Station Note
No. 40 March 1990
University of Idaho
Idaho Forest, Wildlife and Range Experiment Station

Response from Thinning Ponderosa Pine Plantations in Northern Idaho

David L. Adams, Harold L. Osborne, Donald P. Hanley, Said Messat

INTRODUCTION

Small private woodlands throughout the Pacific Northwest frequently do not attain maximum wood fiber production because they receive little or no stand management. In many cases the attainment of sawlog-sized trees is seriously reduced by the overcrowding of individual stems. Thinning is a simple method that land managers employ to alleviate overcrowding, thereby reallocating the available growing space to selected crop trees. Crop trees from thinned stands will grow more rapidly than comparable trees from unthinned stands, thus producing more usable, high-value wood products for the landowner.

The authors are, respectively, Professor and Associate Extension Professor of Forest Resources; Extension Forester, Washington State University; and former graduate student, Department of Forest Resources.

Published as Idaho Forest, Wildlife and Range Experiment Station Contribution No. 521.

ISSN:0073-4594

A 1976 paper in this series reported on the excellent growth responses obtained by thinning twenty-year-old ponderosa pine (*Pinus ponderosa* Laws.) plantations in the Palouse Range of northern Idaho (Hanley and Adams, 1976). This paper updates the progress of the same plantations, including the results of a second thinning undertaken at approximately age 35 years.

STUDY METHODS

Ponderosa pine plantations were established on the University of Idaho Experimental Forest from 1941 to 1943. Between 1958 and 1964, twelve study plots were installed averaging .25 acres in size. All twelve plots were thinned from below at time of establishment, removing the smallest, least vigorous trees. Six of these plots were subject to a second "low" thinning in 1976. Three unthinned control plots were established in 1975, and tree ring measurements were used to recreate tree diameters at the time adjacent plots were thinned. Control plots were used to compare unmanaged growth with results in thinned stands.

University of Idaho

The first thinning reduced the average tree density by 28 percent. Numbers of trees per acre after the first thinning ranged from 147, with an average spacing of 17 ft x 17 ft, to 355, with an average spacing of 11 ft by 11 ft. The second thinning removed an additional 20 percent of the trees. Tree density per acre after the second thinning ranged from a minimum of 130, with an average 18-ft x 18-ft spacing, to a maximum of 318, with an average 12-ft x 12-ft spacing.

STUDY RESULTS

The responses reported in this paper are based on diameter breast high (dbh) and total height measurements taken in 1977 and in 1987, providing average annual growth values for 10 growing seasons. Table 1 shows basic information for the thinned and unthinned plots. Average yearly growth data are presented in Table 2. Table 2 and Figure 1 show that diameter increment on once-thinned plots (0.22 inch/yr) was 120 percent greater than on the unthinned plots (.10 inch/yr). Average annual diameter growth on twice-thinned plots was .27 inch/year, a 170 percent increase over unthinned plots and a 23 percent increase over once-thinned plots. Stated another way, the number of years required for a selected crop tree to grow an additional inch in diameter was 10.0 years in the unthinned stands, 4.6 years in the once-thinned plots, and only 3.7 years in the twice-thinned plots (Table 3).

Dramatic differences were also exhibited in cubic-foot-volume growth per tree (Table 2 and Figure 1). One thinning increased individual tree growth by 188 percent; two thinnings increased tree growth by 227 percent. For a tree to produce one cubic foot of wood volume required about 3 years on unthinned plots, 1 year on once-thinned plots, and less than one year on twice-thinned plots (Table 3).

However, total per-acre annual fiber production was decreased by the thinnings during this 10-year period. As compared with the unthinned control plots, one thinning decreased net per-acre volume growth by 50 percent; two thinnings by 54 percent.

Table 1. Basic information for the thinned and unthinned ponderosa pine plots for the 1977-1987 growth period.

