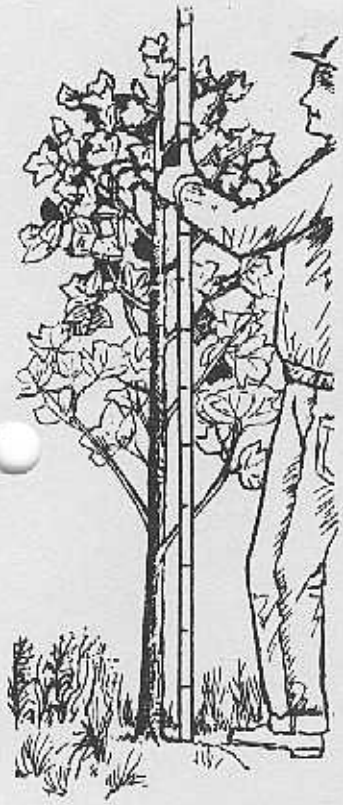

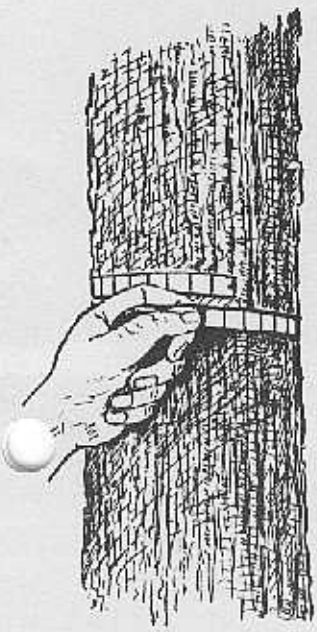

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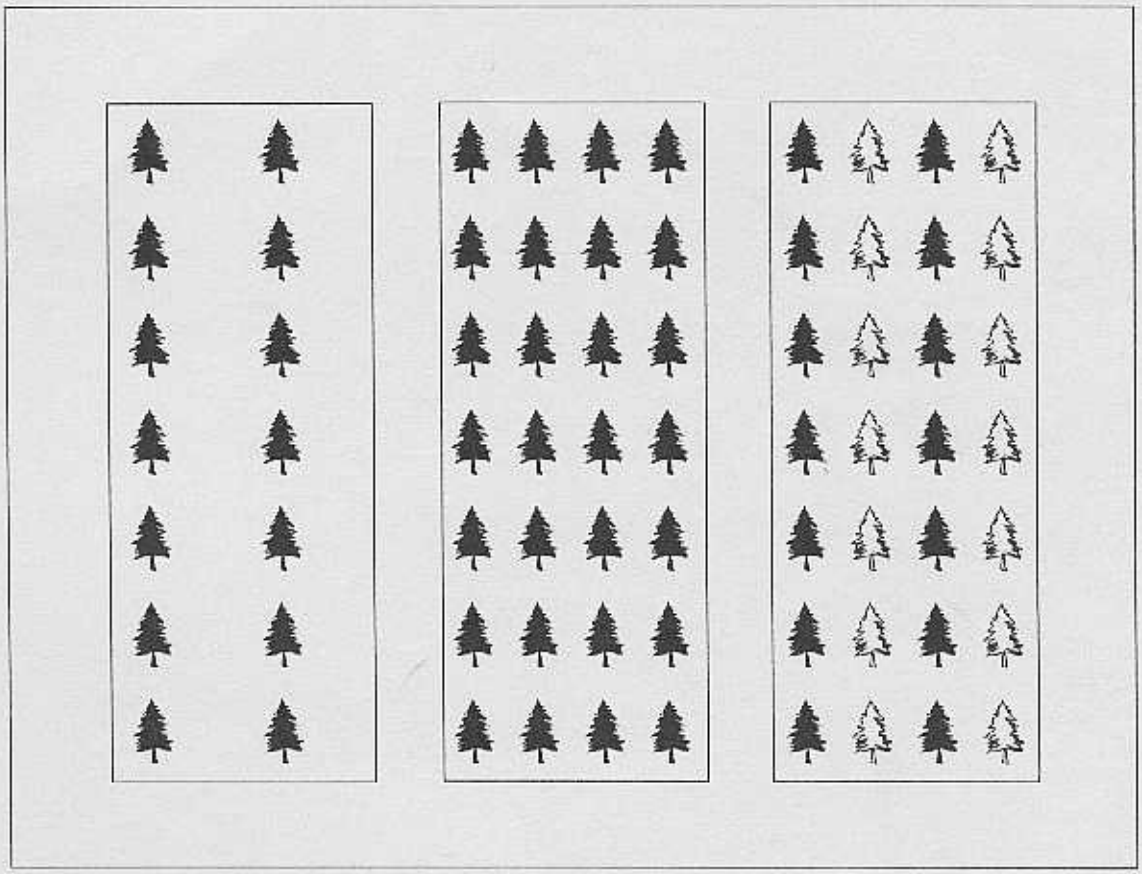
A THREE-YEAR LOBLOLLY PINE INTERPLANTING STUDY ON SITE-PREPARED FORESTLAND



