Forest Research Branch

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J. H. Cayford

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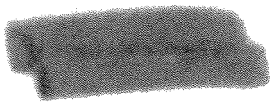

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Results of a 1921 Jack Pine Thinning in Western Manitoba[1]

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J. H. CAYFORD[2]

INTRODUCTION

In 1921 a thinning study was begun in a jack pine (*Pinus banksiana* Lamb.) stand of fire origin on the Riding Mountain Forest Reserve, now the Riding Mountain National Park, in western Manitoba. The purpose was "to study the effect of density on the mortality and rate of growth of naturally reproduced jack pine"[3]. Following remeasurement in 1926 the plots were re-established in 1961 providing a 40-year remeasurement period.

At the time of thinning the stand was 10 years old and was extremely dense, averaging 28,000 jack pine stems per acre. Heights ranged from 1 to 7 feet. In addition, there was a spruce understorey varying from 0 to 900 stems per acre.

Sandy loam to loam soils of moderately fresh to fresh moisture regime occur throughout the experimental area; there is little variation between plots. Soils are well-developed grey-wooded profiles with a leached Ae horizon of 3-inch thickness and a clay Bt horizon of 5-inch thickness. The parent material is a calcareous, stony till. In 1961, lesser vegetation consisted of a mixture of mosses, grasses, herbs, and shrubs; most common species present were Schreber's moss (*Calliergonella schreberi* (BSG.) Grout), fuzzy wild-rye (*Elymus innovatus* Beal), wild strawberry (*Fragaria virginiana* Duchesne), prickly rose (*Rosa acicularis* Lindl.), twinflower (*Linnaea borealis* L.), shrubby cinquefoil (*Potentilla fruticosa* L.), and dwarf raspberry (*Rubus pubescens* Raf.). The experimental area is in Site Group A as described by Jameson (1961).

Five one-quarter-acre plots were established in 1921 by C. B. Gill and G. Tunstell. Four were thinned to spacings varying from 3.6 to 6.1 feet, and the fifth was retained for control (Figure 1). Trees left on thinned plots were spaced at uniform intervals on regularly spaced rows (Figure 2). Plots were remeasured in 1926 by G. H. D. Bedell and G. Tunstell and in 1961 by the author. At the latter remeasurement sufficient height measurements were taken to provide independent plot volumes. In the analysis, data from two plots thinned to spacings of 3.6 and 4.5 feet, and from two plots thinned to spacings of 6.0 and 6.1 feet, were combined. Although there was considerable variation in yield within the two pairs of plots, the heavily thinned plots had larger average diameters and greater merchantable production than the intermediately thinned plots.

RESULTS AND DISCUSSION

In 1961, at age 50 years, the control plot had the greatest number of stems, basal area, and total cubic-foot volume of jack pine (Table 1). The heavily thinned plots had the least number of stems and basal area, while the intermediately thinned plots had the least total cubic-foot volume.

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[3]Unpublished information on file, Manitoba-Saskatchewan District Office.

Neg. M.S. 2926

FIGURE 1. Control plot in 1961. Note the large number of small-sized trees.

Neg. M.S. 2623

FIGURE 2. Plot thinned to a spacing of 6.0 feet photographed in 1961. Note the rows of trees left after thinning.

In addition to the pine there was an average of 435 black spruce (*Picea mariana* (Mill.) BSP.) and 25 white spruce (*Picea glauca* (Moench) Voss) per acre. Eighty-nine per cent of the black spruce and 68 per cent of the white spruce were in the 1- and 2-inch diameter classes. Most black spruce were layers that had developed from the survivors of those present in 1921.

TABLE 1—STAND STATISTICS PER ACRE—1961*

Plot number	Spacing 1921 (ft.)	Number of trees 1921	Number of trees				Basal area (sq. ft.)				Total volume (cu. ft.)			
			jP	bS	wS	Total	jP	bS	wS	Total	jP	bS	wS	Total
62	1.3 (control)	27,877	1,476	4	0	1,480	151	0	0	151	2,805	0	0	2,805
60,61	4.0	2,708	1,045	876	41	1,962	127	15	1	143	2,381	136	13	2,530
58,59	6.1	1,185	812	213	16	1,041	122	3	0	125	2,439	9	4	2,452

*1-inch d.b.h. class and greater.

