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A 20-YEAR GROWTH RECORD FOR THREE STANDS OF RED ALDER

by

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Until very recently, only fragmentary growth information has been available for red alder (Alnus rubra). This gap has now been partially closed through the preparation of normal yield tables[1/] based on temporary sample plot data collected in northwestern Oregon, western Washington, and southern British Columbia.

The growth records summarized in this Research Note, in contrast, are based on periodic remeasurements of three sample stands on the Cascade Head Experimental Forest in coastal Oregon. The records, which cover the age span from 21 to 41 years inclusive, are of interest because they provide an experience check for the new yield tables and also furnish clues on the probable influence of precommercial thinning in young red alder stands.

[1/] Worthington, Norman P., Johnson, Floyd A., Staebler, George R., and Lloyd, William J. Normal yield tables for red alder. U.S. Forest Serv. Pac. NW. Forest and Range Expt. Sta. Res. Paper 36, 3 pp., 13 tables, illus. 1960.

STAND CONDITIONS AND TREATMENTS

When the study was established in 1937, all three sample stands were predominantly 21-year-old red alder. Two stands, however, contained a scattered overstory of 80-year-old Douglas-fir (Pseudotsuga menziesii) which was girdled at time of plot establishment (fig. 1). One of the released stands was then thinned to an approximate spacing of 12x12 feet and the other left unthinned. The third stand to be studied was pure red alder without an overstory; it was left in an untreated condition to develop as a natural stand. Major features of the stand treatments are outlined in table 1.

Figure 1.--All Douglas-fir overstory trees, with some up to 30 inches d.b.h., were girdled on the thinning study site; foreground was heavily thinned and background was unthinned.

Table 1.--Red alder volume before and after treatment at age 21 years[1/]

Stand treatment	Size of sample plot	Volume per acre		
		Original stand	Removed	Left
	Acres	Cubic feet		
Alder thinned (overstory girdled)	0.25	1,277	457	820
Alder unthinned (overstory girdled)	.75	1,453	--	1,453
Untreated pure alder	.92	1,707	--	1,707

[1/]For trees 5.5 inches d.b.h. and larger.

STAND DEVELOPMENT

Net yield of the untreated pure alder stand at age 41 was 4,423 cubic feet per acre. In contrast, the thinned and unthinned alder stands, which, up until age 21 years, developed under a scattered overstory of Douglas-fir, contained 3,042 and 3,664 cubic feet per acre, respectively (table 2). Yield of the untreated pure alder stand is probably representative of natural stands in the study locality. However, dissimilar growing conditions caused by complete absence of Douglas-fir overstory precludes comparison of growth rates with that of the thinned and unthinned stands.

The difference of 622 cubic feet per acre between net yields of the thinned and unthinned stands at age 41 was about the same as immediately after treatment 20 years earlier. Average annual net increment was 111 cubic feet per acre for both stands. Average annual gross increment, however, was 118 for the unthinned and 112 for the thinned (table 3). These growth rates indicate that the unthinned stands produced about 5 percent more wood, but sustained more mortality than the thinned stand.

Table 2.--Red alder volume by stand treatment and age[1/]

Stand treatment	Volume per acre at age (years)--				
	21	26	31	36	41
	Cubic feet				
Alder thinned (overstory girdled)	820	1,443	2,068	2,557	3,042
Alder unthinned (overstory girdled)	1,453	2,093	2,779	3,291	3,664
Untreated pure alder	1,707	2,413	3,248	3,854	4,423

[1/] For trees 5.5 inches d.b.h. and larger.

Table 3.--Red alder net and gross periodic annual increment and mortality per acre[1/]

Stand treatment	Stand age periods	Net increment			Mortality	Gross increment
		Original trees	Ingrowth	Total		
	Years	Cubic feet				
Alder thinned (overstory girdled)	21-26	63	62	125	0	125
	26-31	98	27	125	1	126
	31-36	91	7	98	2	100
	36-41	95	2	97	1	98
Average		87	24	111	1	112
Alder unthinned (overstory girdled)	21-26	71	57	128	0	128
	26-31	107	30	137	0	137
	31-36	81	21	102	6	108
	36-41	67	8	75	23	98
Average		82	29	111	7	118
Untreated pure alder	21-26	114	27	141	4	145
	26-31	142	25	167	3	170
	31-36	118	3	121	4	125
	36-41	113	1	114	20	134
Average		122	14	136	8	144

[1/]For trees 5.5 inches d.b.h. and larger.

For the largest trees, selected at the rate of 100 stems per acre, average 20-year diameter growth was only 0.8 inch greater in the thinned than in the unthinned stand:

	Average d.b.h. at-- age 21 (Inches)	age 41 (Inches)	Diameter increment (Inches)
Treatment:			
Thinned	6.90	11.21	4.31
Unthinned	7.55	11.06	3.51

INFLUENCE OF PRECOMMERCIAL THINNING

Apparently thinning did not increase the yield or net increment of the stand (5.5 inches d.b.h. and larger) and exerted only a minor influence on the diameter growth of the largest trees. This in turn indicates that the small understory trees, of the type removed in the thinned stand, did not influence the development of the dominant stand appreciably.

