

TWENTY-NINE YEARS GROWTH AND THINNING YIELDS IN A SHORTLEAF PINE PLANTATION IN SOUTHERN ILLINIOS

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ABSTRACT.—The shortleaf pine in Southern Illinois will respond to thinning at a relatively early age but begins to stagnate on average sites from 20 to 25 years of age. When these conditions occur, removal of the entire plantation should be considered with emphasis given to the planting of desirable hardwoods.

A study was initiated in 1950 (Bog-gess, 1950) in a 13-layer-old shortleaf pine plantation to determine the effects of four crown thinning treatments. Two replications of each treatment were applied in the plantation. The treatments were:

1. No thinning (check)
2. Thinned to 90 square feet basal area per acre (light)
3. Thinned to 80 square feet basal area per acre (medium)
4. Thinned to 70 square feet basal area per acre (heavy)

As a result of a severe glaze storm in January of 1952, a light salvage cut was made. Second and third thinnings were made in February 1953 and January

1958 (Bog-gess and McMillan, 1953; Bog-gess, 1958). All cubic-foot volumes have been determined from local volume tables.

This paper presents yields from a fourth thinning made in the fall of 1962, growth from the 1958 thinning through the 1965 growing season, and yield for the entire management period.

RESULTS AND DISCUSSION

Rough wood yield removed from the thinning plots during the fourth thinning, excluding mortality, is shown in TABLE 1. Small differences occurred between the thinning treatments.

TABLE 2 presents stand volume, less mortality, from 1958 to 1965. During this period, growth steadily increased, but slowed after 1962 as evidence by the unthinned plots. The annual increase in basal area between the third and fourth thinnings was 5.42, 5.84, 5.92, and 5.00 square feet for the heavy, medium, light, and checked plots, respectively. The annual increase in basal area between 1962 and 1965 was 2.77, 2.40, and 3.63 square

TABLE 1.—Number of Trees, Square Feet Basal Area, and Cubic Feet Volume Per acre Before and After the Fourth Thinning in 1962, Excluding Mortality.

Thinning Treatment	Before Thinning			After Thinning			Cut in Thinning		
	No. Trees	Basal Area	Vol. Cu. Ft.	No. Trees	Basal Area	Vol. Cu. Ft.	No. Trees	Basal Area	Vol. Cu. Ft.
None.	766	191.5	4,214	766	191.5	4,214	.....	.....	.....
90 sq. ft. basal area...	370	118.6	2,544	255	89.7	1,927	115	28.9	617
80 sq. ft. basal area...	350	109.4	2,332	207	79.9	1,714	143	29.5	618
70 sq. ft. basal area...	278	96.9	2,079	168	69.8	1,510	110	27.1	569

TABLE 2.—Number of Trees and Square Feet Basal Area Per Acre Excluding Mortality for Four Thinning Treatments from 1958 to 1965.

Year	Thinning Treatments							
	Heavy		Medium		Light		Check	
	No. Trees	Basal Area	No. Trees	Basal Area	No. Trees	Basal Area	No. Trees	Basal Area
1958.....	275	74.5	355	86.4	378	95.5	813	173.3
1959.....	278	74.5	355	92.3	373	100.6	803	178.3
1960.....	278	85.8	353	97.2	375	106.7	798	184.5
1961.....	278	92.7	353	103.6	373	112.8	780	189.2
1962.....	278	96.9	350	109.4	370	118.6	766	191.5
1962 ¹	168	69.8	207	79.9	255	89.7	766	191.5
1963.....	165	73.1	210	85.2	255	94.7	740	193.2
1964.....	162	75.2	200	85.4	250	97.8	715	192.6
1965.....	162	78.1	195	87.1	248	100.6	682	191.3

¹ Following the fourth thinning.

et for the heavy, medium, and light thinning treatments, respectively, with a decrease of 0.07 square feet in the unthinned plots. At the end of the 1965 growing season, diameters of trees at breast height (4.5 feet above ground) in the heavy, medium, light, and check plots averaged 9.3, 8.8, 8.5, and 7.0 inches, respectively.

A summary of rough wood removed from the plots, including mortality, for the entire management period is presented in TABLE 3. Yield increased up to 1958 but decreased after this date. The unthinned plots produced the largest volume of rough wood during the life of the stand. A discrepancy between TABLES 1 and 3 for the 1962 thinning is due to the inclusion of mortality in TABLE 3.

Results from this study exhibit two factors that should be recognized in the management of shortleaf pine in southern Illinois. Shortleaf pine will respond to thinning at a relatively early age, and begins to stagnate on average sites (site index of 40 at 25 years) from 20 to 25 years of age.

