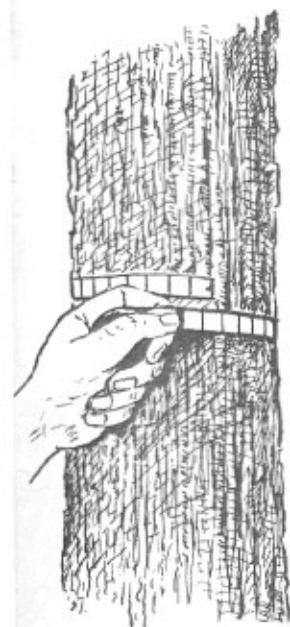


# DOES INTERPLANTING INCREASE YIELDS ?



Virginia Division of Forestry

Department of Conservation and Economic Development



## Interplanting in Old Field Loblolly Pine Plantations

### Results at Time of First Thinning

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#### DESCRIPTION OF STUDY

An interplanting study was installed during the winter of 1957-58 in three different old field loblolly pine plantations on the Cumberland State Forest, which is located in the central Virginia Piedmont. These plantations had been operationally planted one, two and three years before the study was installed, at a nominal spacing of 6 x 6 feet. The actual distance between seedling rows averaged 5.6, 6.3, and 5.6 feet; and spacing within the rows averaged 6.3, 6.2, and 5.2 feet in the one, two, and three year old plantations respectively. Spacings of approximately 6, 9, and 12 feet were created between original and interplanted trees by pulling up rows of original seedlings and replanting with one year old seedlings as shown in the drawing below:

<u>6 foot spacing</u>			<u>9 foot spacing</u>			<u>12 foot spacing</u>		
O	R	O	O	R	O	O	R	O
O	R	O	O	R	O	O	R	O
O	R	O	O	R	O	O	R	O
O	R	O	O	R	O	O	R	O
O	R	O	O	R	O	O	R	O

O = original seedlings

R = replanted seedlings

Vertical lines represent original seedling rows pulled up

Three plots at each spacing were installed in each plantation, giving nine plots in each plantation and a total of 27 plots. A plot consisted of five rows of original trees and five rows of interplanted trees, each row containing ten seedlings. Plot size is approximately .08, .12, and .16 acre for the 6, 9, and 12 foot row spacings respectively.

Seedling heights were measured immediately after the interplanting was done and again one year later (Table 1). The photographs in Figures 1 and 2 were taken immediately after the interplanting was done (the Forester is standing at the end of an interplanted row in each photograph).

TABLE 1. Average height in feet immediately after interplanting and one year after interplanting.

<u>Interplanted After</u>	<u>Immediately After</u>		<u>One Year Later</u>	
	<u>Originals</u>	<u>Interplants</u>	<u>Originals</u>	<u>Interplants</u>
1 year	.82	.47	1.91	1.00
2 years	1.39	.46	2.43	.96
3 years	2.89	.48	3.82	.88



FIGURE 1.

One of the six foot row spacing plots in the two year interplanting.



FIGURE 2.

One of the six foot row spacing plots in the three year interplanting.

The numbers of original and interplanted trees per acre a year after interplanting are given in Table 2. With exact spacing (6 feet within rows and 6, 9, or 12 feet between rows) and perfect survival, the numbers of original and interplanted trees in Table 1 would have been identical: 605, 403, and 302 for the 6, 9, and 12 foot row spacings respectively (see numbers in parenthesis in Table 2).

TABLE 2. Number of surviving seedlings per acre one year after interplanting.

Row Spacing			Interplanted at Age 1	Interplanted at Age 2	Interplanted at Age 3
6	Originals	(605)	428	520	644
	Interplants	(605)	594	547	736
9	Originals	(403)	336	296	400
	Interplants	(403)	396	330	462
12	Originals	(302)	220	237	334
	Interplants	(302)	291	243	324

Seedlings were measured again 3, 6, 10, and 15 years after the study was installed, and a final measurement was made just before the plantations were thinned for the first time. The three year interplanting plots were thinned when the interplanted trees were 18 years old (and the original trees were 21 years old). The one and two year interplanting plots were thinned three years later, when the interplanted trees were 21 years old (and the original trees were 22 and 23 years old respectively).