The decrease in number of lower crown-class trees was very rapid in the unthinned stand (fig. 2), substantiating the intolerant nature of red alder and illustrating the effectiveness of natural thinning in dense red alder stands.

COMPARISON WITH NORMAL STANDS

Several attributes of the 41-year-old study stands are compared with corresponding average values from the normal yield tables[2/] (fig. 3). A site index of 89 was used in this comparison (based on an average height of 82 feet at age 41 in the untreated pure alder stand). The untreated alder stand is consistently above normal in all measures except average diameter, which is close to the expected average value.

In contrast, the thinned and unthinned stands (with overstory girdled) are below normal in average diameter and cubic-foot volume, above normal in number of trees per acre, and close to normal in basal area.

2/ See footnote 1.

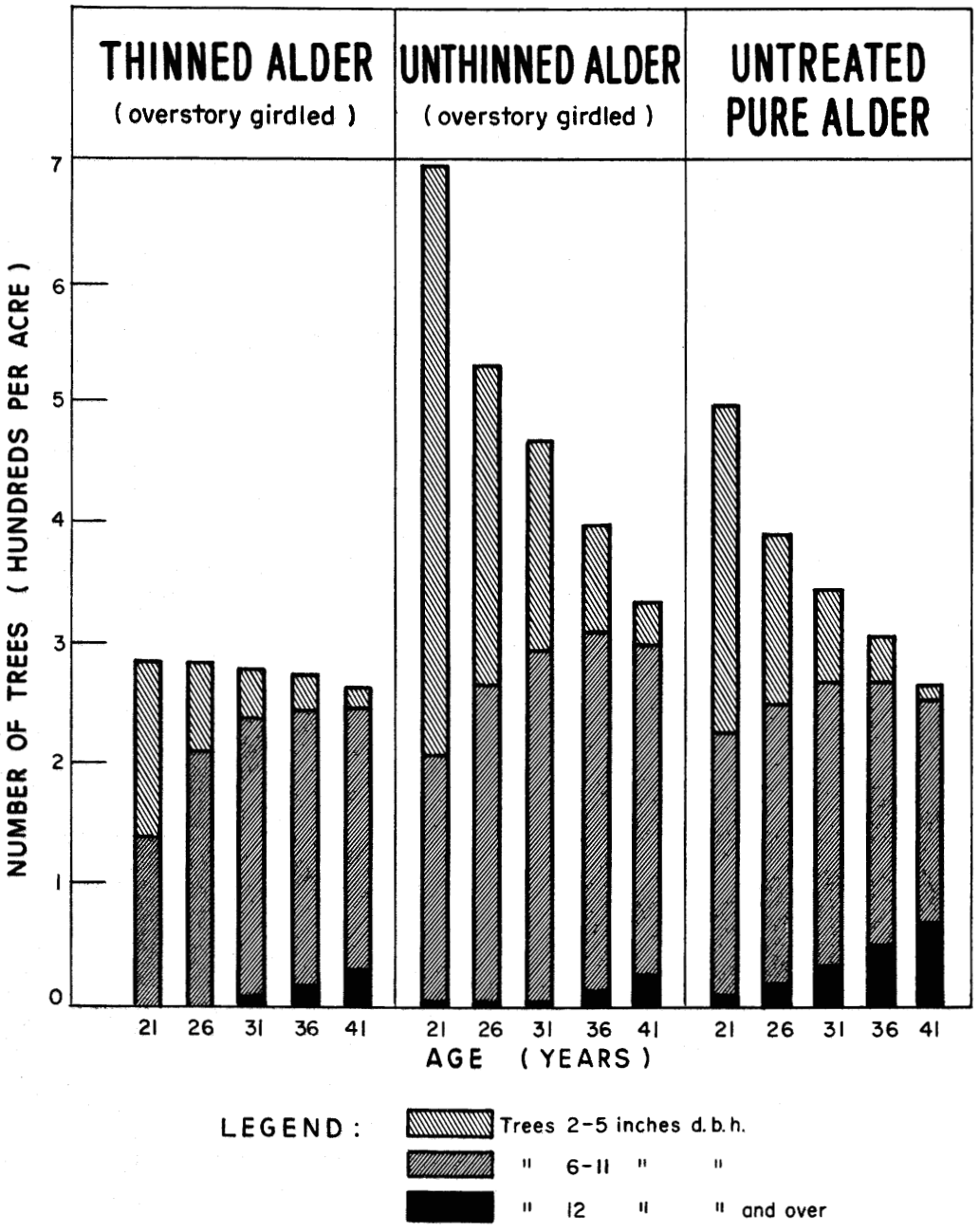

Figure 2.--Number of trees per acre by size classes and stand age. Natural thinning effectively removed the smaller trees of the unthinned stands.