VIRGINIA DEPARTMENT OF FORESTRY

A THREE-YEAR LOBLOLLY PINE INTERPLANTING STUDY ON SITE-PREPARED FORESTLAND

by Thomas A. Dierauf

ABSTRACT

There were three treatments:

1. "Full-planting" at 824 per acre (8'x 6.6')
2. "Half-planting" at 412 per acre (16'x 6.6')
3. Same as #2 but "interplanting" 412 per acre one year later.

The study was installed over a three-year period on cutover sites prepared by drum chopping and burning. Final measurements were made at age 20.

Interplanting was not helpful; it was actually harmful. Compared to "half-planting," interplanting increased cordwood yields hardly at all (less than one cord per acre), considerably increased basal area, reduced average DBH, and greatly increased numbers of sub-merchantable trees. Consequently, interplanted plots will need thinning earlier but will be harder to thin.

Planting was done in late winter and early spring, and seedlings that were dead or looked like they might die later in the spring were replanted the same year. Treatments were replicated four times each year in randomized blocks. Figure 1 illustrates the layout of a typical block. Buffer seedlings were planted around each block, with three buffer seedlings on the ends of each row, and two buffer rows on each side. Buffer seedlings on the ends of interplanted rows were also interplants.

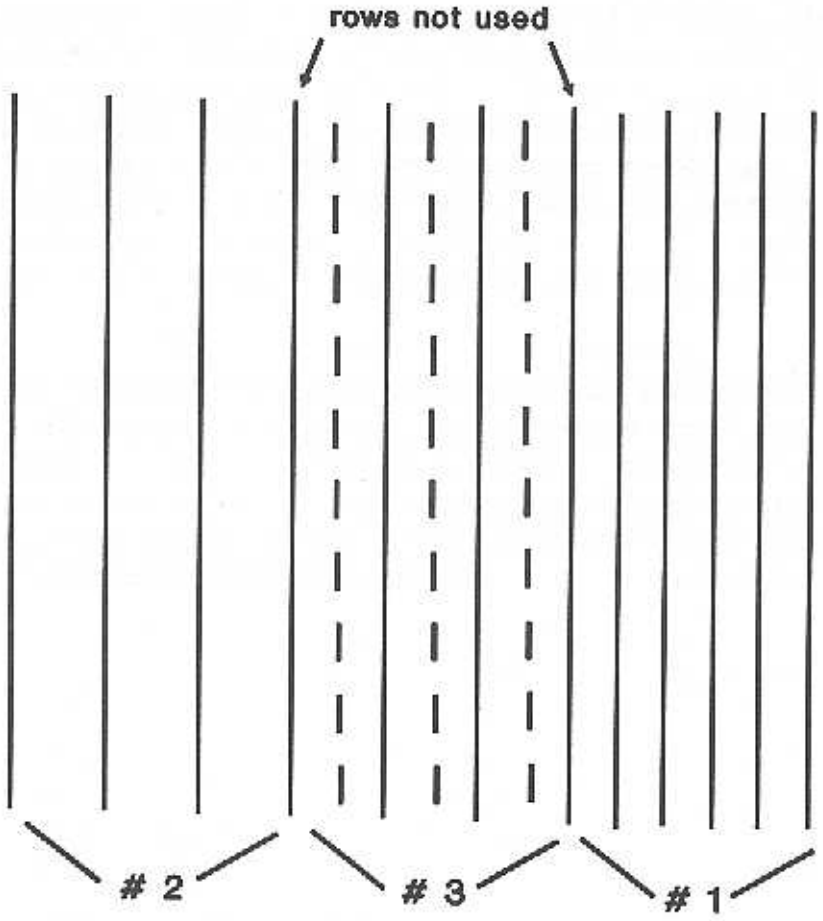


Figure 1. Typical block layout. Solid lines represent original seedling rows and dashed lines represent interplanted rows. Numbers indicate treatments.

We did not install buffer rows between treatment plots within a block. This meant that the outside row of a treatment plot was often adjacent to a row that was either younger or at a wider spacing than specified for that particular treatment. This is illustrated in Figure 1, where an outside row of Treatment 1 is adjacent to a row of interplanted seedlings, and an outside row of Treatment 3 is adjacent to an empty row rather than another row of interplanted seedlings. Outside rows like these were not used when summarizing data, and plot areas were reduced accordingly.

MEASUREMENT

Plots were measured annually for the first four years, and every four years after that until the final measurement at age 20 (age 19 for interplanted seedlings). Total height of each surviving seedling was measured through age four. Starting at age eight, we measured DBH to the nearest inch for each tree. At age eight we did not measure any heights, but at age 12 we measured total height for a sample of dominant and codominant trees and at ages 16 and 20 we measured total height of a sample of all trees that were > 4.5 inches DBH, noting which trees were dominant or codominant. For the final measurement at age 20, we measured heights on 59, 60, and 100 percent of the trees.

