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EFFECT OF THINNING ON FORM OF YOUNG-GROWTH DOUGLAS-FIR TREES

by

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With the advent of increased thinning activity in managed stands of young-growth Douglas-fir (*Pseudotsuga menziesii*), knowledge of growth and form development of released trees becomes necessary for calculations of total volume and growth. Any appreciable change in the rate of radial increment at various points along the stem of a released tree could cause change in its form and volume. This study was initiated to determine to what extent thinning alters the form of released Douglas-fir trees.

METHODS

Stem analyses were made on 30 dominant and codominant trees-- 10 unreleased, 10 released on one side, and 10 released on two sides. The 41-year-old trees were part of a stand on the Voight Creek Experimental Forest^{1/} near Orting, Wash., which had been thinned for the first time in 1949. They were felled and measured in 1958.

Fifteen cross sections per stem were measured. The pattern of radial growth along the stem was determined by data taken from 11 sections--1 at the stump, and 10 at intervals of one-tenth the 1949 height above the stump. "Girard's" and "absolute" form quotients^{2/} were calculated to measure form change.

^{1/} Maintained in cooperation with St. Regis Paper Co., Tacoma, Wash.

^{2/} Formulas given in footnotes to table 1, page 3.

RESULTS AND DISCUSSION

Data indicated differences in distribution of radial growth along stems of released and unreleased trees: released trees grew faster along the lower 20 percent and slower along the upper 20 percent of their stems--the pattern being most pronounced in trees released on two sides (fig. 1). Released trees have probably counteracted the increased wind action on their crowns by placing a greater amount of growth along the lower bole, while the growth pattern of protected, unreleased trees developed a more cylindrical form. These results follow closely the findings of Schumacher.^{3/}

Data also indicated that growth along the stems of all trees was greatest at about 90 percent--and least between breast height and 20 percent--of the 1949 height. This same pattern of growth was noted in red pine by Bickerstaff,^{4/} and could well be the normal pattern for most tree species.

In spite of the redistribution of growth along the stems of released trees, there was no significant difference in form class between treatments when measured by standard methods (table 1). This was true both at time of release and 9 years thereafter, despite some improvement in form class for most trees (fig. 2).

The tendency of released trees to grow faster on the lower bole may be beneficial since a greater portion of the increment would be placed in higher quality wood on the merchantable part of the tree. It is not known whether this change in growth distribution will continue long enough to cause a significant difference in form class or volume between unreleased and released trees. Measurements over a longer period will be necessary to answer these questions.

^{3/}Schumacher, Francis X. Effect of partial cutting in the virgin stand upon the growth and taper of western yellow pine. Calif. Agr. Expt. Sta. Bul. 540, 32 pp., illus. 1932.

^{4/}Bickerstaff, A. Effect of thinning and pruning upon the form of red pine. Canada Dept. Mines and Resources, Dominion Forest Serv. Silvicultural Res. Note 81, 26 pp., illus. 1946. (Processed.)

HEIGHT ABOVE STUMP
IN PERCENT OF TOTAL TREE
HEIGHT ABOVE STUMP (1949)

APPROXIMATE HEIGHT
ABOVE STUMP
(FEET)