Merchantable production for three utilization standards—cordwood, cordwood and sawtimber, and cordwood and poles—is shown in Table 2. Considering solely a cordwood operation, production was greatest on the control plot, and was reduced slightly by both intermediate and heavy thinning. With integrated cordwood and sawtimber or cordwood and pole operations the heaviest thinning resulted in an increase in sawtimber volume of 1,200 board feet, or an increase in pole production of 80 poles. There was little difference in either sawtimber or pole production between the control and intermediately thinned areas. In all instances, cordwood volume of 4- and 5-inch trees was greatest on the control plot and least on heavily thinned plots.

TABLE 2—JACK PINE YIELDS PER ACRE—1961

Plot number	Spacing 1921 (ft.)	Total volume* (cu. ft.)	Cordwood	Cordwood and sawtimber		Cordwood and poles	
			cords**	cords	b.f.***	cords	number of poles†
62	1.3	2,805	30.6	18.5	2,530	18.5	230
60,61	4.0	2,381	27.6	15.4	2,408	15.4	236
58.59	6.1	2,439	28.4	11.5	3,723	11.5	309

*Table 28 (Anon. 1948).
**Stump height, 1.0 feet, top diameter outside bark, 3 inches. Table 94 (Brown and Gevorkiantz 1934).
***Stump height, 1 foot, top diameter inside bark, 5 inches. Table 89 (Brown and Gevorkiantz 1934).
†Class 5, 6 and 8 poles (Anon. 1960).

Values of jack pine for the three utilization standards are presented in Figure 3. Values used were $12 per cord of cordwood, $45 per thousand board feet of sawtimber, $2.50 per Class 5 pole, and $1.50 per Class 6 or 8 pole. They are based on approximate prices paid in 1963 for products delivered at the roadside and were provided by government and industrial foresters. Heavy thinning has slightly increased the values in a cordwood and pole operation, but with either a cordwood or cordwood and sawtimber operation, maximum values were obtained on the control plot.

During the 40-year period after thinning, considerable mortality occurred on all plots. It averaged 95 per cent on the control, 61 per cent on the intermediately thinned plots, and 31 per cent on the heavily thinned plots.