Plot No.	Plot size (Acre)	Trees per Acre		DBH (inches)		Volume per Acre (Cubic Feet)		Volume per Tree (Cubic Feet)	
		1977	1987	1977	1987	1977	1987	1977	1987
Unthinned									
75-1	0.23	552	530	7.4	8.3	2419	4061	4.0	8.0
75-2	0.13	823	654	5.9	7.0	2077	3332	3.0	5.0
75-3	0.23	448	409	7.3	8.4	1863	3170	4.0	8.0
Average	0.20	608	531	6.9	7.9	2120	3521	3.7	7.0
Thinned Once									
61-1	0.10	180	140	11.1	13.8	2115	3642	12.0	26.0
61-2	0.10	230	230	8.8	10.3	1578	2973	9.0	13.0
61-5	0.23	178	139	10.3	12.4	1740	2802	11.0	20.0
63-1	0.23	157	152	10.0	11.8	1403	2683	9.0	18.0
63-2	0.23	217	148	9.0	11.1	1487	2226	7.0	15.0
63-3	0.23	357	217	9.1	12.3	2598	4324	7.0	20.0
Average	0.19	220	171	9.7	12.0	1820	3108	9.2	18.7
Thinned twice									
59-1	0.40	173	130	8.9	11.2	1195	2080	7.0	16.0
59-2	0.40	278	135	8.2	11.0	1638	2126	6.0	16.0
59-3	0.40	318	143	7.7	10.6	1534	1973	5.0	14.0
61-3	0.23	174	91	10.8	13.5	1899	2260	11.0	25.0
61-4	0.23	130	96	10.9	13.3	1447	2239	11.0	23.0
64-1	0.23	170	113	9.3	12.1	1282	2129	8.0	19.0
Average	0.32	207	118	9.3	12.0	1499	2134	8.0	18.8

Table 2. Average yearly growth for the thinned and unthinned ponderosa pine plots for the 1977-1987 growth period.

Plot No.	DBH (inches)	Volume/acre (cubic feet)	Volume/tree (cubic feet)
Unthinned			
75-1	0.09	164	0.40
75-2	0.11	126	0.20
75-3	0.11	131	0.40
Mean	0.10	140	0.333
Thinned once			
61-1	0.27	153	1.40
61-2	0.15	140	0.40
61-5	0.21	106	0.90
63-1	0.18	128	0.90
63-2	0.21	74	0.80
63-3	0.32	173	1.30
Mean	0.22	129	0.95
Thinned twice			
59-1	0.23	88	0.90
59-2	0.28	49	1.00
59-3	0.29	44	0.90
61-3	0.27	36	1.40
61-4	0.24	79	1.20
64-1	0.28	85	1.10
Mean	0.27	64	1.08

Table 3. Number of years required for a tree to grow one inch in DBH and one cubic foot in volume for thinned and unthinned ponderosa pine plantations.

Plot No.	Number of years to grow one unit in DBH	Volume
Unthinned		
75-1	11.1	2.5
75-2	9.1	5.0
75-3	9.1	2.5
Mean	10.0	3.0
Thinned once		
61-1	3.7	0.7
61-2	6.7	2.5
61-5	4.8	1.1
63-1	5.6	1.9
63-2	4.8	1.2
63-3	3.1	0.8
Mean	4.6	1.0
Thinned twice		
59-1	4.4	1.1
59-2	3.6	1.0
59-3	3.4	1.1
61-3	3.7	0.7
61-4	4.2	0.8
64-1	3.6	0.9
Mean	3.7	0.9