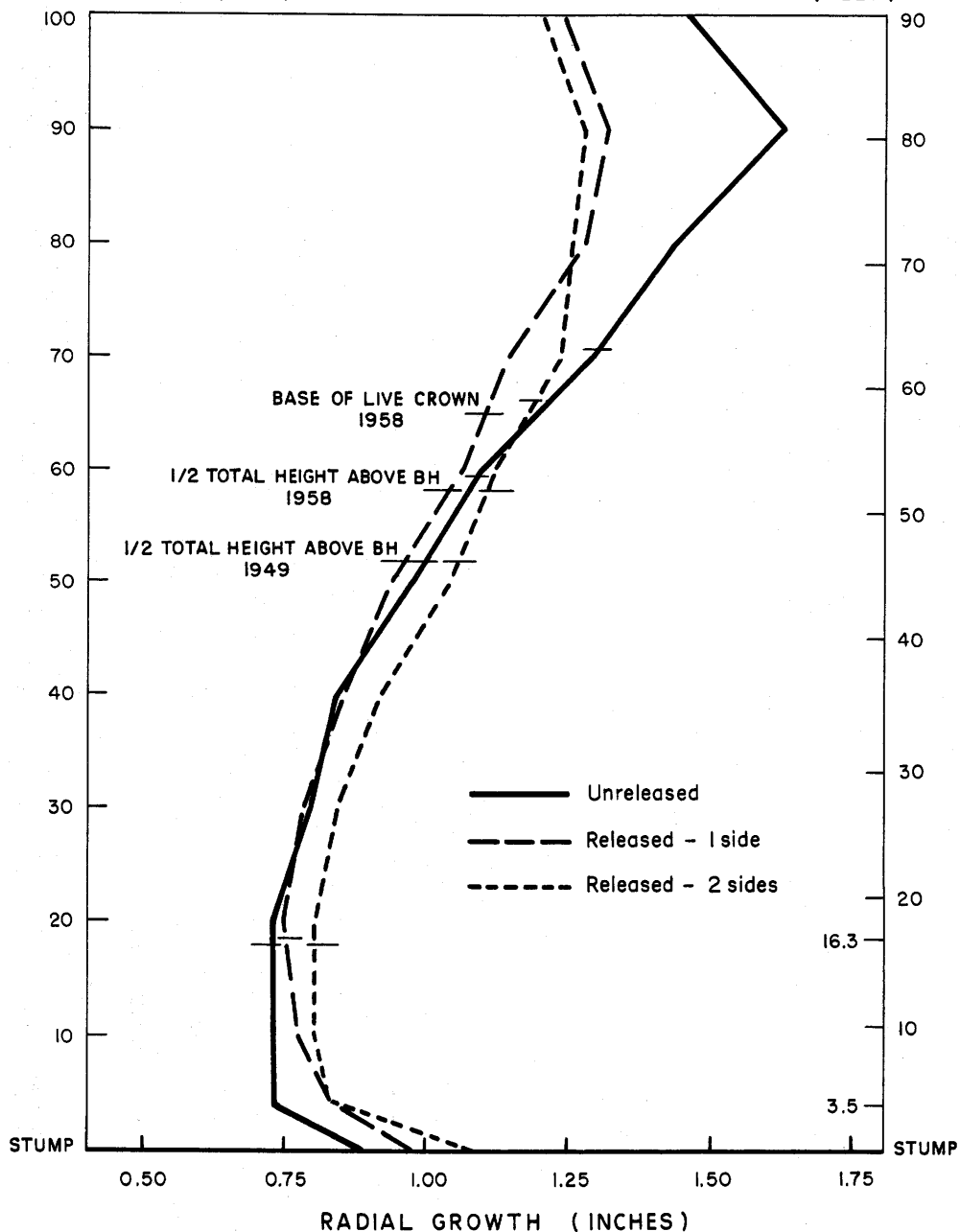


Figure 1.--Radial growth along the stem of dominant and codominant young-growth Douglas-fir trees, 1949-1958 (average of 10 trees for each treatment). Curve shape is highly significant, and the crossing of the curves is also highly significant.

Table 1.--Change in average form quotient of dominant and codominant

young-growth Douglas-fir trees after 9 years of release

Treatment	Girard's 1/		Modified Girard's 2/		Absolute 3/	
	1949	1958	Change	1949	1958	Change
Unreleased	84.62	84.98	+0.36	91.97	92.75	+0.78
Released one side	84.34	83.74	-.60	91.32	91.23	-.09
Released two sides	84.90	85.80	+.90	90.72	92.42	+1.70
					66.96	69.86
					67.27	69.33
					70.40	71.92
						+1.52

$$\frac{1/}{D_1} \frac{d_1}{100}$$

where d_1 = diameter inside bark at 16.3 feet

and D_1 = diameter outside bark at breast height (estimated for 1949).

$$\frac{2/}{D_2} \frac{d_1}{100}$$

where d_1 = diameter inside bark at 16.3 feet

and D_2 = diameter inside bark at breast height.

This formula was used to eliminate possible errors due to estimation of 1949 bark thickness.

$$\frac{3/}{D_2} \frac{d_2}{100}$$

where d_2 = diameter inside bark at 1/2 total height above breast height

and D_2 = diameter inside bark at breast height.