We had problems with unusual mortality in the 1971-72 study. Sometime between the 8 and 12-year measurements, a tractor-trailer lost control while driving down an adjacent road and destroyed 14 trees in Treatment 2 of Block 1. Later, during the 16th and 17th growing seasons, southern pine bark beetles destroyed so much of Block 3 that the entire block had to be excluded from the study. For the truck damage that occurred in Block 1, we reduced the plot area of Treatment 2 when summarizing the data.

RESULTS

Table 1 summarizes the data at age 20. Interplanting, compared to half-planting, increased volume by less than a cord (.8, 0 and 1.8 cords per acre for the three years of the study). Even though interplanted trees produced an average volume of 5.4 cords per acre, they caused an average reduction of 4.6 cords from the original trees planted a year earlier, (25.6 minus 21.0). This is reflected in the .6-inch difference in average DBH between half-planted trees (7.6 inches) and original trees on interplanted plots (7.0 inches), and the 19.1 square foot difference in basal area (120.4 minus 101.3). The magnitude of this difference surprised us. The strongly inhibiting effect of original trees on the growth of interplanted trees was obvious, but without the half-planted "check plots" for comparison, we would have had no idea how much the smaller, interplanted trees were inhibiting the growth of the larger, original trees.

Table 1. Age 20 averages by treatment and year for number of trees per acre, DBH, basal area per acre, standard cords per acre, and dominant and co-dominant height.

		Full	Half		Interplanting	
	Year	Planting	Planting	Originals	Interplants	Combined
Number	70-71	742	370	379	328	707
	71-72	736	366	345	287	632
	72-73	659	353	358	370	728
	Means	712	363	361	328	689
DBH	70-71	6.0	7.2	6.6	4.5	5.6
	71-72	6.4	7.9	7.5	4.1	6.0
	72-73	6.3	7.8	7.0	4.9	5.9
	Means	6.2	7.6	7.0	4.5	5.8
Basal Area	70-71	149.6	110.4	95.2	39.9	135.1
	71-72	170.8	128.9	108.9	29.9	138.8
	72-73	150.1	122.0	99.8	52.2	152.0
	Means	156.8	120.4	101.3	40.7	142.0
Std. Cords	70-71	25.8	21.7	17.7	4.8	22.5
	71-72	34.7	27.6	24.1	3.5	27.6
	72-73	30.5	27.4	21.3	7.9	29.2
	Means	30.3	25.6	21.0	5.4	26.4
D&CD Height	70-71	44.6	46.4	45.2	--	--
	71-72	49.8	49.3	50.8	--	--
	72-73	51.0	51.4	50.7	--	--
	Means	48.5	49.0	48.9	--	--