As pointed out in TABLE 3, basal area yield began to decrease at the time of the 1958 thinning when the plantation was 22 years old. FIGURE 1 presents the previous accumulative basal area yield for each thinning and the cut (growth following thinning) made during that period. A decline in basal area in the thinned plots is evident after 1958. Basal area declined after 1962 in the unthinned plots at 26 years of age. Although basal area in the unthinned plots has started to decline, cubic-foot volume continues to increase but at a reduced rate.

Accumulative mortality is shown in FIGURE 2. *Fomes annosus*, the *Ips* engraver or bark beetle, and natural suppression account for most mortality in the study area. Mortality was greatest in the unthinned plots, thus resulting in a greater loss of product than in the thinned plots. After the 1965 growing season, mortality in the plots at 29 years of age resulted in a loss (trees not salvaged during thinning operations) of 21.3, 3.6, 2.1, and 1.7 square feet basal area for the check, medium, heavy, and light treatments, respectively. In 1953

TABLE 3.—Square Feet Basal Area and Cubic Feet Volume Removed from Thinnings and Total Yields for the Entire Management Period.¹

Year Thinned	Square Feet Basal Area				Cubic Feet Volume			
	Heavy	Medium	Light	Check	Heavy	Medium	Light	Check
1950.....	25.0	14.0	14.0	.....	275	165	185	.....
1952 ²	3.8	3.9	2.0	.....				.....
1953.....	24.8	28.6	25.6	.....	323	281	346	.....
1958.....	38.4	40.5	43.4	.....	666	712	764	.....
1962.....	27.5	30.0	29.3	.....	569	618	633	.....
Total removed....	119.5	117.0	114.3	.....	1,833	1,776	1,928	.....
Residual 1962....	96.9	109.4	118.6	191.5	1,510	1,714	1,927	4,214
Total to 1962....	216.4	226.4	232.9	191.5	3,343	3,490	3,855	4,214

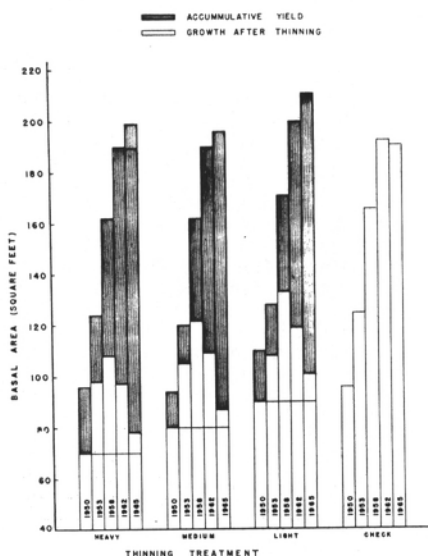
¹ Area and volume figures include mortality.² Salvage cut.

FIGURE 1.—Accumulative yield for four thinning periods and basal area growth from 1962 to 1965.

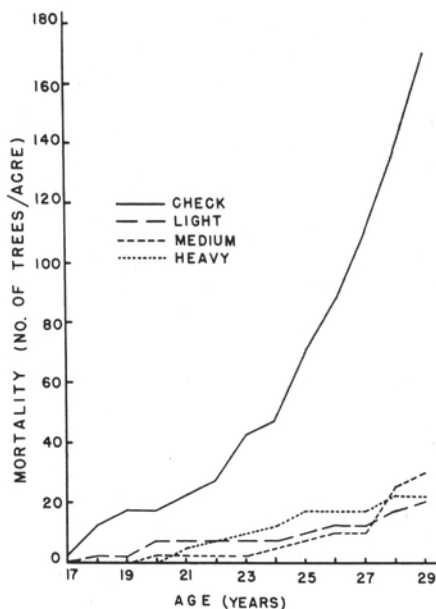


FIGURE 2.—Total mortality for each thinning treatment during twelve years of management (1953 to 1966).

t 17 years of age, the unthinned plots were fully stocked containing 134 square feet of basal area. The rate of mortality increased as the check plots became overstocked. Although the light thinning treatment showed signs of mortality earlier than the other treatments, total loss of useable product was the lowest of the three treatments.

CONCLUSION

Shortleaf pine in southern Illinois is at the northern extremity of its natural range and is undoubtedly more susceptible to attack by insects and diseases resulting in a shorter life expectancy. Although it is hazardous to make conclusive statements on the basis of one study, the following recommendations based upon this study and observations on other plantations in the area suggest that shortleaf pine in southern Illinois can be lightly thinned at an early age to produce a higher quality product in a short period of time; but when the plantation shows signs of increased mortality and a reduction in the rate of growth,

around 25 years of age on average sites, removal of the entire stand should be considered. The plantation could be clear cut and pines replanted, although serious consideration should be given to the planting of desirable hardwoods as the pines should improve the site so that hardwoods will respond favorably.

LITERATURE CITED

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