#### YIELDS AT TIME OF FIRST THINNING

Volumes in standard cords for original and interplanted trees are given in Table 3 and illustrated in Figure 3. As expected, the contribution of interplanted trees to total volume decreased with the age at which interplanting was done and increased with row spacing.

TABLE 3. Per acre volume in standard cords at time of first thinning (outside bark volume for trees greater than 4.5 inches DBH to a 4.0 inch top, outside bark)<sup>1/</sup>

Row Spacing	Originals	Interplants	Total
<u>Interplanted after 1 year (age 22 and 21)</u>			
6	24.7	18.2	42.9
9	29.3	17.7	47.0
12	18.6	19.0	37.6
<u>Interplanted after 2 years (age 23 and 21)</u>			
6	31.1	1.4	32.5
9	22.2	5.9	28.1
12	20.3	11.0	31.3
<u>Interplanted after 3 years (age 21 and 18)</u>			
6	42.4	0	42.4
9	34.6	2.9	37.4
12	31.8	5.2	37.1

When interplanting was done after one year, trees interplanted 6 feet from original trees produced almost as much volume as trees interplanted 12 feet from original trees (18.2 versus 19.0 cords). When interplanting was done after two years, however, suppression of interplanted trees by original trees was severe, and trees interplanted 6 feet from original trees produced only one-eighth the volume of trees interplanted 12 feet from original trees (1.4 versus 11.0 cords). After three years, trees interplanted 6 feet from original trees produced no merchantable volume at all.

Total volumes for the two year interplanting seem low compared to the one and three year interplantings. This may be explained by differences in initial stocking and site index. The two year interplanting had considerably fewer seedlings than the three year interplanting (see Table 2). Also, the two year interplanting has the lowest estimated site index (50 year base)<sup>2/</sup>: 95, 83, and 87 for the one, two and three year interplantings respectively.

<sup>1/</sup> MacKinney, A. L. and L. E. Chaiken. 1939. Volume, Yield, and Growth of Loblolly Pine in the Mid-Atlantic Coastal Region. Table 5.

<sup>2/</sup> The site index curves used were: Coile, T. S., and F. X. Schumacher. 1953. Journal of Forestry 51, pp 432-435.