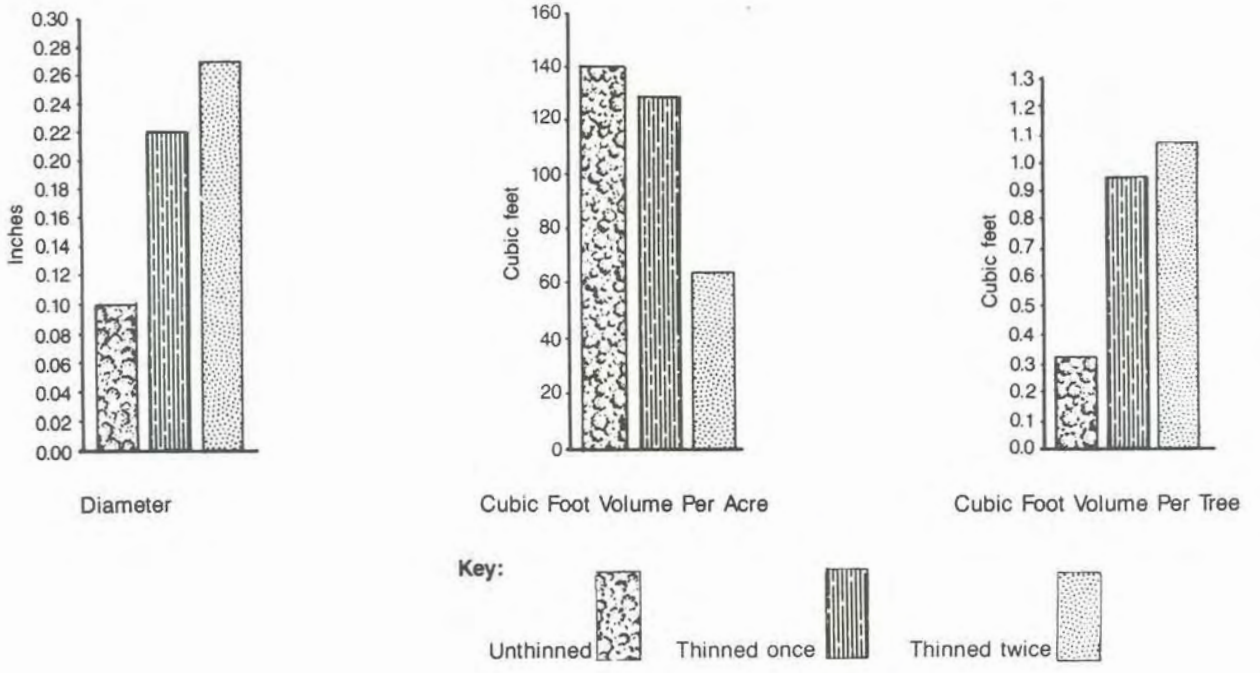

Figure 1. Average yearly growth for the thinned and unthinned ponderosa pine plots, 1977-1987.

WHAT THIS MEANS TO THE LANDOWNER

This study illustrates that thinned pine plantations can result in:

- increased growth of the selected crop trees, resulting in—
  - more rapid attainment of a marketable high-value wood product, resulting in—
    - a faster and usually higher monetary return to the landowner,
      - but, with a possible decrease in total cubic foot volume production.

Additionally, thinning overcrowded pine plantations results in a more vigorous plantation which is usually less vulnerable to insect and disease problems.

LITERATURE CITED

Hanley, D.P., and D.L. Adams. 1976. Thinning increases growth in young ponderosa pine plantations of the Palouse Range. Idaho Forest, Wildlife and Range Experiment Station Note No. 26. College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow. 4 pp.

Related Publications

Adams, D.L. 1972. Natural Regeneration following four treatments of slash on clearcut areas of lodgepole pine: A case history. Idaho Forest, Wildlife and Range Experiment Station Note No. 19. Univ. of Idaho, Moscow. 2 pp. $.25/copy.

Allen, G.M., D.L. Adams, and C.R. Prausa. 1974. Preliminary volume tables for small trees in northern Idaho. Idaho Forest, Wildlife and Range Experiment Station Note No. 21. 3 pp. $.25/copy.

Allen, G.M., D.L. Adams, G.L. Houck, and C.R. Hatch. 1976. Volume tables for small trees in northern Idaho. Idaho Forest, Wildlife and Range Experiment Station Note No. 27. 6 pp. $.25/copy.

Ferguson, D.E., and D.L. Adams. 1979. Guidelines for releasing advanced grand fir from overstory competition. Idaho Forest, Wildlife and Range Experiment Station Note No. 35. 3 pp. $.25/copy.

Hanley, D.P., and D.L. Adams. 1976. Thinning increases growth in young ponderosa pine plantations of the Palouse Range. Idaho Forest, Wildlife and Range Experiment Station Note No. 26. 4 pp. $.25/copy.

Mahoney, J.L., J.A. Moore, and J.J. Ulliman. 1980. Stand and site evaluation for silvicultural prescriptions. Idaho Forest, Wildlife and Range Experiment Station Note No. 37. 6 pp. $.25/copy.

For these publications, or for a listing of available experiment station publication and reprints, please write:

Editor
Idaho Forest, Wildlife and Range Experiment Station
University of Idaho
Moscow, Idaho 83843

Idaho Forest, Wildlife and Range Experiment Station

Scientists associated with the Idaho Forest, Wildlife and Range Experiment Station conduct wide-ranging research in forest management, wood products and wood technology, range resources, wildland recreation management, and fish and wildlife resources. The knowledge gained from research is disseminated nationally to educational institutions, federal and state agencies, private industries, and private citizens.

The mission of the Idaho Forest, Wildlife and Range Experiment Station, like that of the university, is service—to the people of Idaho and the nation. Experiment station scientists fulfill that mission through research directed toward knowledgeable, responsible use, development, and management of renewable natural resources for Idaho and the nation.