

LOBLOLLY PINE RELEASE STUDY

REPORT NUMBER

10



Virginia
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by:
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Abstract. This study included two treatments: no release and hand-chopping after the fourth growing season. At age 22, released plots averaged only seven percent more basal area and five percent more volume in standard cords than check plots.

INTRODUCTION:

This is the tenth in a series of Occasional Reports concerning release of loblolly pine seedlings from hardwood competition. This particular study was installed in Stand 3 of the Dvorak 5 Management Unit on the Pocahontas State Forest, which is located on the fall line, about ten miles south of Richmond, Virginia. Following harvest of the predominantly hardwood stand, the area was prescribe-burned in the summer of 1964. Seedlings were planted in the spring of 1965. The nearly-level, Coastal Plain soils are about average in site quality.

After four growing seasons, during the winter of 1968-69, pine seedlings were released on most of the area by cutting all hardwoods close to the ground. A check area was left untreated.

After the fifth growing season, in late October of 1969, 100 mil-acre plots were systematically located in both the released and check areas where permanent growth plots would later be installed. Of the 100 mil-acre plots installed in each treatment area, 45 actually fell within the permanent plots that were installed five years later. The height of each loblolly pine was measured to the nearest one-half foot. Estimates of loblolly pine stocking and average heights, based on the 45 mil-acre plot samples, are shown in Table 1.

Table 1. Estimated number and height of loblolly pine seedlings five seasons after planting.

<u>Treatment</u>	<u>Number per Acre</u>	<u>Total Height (feet)</u>	
		<u>Average</u>	<u>Range</u>
Check	1,000	9.2	3½ to 12½
Hand-chopped	911	9.2	4 to 12½

GROWTH PLOT INSTALLATION:

In April of 1975, after ten growing seasons, permanent one-tenth acre growth plots were installed. Eight plots were installed, four each in the check and hand-chopped areas (Figure 1). All volunteer pines, mostly loblolly, were cut down at this time. Planted rows were straight enough that volunteer pines could easily be determined.

