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# Research Note

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## THIRTEEN YEARS OF THINNING IN A DOUGLAS-FIR WOODLAND

By

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The impressive, integrated forest products industries and large forest ownerships of the Douglas-fir region are well known. Sometimes overlooked are the 53,000 owners of woodlands of under 100 acres, the average holding being 35 acres. These small tracts, totaling 1,900,000 acres, are growing timber at rates far below their potential.<sup>1</sup>

To secure localized information helpful to these owners, a 40-acre tract on the McCleary Experimental Forest<sup>2</sup> in Grays Harbor County, Wash., has been managed for the past 13 years to demonstrate that an annual income can be produced from thinnings, and, at the same time, the potential growth of the land can be maintained or even increased.

This 57-year-old stand, which became established after repeated burns of the area, is about two-thirds Douglas-fir, interspersed with western redcedar, western hemlock, and red alder. The soil, derived from a basalt cap, is Olympic loam. Site quality is II for Douglas-fir. Elevations range from 270 to 440 feet. Annual precipitation averages 60 inches, 14 inches falling during the April-to-September period, and average frost-free growing season is 184 days.

<sup>1</sup>U.S. Forest Service. Timber Resources for America's Future. U.S. Dept. Agr. Forest Resource Rpt. 14, pp. 552-553. 1958.

<sup>2</sup>A privately owned tract of forest land maintained through a cooperative lease agreement with Simpson Timber Co., Shelton, Wash.

## MANAGEMENT APPLIED

The tract, which is closely adjacent to and on one side of a county road, was divided into five compartments of about 8 acres each to simplify scheduling of thinning operations. One compartment was thinned each year so that the entire tract was cut over every 5 years. Three compartments have been thinned three times; the others, twice. The first cutting was made in 1949; thus, the 1961 harvest marked a 13-year thinning record.

Annual sales were made to a small local sawmill during the summer and early fall for a negotiated total price, derived from a marked tree scale. Logging was done in conjunction with other sales on the Experimental Forest by a 2- to 3-man crew using in most instances small crawler tractors and forklift loaders for skidding and loading. Minimum supervision was required since the contractors were experienced in thinning work.

Prior to cutting, a cruise was made of the three or four 1/5-acre sample plots in each compartment to determine growth over the previous 5 years. The average cutting has amounted to 55 percent of current increment, 45 percent being left to supplement growing stock.

Timber marked in the first 5-year cycle consisted of branchy open-grown dominant and badly misshapen trees plus those that were either dead or dying. Each operation was a crown thinning that removed trees averaging 16.5 inches d.b.h. from a stand averaging 14.0 inches. In the second and third cycles, trees were marked primarily to improve spacing and to salvage mortality. These operations, more nearly low thinnings, removed trees averaging 13.9 inches d.b.h. from a stand averaging 15.5 inches. Minimum tree diameters marked were 10 and 12 inches at breast height for conifers and alder, respectively.

In 13 years, the average diameter of trees over 10 inches has increased from 14.0 inches d.b.h. to 16.2 inches. Proportion of volume represented by trees under 16 inches d.b.h. has declined while that of trees over 16 inches has increased (fig. 1). In an even-aged stand cutting subdominant trees, of course, favors the better dominants and codominants. Volume removed in a single thinning averaged 4,446 board feet per acre for the first few years and 2,989 board feet per acre for the 13-year period.

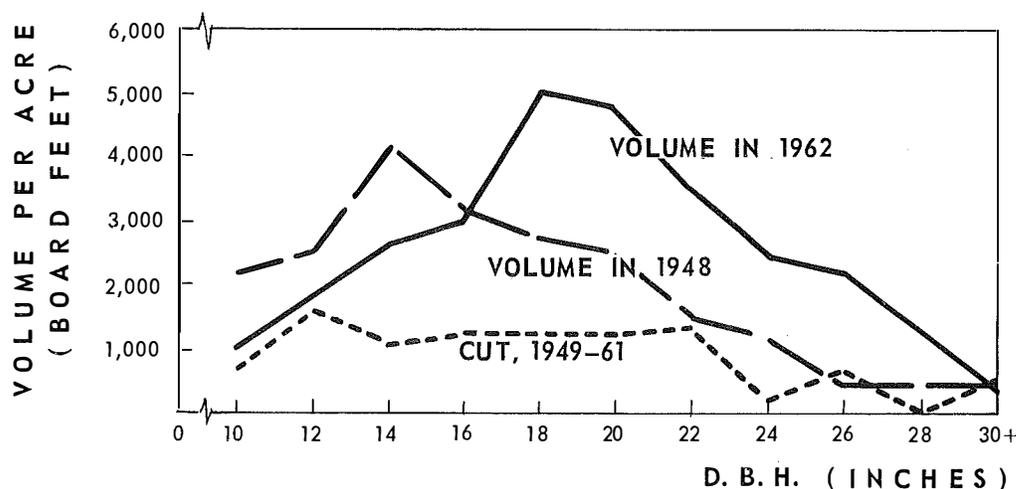


Figure 1. - Board-foot volume per acre by tree size classes.