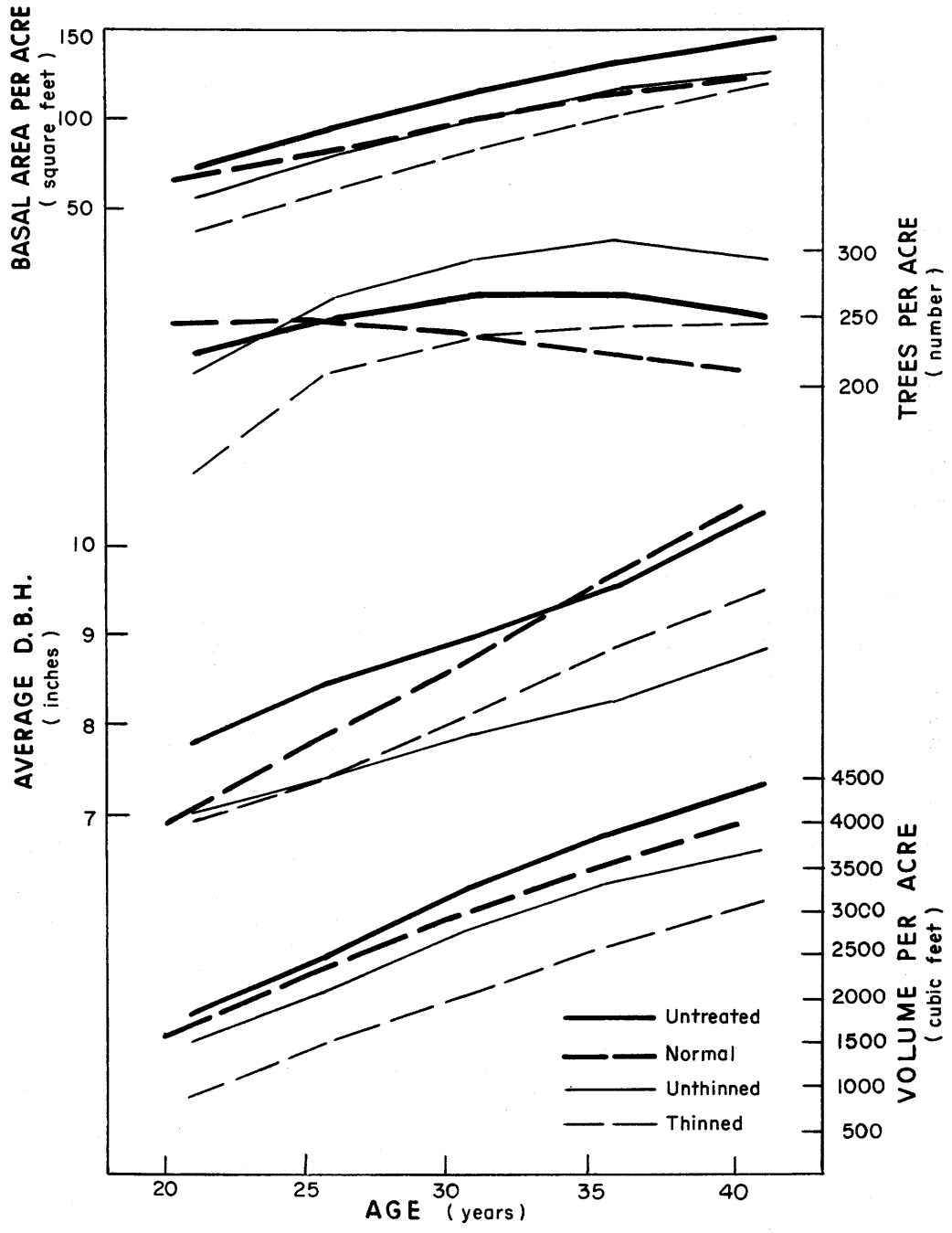

Figure 3.--Comparison of actual with normal yield table values (trees 5.5 inches d.b.h. and larger).

These deviations seem to be within the general range of differences that could be expected in sampling well-stocked stands with single plots. Here again, the release effect of girdling overstory conifers and thinning the alder at age 21 did not appear to have substantially altered the characteristics of the stand up to age 41 years.

APPLICATION

The 4,423-cubic-foot volume per acre of the untreated pure alder stand at age 41 represents a reasonable yield for natural stands in the study area. Such yields are somewhat higher than predicted in normal yield tables. The difference is accounted for largely by the greater number of trees per acre in the study stand.

Precommercial thinning did not appreciably stimulate growth of residual trees. Silvicultural treatments to increase yields, therefore, may be limited to salvage of merchantable dead or low-vigor trees. The intolerant nature of red alder can apparently be relied on to naturally thin out many of the smaller trees.