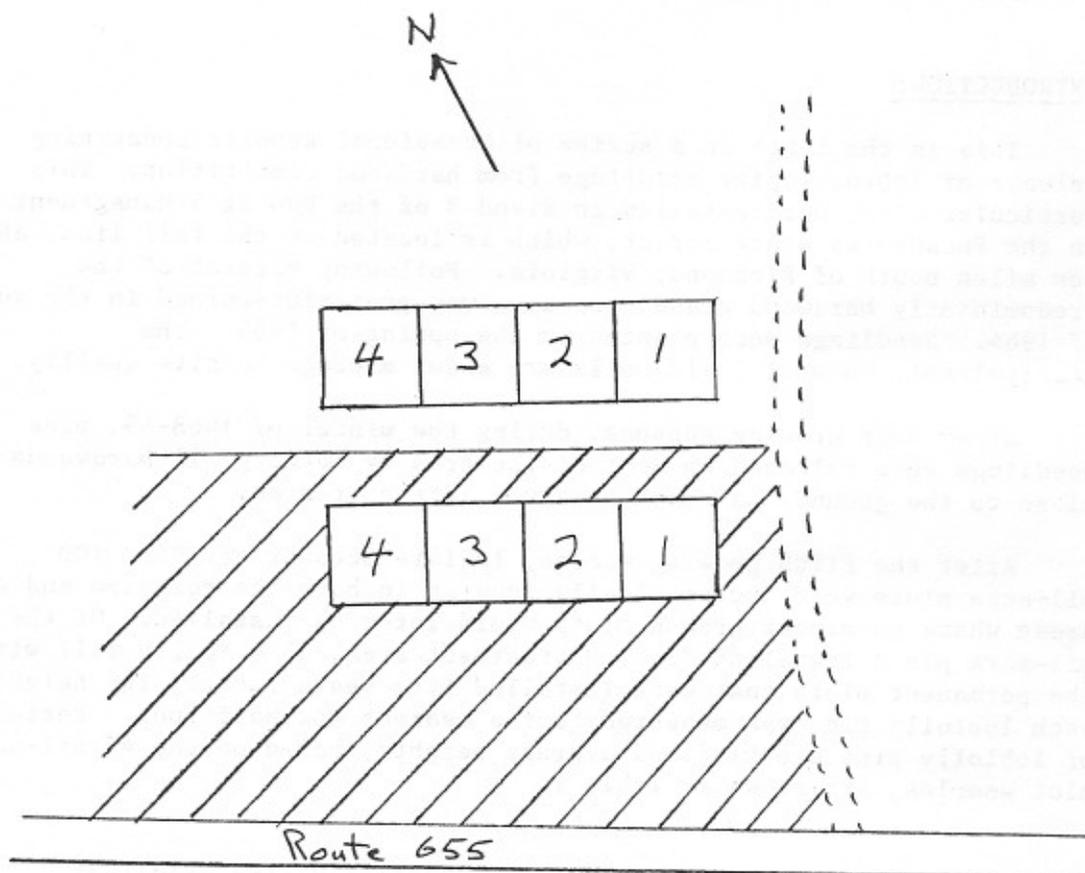


Figure 1. Layout of study and growth plots. Hand-chopped area is cross-hatched.

Measurements were taken at age 10, when the plots were installed, and again at ages 14, 18, and 22. At each measurement, the diameter at breast height of each loblolly pine was measured to the nearest inch, and a sample of trees in each diameter class was measured for total height to the nearest foot, noting which trees were dominant or codominant. Hardwoods were tallied by species and one-inch diameter class (all trees greater than .5 inches DBH) at age 10 and 22. At age 22, heights were also measured on all intermediate, codominant and dominant trees.

RESULTS AND DISCUSSION:

A summary of loblolly pine data for the four measurements is presented in Table 2. At age 22, hand-chopped plots exceeded check plots by only 1.1 standard cords and 9.5 square feet of basal area per acre. The difference was actually greater at the 18-year measurement (1.5 standard cords and 12.3 square feet). Stand tables for loblolly pine at age 22 show that release had no effect on diameter distribution (Table 3).

A summary of average hardwood data for the 10 and 22-year measurements is presented in Tables 4, 5, and 6. At both measurements, total numbers of hardwoods were greater on the released plots, but there were fewer large hardwoods and less basal area. There were 33 and 63 percent more hardwoods, but 30 and 21 percent less basal area, on the released plots at age 10 and 22, respectively. It is common for numbers of hardwoods to increase following hand-chopping, because chopping frequently increases the number of sprouts in a clump. Table 7 presents hardwood data at age 22 by individual plots, giving numbers by diameter and crown class and basal area by crown class.

At age 22, there were a total of 19 dominant and codominant hardwoods on the 4 check plots and none on the 4 released plots (19 trees on 4 plots represent 47 per acre). There were 12 scarlet oaks, 4 yellow-poplar, and 3 sweetgum, which ranged in height from 42 to 53 feet, and averaged 46.5 feet. The dominant and codominant loblolly pine on the check plots averaged 47.2 feet at age 22, so some of these hardwoods should maintain a position in the crown canopy. On the released plots at age 22, the canopy was already completely dominated by pine.

Table 2. A summary of loblolly pine data for check and hand-chopped plots at ages 10, 14, 18, and 22 years: number of trees per acre, average DBH, basal area per acre, standard cords per acre; and average height of dominant and codominant trees.