## INCREMENT

In 1948, volume for all species on the tract was 853,040 board feet, Scribner rule.<sup>3</sup> By 1962 it had increased to 1,121,560 board feet. This increase of 268,520 board feet added to the 328,358 board feet removed in cuttings indicates a total growth of 596,878 board feet (table 1). Thus, increment amounted to 1,067 board feet per acre annually over the 14-year period. Net annual board-foot increment for Douglas-fir has been 4.3 percent, based on an average of starting and ending inventories. However, for residual trees remaining in 1962, a 6.2-percent rate was being realized.

Table 1. - Volume and increment record, 1948-62

Item	40 acres	Per acre	Per acre per year
	<u>M Bd. ft.</u>	<u>Bd. ft.</u>	<u>Bd. ft.</u>
Starting inventory (1948) <sup>1</sup>	853	21,326	--
Ending inventory (1962) <sup>1</sup>	1,122	28,039	--
Increase	269	6,713	480
Thinnings <sup>2</sup>	305	7,641	546
Salvaged mortality <sup>2</sup>	23	568	41
Increment	597	14,925	1,067

<sup>1</sup> From sixteen 1/5-acre plots.

<sup>2</sup> From actual sales.

## COSTS AND RETURNS

Coniferous timber, comprising 85 percent of the total cut, was made into saw logs and veneer logs. Alder was utilized as saw logs and pulpwood. Total stumpage sales for the 13 year period brought \$3,383.54, or \$6.51 per acre annually. Stumpage averaged \$11.13 per M board feet for Douglas-fir, \$5.43 for alder, or \$10.30 for both. Fixed private ownership expenses were \$320.88. Direct management expenses such as yield taxes, roads, marking, and sale administration were \$1,494.10. Average for all costs was \$3.48 per acre annually (table 2). Thus, net annual cash return from operation of the tract has been \$3.03 per acre. Added to this amount should be the increase in growing stock, worth at present prices (\$15.00 per M board feet) \$4,027.80, or \$7.20 per acre per year, so that total net return has been \$10.23 annually. A compound interest rate of 5.7 percent annually has been realized on the 1948 value of the growing-stock volume.<sup>4</sup>

<sup>3</sup>All trees 10 inches d.b.h. or larger to an 8-inch minimum top.

<sup>4</sup>No allowance for costs of land acquisition, which undervalues the forest investment to a small degree.

Table 2. - Management and thinning costs, 1949-61 (inclusive)

Type of expenses	Total cost <sup>1</sup>	Annual cost per acre	Cost per M bd. ft.
-----Dollars -----			
Fixed ownership:			
General administration	249.08	0.48	0.76
Fire patrol	45.80	.09	.14
Ad valorem taxes	26.00	.05	.08
Total	320.88	.62	.98
Direct management & thinning:			
Sale administration	418.26	.80	1.27
Road depreciation	406.72	.78	1.24
Marking	328.77	.63	1.00
Yield taxes	241.15	.46	.73
Road maintenance	99.20	.19	.30
Total	1,494.10	2.86	4.54
Grand total	1,814.98	3.48	5.52

<sup>1</sup> Labor costs including 15 percent overhead averaged \$2.33½ per hour, plus allowance for a car. Road depreciation was for a 1,500-foot road prorated over 328 M board feet of sales plus 1,122 M board feet of ending inventory. All other costs per M board feet are based on thinning sale volume alone.

Value of salvaged mortality has averaged 46 percent of road depreciation and maintenance costs for the 13-year period. Mortality salvaged in stands over 40 years old can in many cases finance the total cost of road construction and maintenance.

Although this study was designed as an annual operation, making cuttings every year may not be the most practical or economical. Operations ranging over the entire area at 3-to 6-year intervals may, in some instances, be more suitable to the circumstances. Less frequent cuts could materially reduce sale administration and tree-marking expenses and thus increase net returns. Furthermore, intermittent cutting could enable the owner to take advantage of favorable markets, although it would reduce mortality salvage slightly.

This study illustrates that the modern woodland can represent a valuable investment, that annual returns during the period of growth and development can be had through skillful management, and finally, that the cost of such management would be more than repaid by salvage of values that otherwise would be wasted and by the assurance of better and continuing future values.