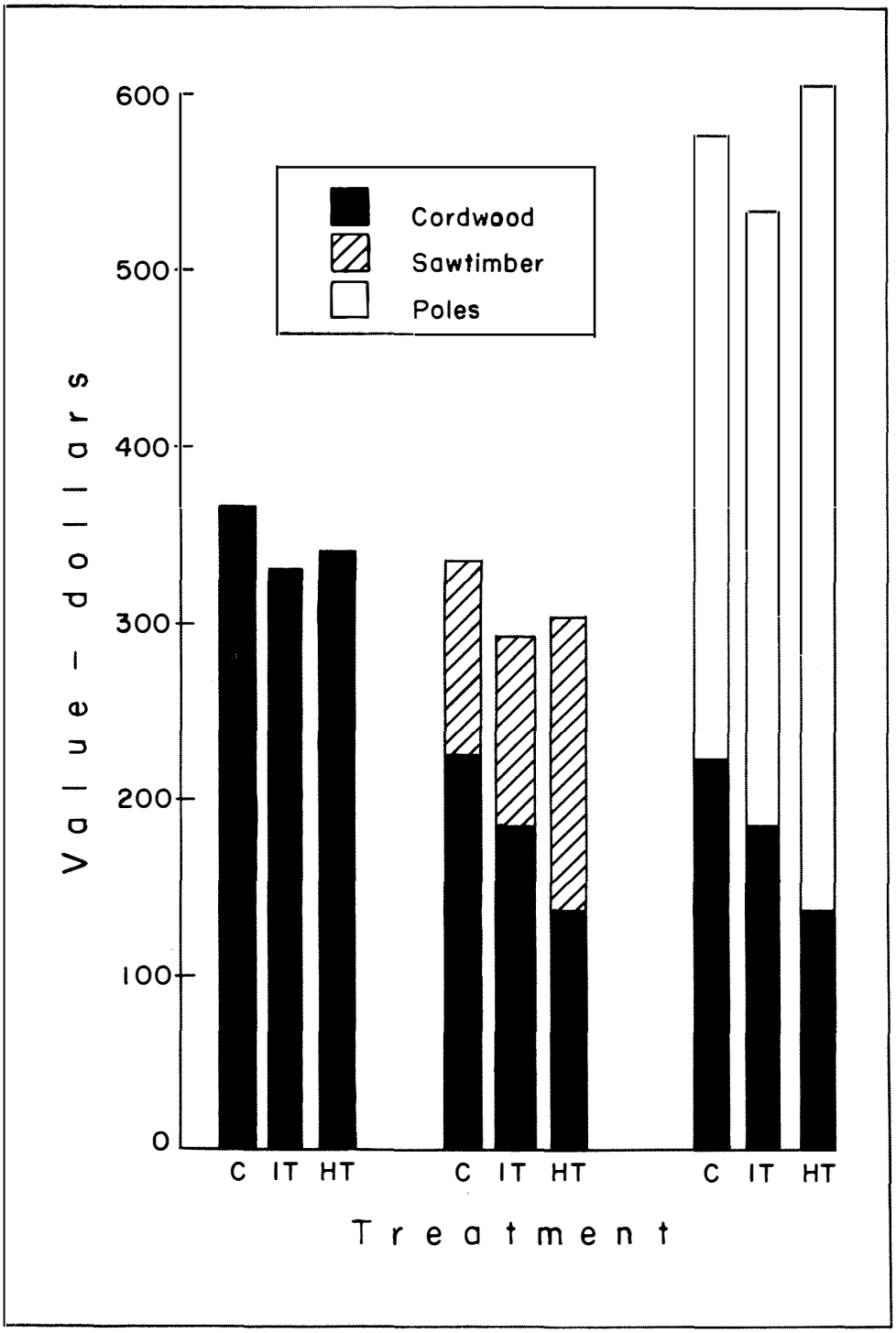

FIGURE 3. Values of jack pine for control, intermediately thinned and heavily thinned areas, based on three utilization standards.

The study has provided another example of response of young jack pine to intermediate cutting. Thinning to a 6-foot spacing increased sawtimber and pole production, but did not increase cordage production. Thinning to a 4-foot spacing did not increase cordage, sawtimber or pole production.

These results may be compared to those obtained from a 1927 thinning in Saskatchewan in an 18-year-old stand averaging 2,600 and 4,400 stems per acre before thinning (Cayford 1961). There, board-foot production was increased by two- to three-fold and cordage production by up to 4.8 cords. Mortality for a 32-year period after thinning averaged 46 and 10 per cent for plots thinned to spacings of 4 and 6 feet, respectively.

The differences in response to thinning in the Riding Mountain and Saskatchewan stands are due largely to greater post-thinning mortality in the Riding Mountain study. Reasons for the mortality—which occurred subsequent to 1926—are not known, but the author believes that an ice storm may have been responsible. Ice storms that have occurred in southeastern Manitoba, in the Duck Mountain Forest Reserve,[4] located in western Manitoba, and in the Lake States have demonstrated the susceptibility of jack pine to ice damage (Rudolf 1958, Cayford and Haig 1961). Records[4] indicate that ice storms occurred on the Riding Mountain in 1938 and again in 1944, and the presence of bent trees on the study area suggests that one or both storms may have caused post-thinning mortality.

It is possible that a second thinning might have salvaged some merchantable wood production and increased the rate of growth of the largest trees. In addition, the spruce understorey which was primarily confined to the thinned plots may have exerted a detrimental effect on the growth of the jack pine, and its removal might have improved the growth rate of the jack pine overstorey.

Thinnings are made to stimulate the growth of residual trees and to increase the total yield of useful material and final results do not become available until rotation age when comparisons can be made between thinned and unthinned stands. In this study, heavy thinning has resulted in the production, by 50 years, of 310 trees per acre six inches and larger. Comparable figures for control and intermediately thinned areas are 230 and 236 trees, respectively. It appears as if the heavy thinning will result in an increase in the production of sawtimber and poles and a decrease in the production of cordwood. Thus, its success or failure must be judged in the light of economic considerations, of which utilization practices for a given area are of utmost importance.

[4]Unpublished information on file, Manitoba-Saskatchewan District.

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