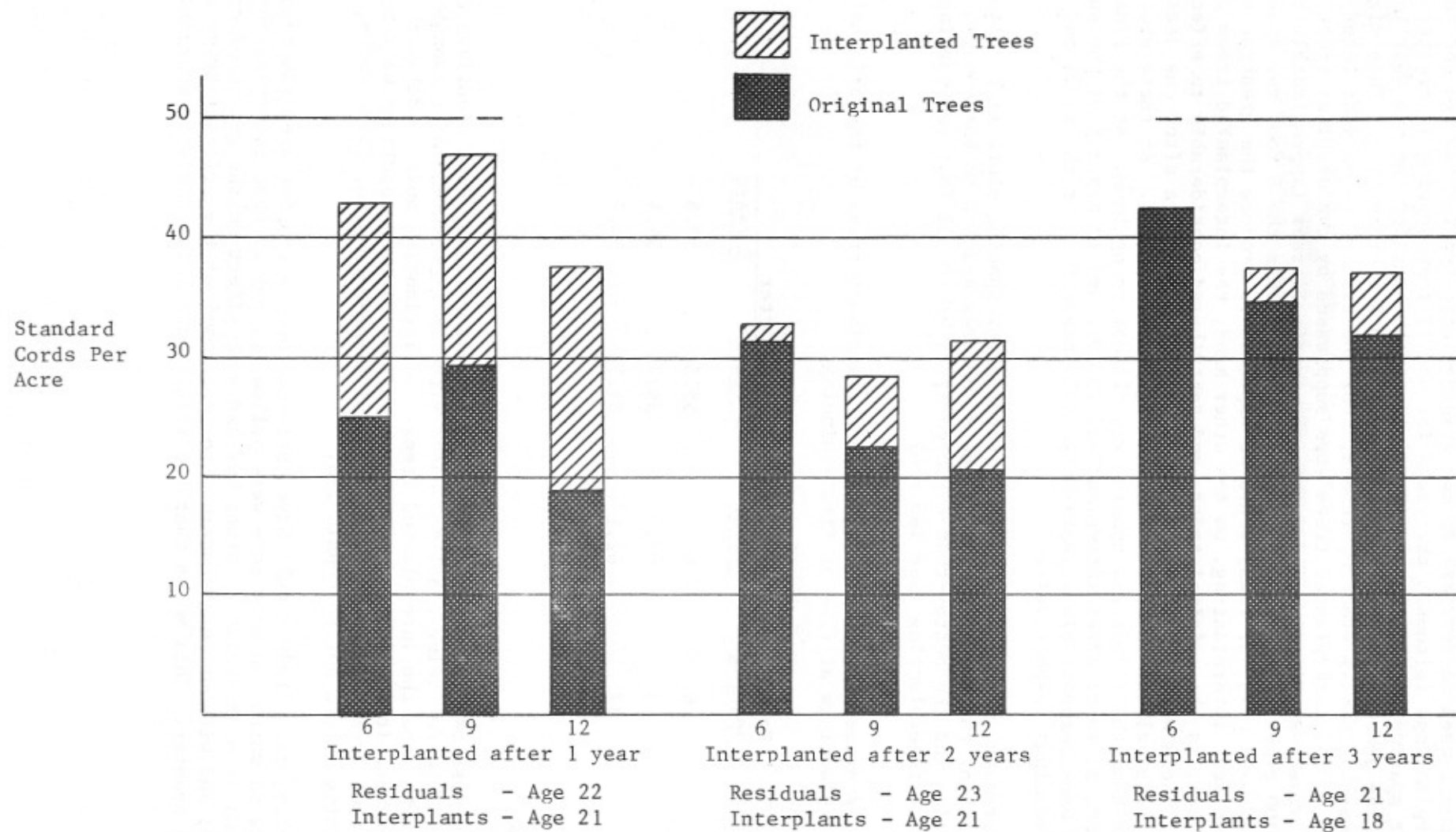


FIGURE 3. Volumes per acre in standard cords at time of first thinning.

Volumes tended to decrease as row spacing increased for the two and three year interplantings (although the yield for the 12 foot spacing is greater than the 9 foot spacing in the two year interplanting). But for the one year interplanting, the greatest volume was produced by the 9 foot spacing. This might be explained by initial stocking levels. For the two and three year interplantings, most of the interplanted trees were suppressed by the original trees and effective stocking was primarily due to the original trees (approximately 600, 400, and 300 trees per acre). At these stocking levels the 6 foot row spacing (12 feet between original rows) would be expected to produce the greatest yields. For the one year interplanting, on the other hand, the interplanted trees grew almost as well as the original trees, and contributed considerably to effective stocking. There were 1,022, 732, and 511 seedlings per acre after one season combining original and interplanted seedlings (see Table 2). At these stocking levels, perhaps the 9 foot row spacing was closest to optimum. At the final measurement, 21 years after interplanting, 73, 97, and 93 percent of the surviving trees were merchantable (greater than 4.5 inches DBH) at the 6, 9, and 12 foot row spacings respectively.

Differences in average site index between row spacing plots might also explain part of the better yields of the 9 foot row spacing in the one year interplanting and the better-than-expected yield of the 12 foot row spacing in the two year interplanting (see Table 4).

TABLE 4. Average heights of dominant and codominant trees of the original plantings at time of first thinning.

Row Spacing	Interplanted After		
	1 Year	2 Years	3 Years
6	61.4	55.5	53.8
9	63.3	55.3	54.4
12	62.1	57.7	54.7

## DISCUSSION

These results indicate that in old-field plantations, dead seedlings can be replaced the following planting season with the expectation of reasonable volume growth from the interplanted trees. If replanting must be delayed two years, however, it should be done only where interplanted seedlings will be at least 12 feet from seedlings of the original planting. After three years, interplanting should not be considered.

Ideally, this study should have included check plots for each row spacing, i.e. plots in which the same rows were pulled up, but without interplanting. Competition from interplanted trees has had some effect on the growth of original trees, and without interplanting, volume growth of the original trees would have been greater. This means that the results presented probably exaggerate

somewhat the volume gains that may be achieved by interplanting.

These results should be applied with caution to plantations on site-prepared, cutover sites. On prepared sites, interplanted pines must compete not only with older pine seedlings but with hardwood sprouts and brush that have had the same head start. In 1970 a three-year interplanting study was initiated on prepared, cutover sites, and observations to date suggest that interplanting will not be as successful on cutover sites as on abandoned fields.