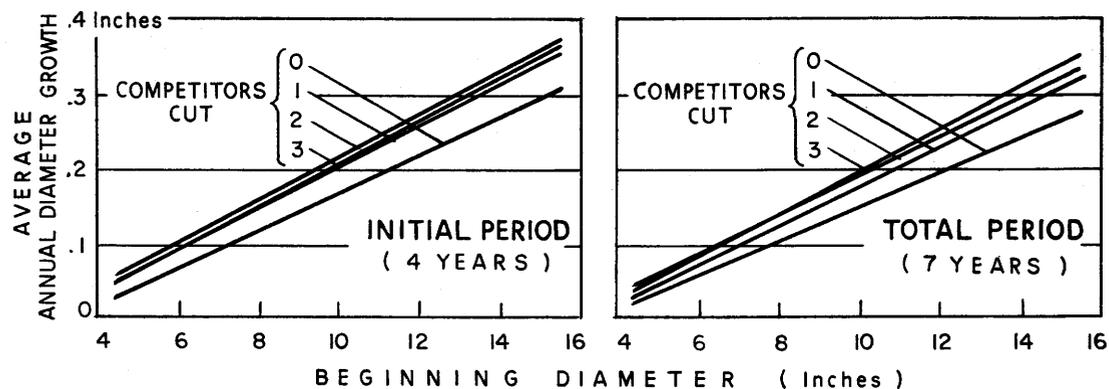


Figure 2.--Average diameter growth of young Douglas-fir in relation to initial diameter, by degree of release.

## DISCUSSION

Since this study was designed to test response of individual trees to release rather than the influence of thinning on stands of trees, close control of number and quality of trees removed was possible. A more direct and precise measure of release effects was therefore provided than could be expected from conventional thinning studies.

It is not too surprising that dominant trees with their larger root and crown systems were benefited most by release. On the other hand, codominant and intermediate trees with smaller roots and crowns are apparently capable of only limited response or postponement of eventual suppression, even when all their chief competitors are removed.