Full-planting produced an average of 4.7 cords more than half-planting at age 20, but average DBH was 1.4 inches less (6.2 vs. 7.6) and basal area per acre was 36.4 square feet greater (156.8 and 120.4). The full-planting plots were in serious need of thinning at age 20, but will be difficult to thin because of their small average DBH and the large number of sub-merchantable trees (below 4.5" DBH). Thinning on the half-planting plots could actually be delayed a few years, but even now they would be easy to thin because they are so much larger in diameter and have many fewer sub-merchantable trees (Table 2 and Figure 2). The interplanted plots will also be difficult to thin because they contain so many sub-merchantable trees.

When we installed this study we were recommending planting 800 seedlings per acre and considered 400 surviving seedlings the minimum number for an acceptable stand. Twenty years ago we had no difficulty getting thinning done, even with the many small trees that result from planting 800 seedlings per acre. Today, the situation has changed, and the half-planted plots are clearly acceptable stands that will be easier to thin and manage for a sawtimber crop. We had expected the interplanting to be helpful, but it turned out to be actually "harmful" because average DBH was reduced, there was hardly any increase in volume, and basal area was substantially increased.

This study raises serious questions about the need for or the desirability of interplanting. A 16-foot space was not wide enough to successfully interplant in this study. Openings would have had to be quite wide, probably at least 20 feet, for interplanted trees to have significantly increased yields. It is difficult to get a planting crew to search out and plant only large openings. In practice, interplanting usually means replanting the entire tract at a reduced rate (i.e., wider spacing). This means that seedlings are often planted close to existing seedlings, causing overstocking, which tends to offset the benefit from seedlings planted in large openings where they are needed. The ideal solution to the problem is to obtain adequate survival so that interplanting does not have to be considered.

Table 2. Average number of trees per acre by diameter class at age 20.

Year	DBH	Full Planting	Half Planting	Interplanting Originals	Interplanting Interplants	Interplanting Combined
1970-71	1	--	--	--	2	2
	2	10	--	2	19	21
	3	13	7	3	60	63
	4	52	16	18	74	92
	5	162	27	57	93	150
	6	254	56	75	65	140
	7	187	87	121	10	131
	8	62	108	75	5	80
	9	2	47	28	--	28
	10	--	22	--	--	--
	Totals	742	370	379	328	707
1971-72	1	--	--	--	2	2
	2	5	--	--	37	37
	3	20	--	--	51	51
	4	42	--	3	87	90
	5	89	17	8	60	68
	6	224	38	58	41	99
	7	212	74	100	7	107
	8	122	114	105	2	107
	9	16	83	61	--	61
	10	3	29	7	--	7
	11	3	11	3	--	3
	Totals	736	366	345	287	632
1972-73	2	7	--	2	5	7
	3	19	--	3	50	53
	4	46	10	18	84	102
	5	76	16	23	107	130
	6	199	40	85	81	166
	7	197	71	78	38	116
	8	87	94	98	5	103
	9	26	78	46	--	46
	10	2	35	5	--	5
	11	--	9	--	--	--
	Totals	659	353	358	370	728

