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GROWTH AFTER THINNING IN 110-YEAR-OLD DOUGLAS-FIR

by

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A 6-year record of growth after thinning indicates that 110-year-old Douglas-fir stands on site III land have passed the age when growth capacity can be fully transferred to fewer stems through thinning.

The study area is located on the Wind River Experimental Forest near Carson, Wash., at an elevation of about 2,200 feet. In 1952, nine 1-acre plots were established and thinned experimentally. Residual cubic-foot volumes immediately after treatment were 86 percent of normal for unthinned stands, 79 percent for lightly thinned (20 percent removal), and 61 percent for heavily thinned (30 percent removal). The plots were remeasured in 1958.

Gross periodic annual increment was highest in the unthinned stand, intermediate after light thinning, and lowest following heavy thinning (table 1). In contrast, periodic annual mortality was four to five times higher in the unthinned stand than in either of the thinned stands. Net periodic annual increment was accordingly highest in the lightly thinned stand, slightly less in the heavily thinned stand, and lowest in the unthinned stand.

Differences in net increment between the light and heavy thinning are attributed in part to the kind of trees removed. The light thinning mainly removed dead, dying, and badly suppressed trees, whereas the heavy thinning extended cutting into the more vigorous growing stock. In the unthinned stands, high mortality reduced net increment to a very low level.

Table 1.--Residual volumes and growth rates for thinned 110-year-old Douglas-fir

Item	Treatment	Basal area	Volume	
			Cubic	Scribner
		Sq.ft.	Cu.ft.	Bd.ft.
Average residual stand after thinning, 1952	Unthinned	247	11,707	65,001
	Lightly thinned	225	10,568	59,514
	Heavily thinned	155	7,177	36,867
Periodic annual increment and mortality, 1952-58:				
Gross increment	Unthinned	2.7	128	854
	Lightly thinned	1.8	95	602
	Heavily thinned	1.5	81	466
Mortality	Unthinned	2.8	130	709
	Lightly thinned	.8	34	162
	Heavily thinned	.6	24	118
Net increment	Unthinned	-.1	-2	145
	Lightly thinned	1.0	61	440
	Heavily thinned	.9	57	348
Mean annual net increment:				
Before thinning, 1952	Unthinned	2.2	106	591
	Lightly thinned	2.6	120	669
	Heavily thinned	2.0	93	467
6 years after thinning, 1958[1/]	Unthinned	2.1	101	568
	Lightly thinned	2.5	117	657
	Heavily thinned	2.0	91	461

[1/] Includes volume removed in thinning.

Net periodic annual increment on all plots for the 6-year period was well below the net mean annual increment (table 1), suggesting that the stand is at or past culmination in both cubic-foot and board-foot volume growth. The consistent reductions in mean annual increment from 1952 to 1958 further suggest that the stand has passed the peak in volume production. Net return on growing stock investment, expressed as annual growth percent, was very low, amounting to less than 1 percent of the 1952 residual volume for all treatments:

	Unthinned	Lightly thinned	Heavily thinned
Basal area	-0.04	0.44	0.58
Cubic volume	-.02	.58	.79
Scribner volume	.22	.74	.94

Analysis of variance tests indicates that differences between treatments in residual volume, growth, and mortality are nonsignificant at the 5-percent level. However, because the levels of gross and net increment are similar to and consistent with an 18-year record[1/] in a neighboring stand of the same age, these differences are believed to represent actual growth response.

Though far from conclusive, this 6-year growth record indicates (1) that Douglas-fir stands on site III are at or near maturity when they reach an age of 110 years, and (2) that if such stands are reserved for later harvest, overall yields can be maximized by limiting periodic thinnings to the removal of expected mortality.

[1/] Bishop, Daniel M. Report of the 1957 examination of Panther Creek thinning plots, Permanent Sample Plots 91-97 and Check Plots 4, 5, and 90. 1958. (Unpublished report on file at Pac. NW. Forest and Range Expt. Sta., U.S. Forest Serv., Portland, Oreg.)