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LIGHT THINNING IN CENTURY-OLD DOUGLAS-FIR

By

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A stand-improvement study in century-old Douglas-fir at the Wind River Experimental Forest provides an example of a commercial thinning that gave a substantial intermediate harvest, salvaged considerable material that would have been lost through mortality, greatly increased the net growth rate, and improved the general vigor of the stand, leaving the forest in a more healthy condition.

A 97-year-old stand of Douglas-fir on site III was thinned for piling by commercial timber sale covering some 40 acres in the fall of 1939. At that time seven 1-acre sample plots were established in the stand. Seven years later, in 1946, these sample plots were remeasured and the effects of the thinning determined.

By 1939 the stand had reached a stage at which merchantable trees were dying from suppression, windfall, root rot (Poria weirii), and attacks of bark beetles. The average diameter at the time was 19.4 inches, the average height 140 feet, and there were 113 trees per acre. The cut amounted to 7,870 board feet, Scribner rule, per acre, or approximately 12 percent of an original stand of 65,860 board feet. On the average about 14 trees were harvested from each acre.

Probably because the logging was done carefully in the early fall with a small tractor, and because the cut was of light intensity, logging injury was small. Actually only 3.4 percent of the residual trees were scarred. All the injured trees had less than half their circumference scraped and exposed.

At the time of cutting only piling and a limited number of small logs could be sold; therefore, the objective was to cut as far as possible trees that would produce piling and at the same time relieve the crowded condition in the stand. A short sawlog was taken from the base of the larger trees and a piling from the top.

On two of the plots the stand was thinned from below. On the remaining five, trees were taken from all crown classes but were selected to improve spacing and to release well-formed vigorous crop trees. The variations in cut were so slight, however, that no significant differences in growth rate have developed between the thinned plots. However, differences are substantial between the thinned plots and unthinned check plots situated on an adjoining area in the same stand. Table 1 is based on data from the seven thinned and two unthinned plots.

Table 1.--Growth and mortality of thinned and unthinned 97-year-old Douglas-fir at Wind River[1/]

Treatment	Dates measured	Net growth per acre				Periodic annual gross growth per acre		Periodic annual mortality per acre	
		Periodic annual		Mean annual[2/]					
		Cu.ft.	Bd.ft.	Cu.ft.	Bd.ft.	Cu.ft.	Bd.ft.	Cu.ft.	Bd.ft.
Thinned plots	10/39			131	677				
	10/46	111	769	130	683	159	987	48	218
Unthinned plots	10/39			129	664				
	5/45	21	274	123	645	192	1,092	171	818

1/ Board-foot volume by Scribner rule, trees 11.6"+ d.b.h. Cubic-foot volume for trees 1.6"+ d.b.h.
2/ Including material removed in thinning.

The "recruits," trees coming into the 12-inch d.b.h. class, contributed 8 percent of the periodic gross growth in board feet on the thinned plots and 16 percent of that for the unthinned plots.

Increment borings showed only a slight increase in diameter increment for the lightly thinned stand in comparison with that in the uncut. The rate of mortality in the thinned plots, however, was much less than in the natural forest.

Annual mortality for the seven years after cutting on the thinned plots averaged one tree, or 218 board feet, Scribner rule, per acre, while mortality on the unthinned plots was 2.8 trees containing 818 board feet per acre. Because of this mortality in the natural stand the periodic net saw-timber growth on the thinned plots was more than three times that on the unthinned. In cubic feet, net growth in the thinned stand averaged more than four times as much as in the uncut. Windfall losses associated with root rot were abnormally high on the unthinned check plots. Such losses were comparatively small in the thinned stand where efforts were made to remove trees of declining vigor.

Returns from Thinnings

Besides increasing net growth, thinning more than paid its own way. Each 1,000 board feet of timber cut yielded on the average 120 lineal feet of piling plus 408 board feet marketed as sawlogs plus the equivalent of 14 board feet of long butts utilized as fuel. Each tree produced on the average 66 lineal feet of piling.

Stumpage was sold at the rate of $1.50 per M for sawlogs, 1½ cents per lineal foot of piling 60 feet or less in length, and 2 cents per lineal foot over 60 feet in length. Using a computed converting factor of 4.808 board feet per lineal foot, piling at the rate of 1½ cents per lineal foot was equivalent to $3.12 per M board feet; at the rate of 2 cents per lineal foot, piling was equivalent to $4.16 per M board feet. Average net stumpage return per acre realized in the thinning amounted to about $21. At stumpage rates that have prevailed during the last few years, the net return per acre from this stand-improvement cut would have amounted to several times $21.

The volume removed by thinning has already been restored by growth and the stand is ready to yield another light intermediate harvest made as a stand improvement that pays its way and provides a substantial margin for profit.