Age	Check						Hand-chopped					
	Plot	No.	DBH	B.A.	Cds.	Ht.	Plot	No.	DBH	B.A.	Cds.	Ht.
10	1	930	3.45	66.3	-	27.4	1	840	3.50	59.3	-	24.6
	2	780	3.82	65.5	-	26.0	2	1050	3.66	82.6	-	27.2
	3	770	3.49	57.2	-	27.1	3	890	3.87	76.5	-	26.4
	4	790	3.48	56.2	-	26.4	4	830	3.66	63.8	-	26.6
	Means	818	3.56	61.3	-	26.7	Means	902	3.67	70.6	-	26.2
14	1	890	4.42	102.4	9.1	36.1	1	820	4.39	90.9	6.6	33.6
	2	820	4.76	106.6	10.7	36.0	2	1010	4.51	123.0	12.0	36.1
	3	750	4.52	92.0	9.1	34.9	3	890	4.75	116.2	11.2	34.6
	4	770	4.34	84.6	6.9	34.5	4	830	4.55	99.0	8.2	34.6
	Means	808	4.51	96.4	8.9	35.4	Means	888	4.55	107.3	9.5	34.7
18	1	840	5.00	121.7	16.1	42.4	1	800	4.94	114.0	13.9	40.9
	2	800	5.29	128.3	19.4	43.9	2	940	5.03	140.7	20.0	43.7
	3	680	5.22	107.4	14.7	42.6	3	850	5.39	142.1	20.7	41.7
	4	730	4.93	104.5	13.4	41.8	4	760	5.11	114.3	14.8	41.3
	Means	762	5.11	115.5	15.9	42.7	Means	838	5.12	127.8	17.4	41.9
22	1	790	5.46	135.4	23.0	46.8	1	720	5.44	124.1	19.5	45.8
	2	760	5.80	147.1	27.2	49.2	2	840	5.58	154.2	26.0	46.3
	3	670	5.60	123.0	20.7	46.5	3	800	5.82	155.9	28.3	46.8
	4	690	5.46	120.5	19.8	46.5	4	730	5.52	129.6	21.2	45.3
	Means	728	5.58	131.5	22.7	47.2	Means	772	5.59	141.0	23.8	46.0

Table 3. Average number of loblolly pine per acre by diameter class at age 22.

<u>DBH</u>	<u>Check Plots</u>	<u>Hand-chopped Plots</u>
2	5	2
3	40	55
4	133	135
5	163	170
6	200	198
7	130	130
8	40	72
9	<u>17</u>	<u>10</u>
	<u>728</u>	<u>772</u>

Table 4. Average numbers of hardwoods per acre by species and diameter class, and basal area per acre, at age 10.

<u>Species</u>	<u>Check Plots</u>					<u>Hand-chopped Plots</u>		
	<u>DBH</u>					<u>DBH</u>		
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Totals</u>	<u>1</u>	<u>2</u>	<u>Totals</u>
Red oaks*	155	85	42	2	284	140	10	150
White oak	60	28	5		93	152	5	157
Sweetgum	168	22	20		210	945	5	950
Yellow-poplar	8	15	5	2	30	-		-
Hickory	58	20	2		80	85		85
Red maple	42	8			50	150		150
Blackgum	145				145	60		60
Dogwood	225	28			253	150		150
Holly	128				128	30		30
Sassafras	22				22	10		10
Misc.	22				22	5		5
Totals	1,033	206	74	4	1,317	1,727	20	1,747
Basal Area					14.1			9.9

* Scarlet oak, southern red oak, and black oak in decreasing order of occurrence.

Table 5. Average numbers of hardwoods per acre by species and diameter class at age 22.

Species	Check Plots								Totals
	DBH								
	1	2	3	4	5	6	7	8	
Red oaks*	112	77	52	15	17	5	5		278
White oak	30	23	15	3					71
Sweetgum	155	55	22	18	10	2			262
Yellow-poplar			8		5	3		2	18
Hickory	43	20	10	2					75
Red maple	48	10		2					60
Blackgum	355								355
Dogwood	215	90	3						308
Holly	170	35							205
Sassafras	70								70
Misc.	22	8							30
TOTALS	1,220	313	110	40	32	10	5	2	1,732

Species	Hand-chopped Plots				Totals
	DBH				
	1	2	3	4	
Red oaks*	113	43	23		179
White oak	103	45	5		153
Sweetgum	1335	207	15	2	1559
Hickory	83	20			103
Red maple	150	20	2		172
Blackgum	258	5			263
Dogwood	212	45	8		265
Holly	55	5			60
Sassafras	52				52
Misc.	22				22
TOTALS	2,383	390	53	2	2,828

* Scarlet oak, southern red oak, and black oak in decreasing order of occurrence.

Table 6. Average numbers of hardwoods per acre by diameter class and crown class, and basal area by crown class, at age 22.