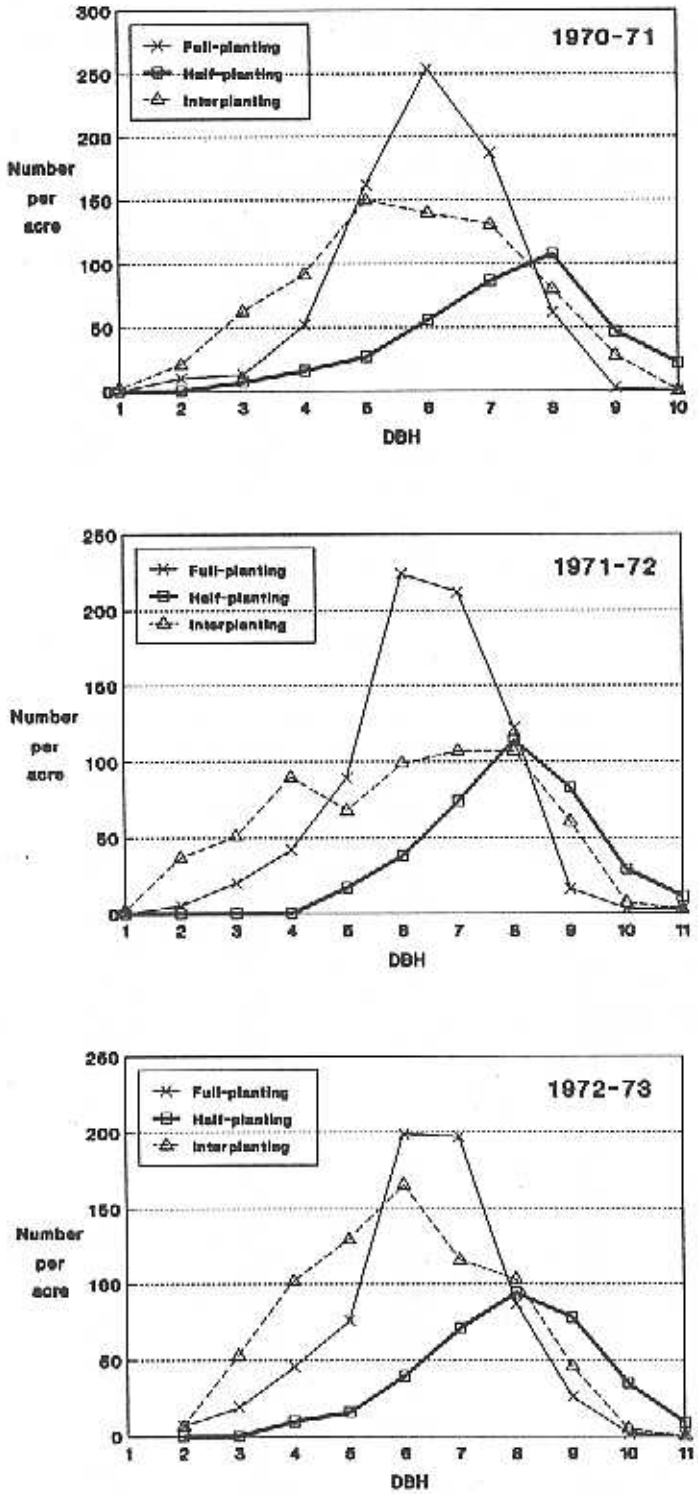
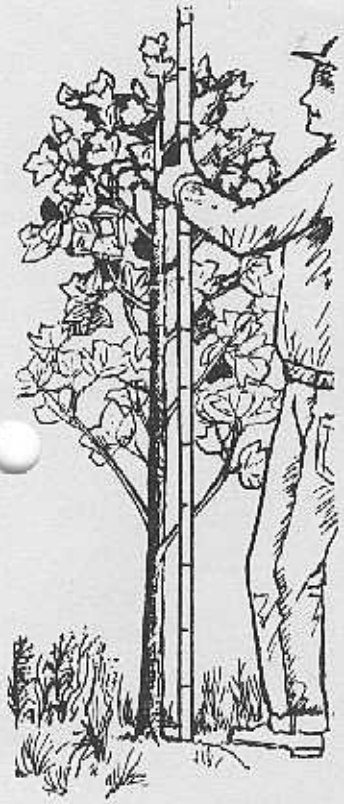
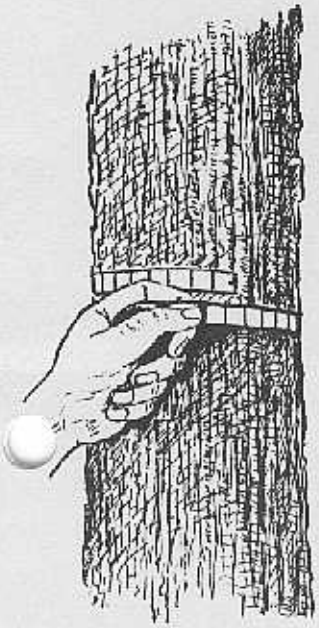