HEIGHT ABOVE STUMP
IN PERCENT OF TOTAL TREE
HEIGHT ABOVE STUMP (1949)

APPROXIMATE HEIGHT
ABOVE STUMP
(FEET)

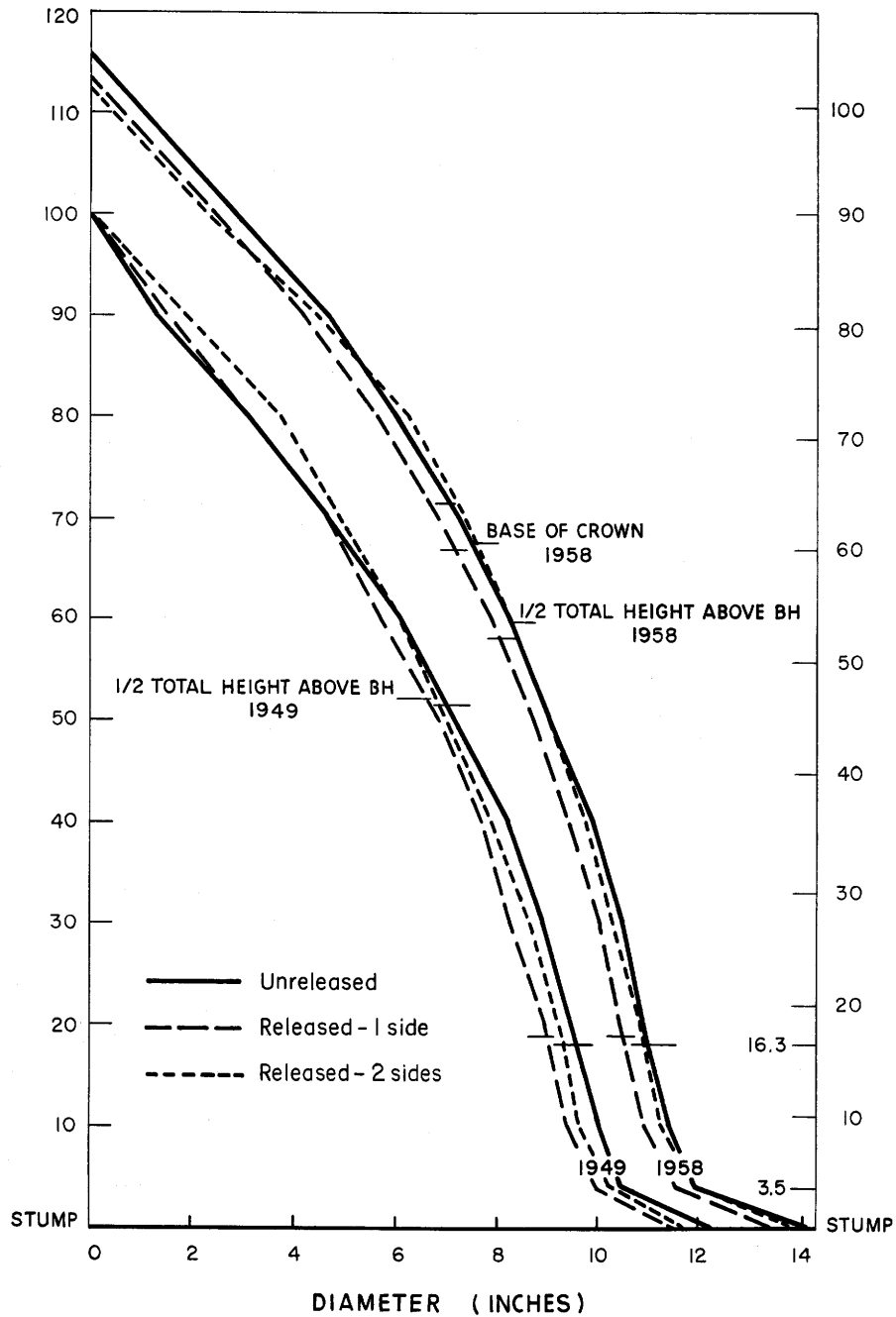


Figure 2.--Taper curves for dominant and codominant young-growth Douglas-fir trees before and 9 years after release. (Average of 10 trees per treatment.)