Figure 2. Average number of trees per acre by diameter class at age 20.





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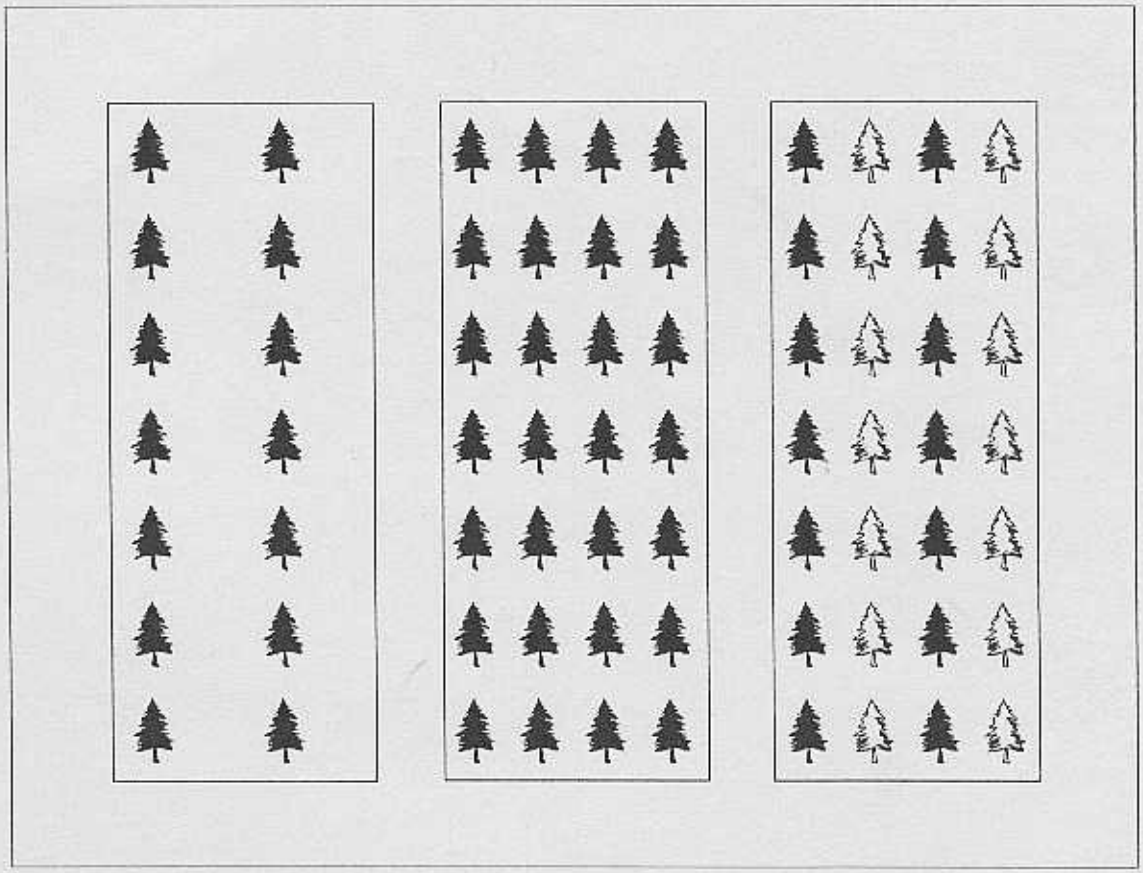

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