<u>DBH</u>	<u>Check Plots</u>				<u>Totals</u>
	<u>Over-topped</u>	<u>Intermediate</u>	<u>Codominant</u>	<u>Dominant</u>	
1	1,220				1,220
2	313				313
3	105	5			110
4	22	10	8		40
5	2	8	12	10	32
6			5	5	10
7				5	5
8				2	2
<u>TOTALS</u>	<u>1,662</u>	<u>23</u>	<u>25</u>	<u>22</u>	<u>1,732</u>
<u>B.A.</u>	<u>20.8</u>	<u>2.2</u>	<u>3.3</u>	<u>4.4</u>	<u>30.7</u>

<u>Hand-chopped Plots</u>					
1	2,383				2,383
2	390				390
3	48	5			53
4	2				2
<u>TOTALS</u>	<u>2,823</u>	<u>5</u>			<u>2,828</u>
<u>B.A.</u>	<u>24.0</u>	<u>.3</u>			<u>24.3</u>

Table 7. Number of hardwoods by diameter class and crown class, and basal area by crown class, on each 1/10-acre plot.

DBH	Plot - Check #1				Totals	DBH	Plot - Check #2				Totals
	0	I	CD	D			0	I	CD	D	
1	149				149	1	119				119
2	38				38	2	40				40
3	7	2			9	3	7				7
4		2			2	4	7				7
5	1		1	2	4	5		1		1	2
6						6			1	1	2
7						7					
8						8				1	1
Totals	195	4	1	2	202	Totals	173	1	1	3	178
BA	2.12	.27	.14	.27	2.80	BA	2.48	.14	.20	.68	3.49

DBH	Plot - Check #3				Totals	DBH	Plot - Check #4				Totals
	0	I	CD	D			0	I	CD	D	
1	110				110	1	110				110
2	24				24	2	23				23
3	13				13	3	15				15
4	2	1	3		6	4		1			1
5		1	2	1	4	5		1	2		3
6			1		1	6				1	1
7				1	1	7				1	1
Totals	149	2	6	2	159	Totals	148	2	2	2	154
BA	1.94	.22	.73	.40	3.29	BA	1.84	.22	.27	.46	2.80

DBH	Plot - Hand-chop #1				Totals	DBH	Plot - Hand-chop #2				Totals
	0	I	CD	D			0	I	CD	D	
1	288				288	1	200				200
2	45				45	2	44				44
3	9	1			10	3	3				3
4						4	1				1
Totals	342	1			343	Totals	248				248
BA	2.99	.05			3.04	BA	2.28				2.28

DBH	Plot - Hand-chop #3				Totals	DBH	Plot - Hand-chop #4				Totals
	0	I	CD	D			0	I	CD	D	
1	186				186	1	279				279
2	34				34	2	33				33
3	4	1			5	3	3				3
Totals	224	1			225	Totals	315				315
BA	1.95	.05			2.00	BA	2.39				2.39

The relationship between cordwood yields of loblolly pine and hardwood basal area at age 22 is weak. Figure 2 shows pine cordwood yields relative to total hardwood basal area at age 22, for the 8 plots. A simple linear regression fitted to these eight plots accounted for only ten percent of the variation in cordwood yields.^{1/} A regression of yields over hardwood basal area in just intermediate, codominant, and dominant hardwoods accounted for only 4 percent of the variation in yields.

The increase in yield from release is considerably less than we expected when we installed the study. Hardwood competition did not become (or remain) as serious on the check plots as we had anticipated when the release was done. Either the hardwoods did not grow as aggressively as we expected, or the pine grew more rapidly and was able to dominate the hardwoods sooner. In addition, site index may be slightly higher on the check plots. Differences in average height of dominant and codominant trees at ages 10, 14, 18, and 22 were .5, .7, .8, and 1.2 feet, respectively (Table 2). Cordwood yields are plotted over average dominant and codominant height for each of the 8 plots in Figure 3, which suggests that the small yield advantage of the hand-chopped plots would have been greater if dominant and codominant heights had been similar. Covariance analysis was used to adjust yields at age 22 for differences in loblolly pine dominant and codominant height. After adjusting to a common height, the average difference in yield between released and check plots at age 22 increased from 1.1 to 4.0 standard cords. However, this difference was still not statistically significant.^{2/}

1/ Estimated standard cords = $29.31 - .221$ (total basal area),
 $r^2 = .105$, probability of a larger F = .43.

2/ Probability of a larger F = .329

Figure 2. Pine cordwood yields at age 21 relative to total hardwood basal area.

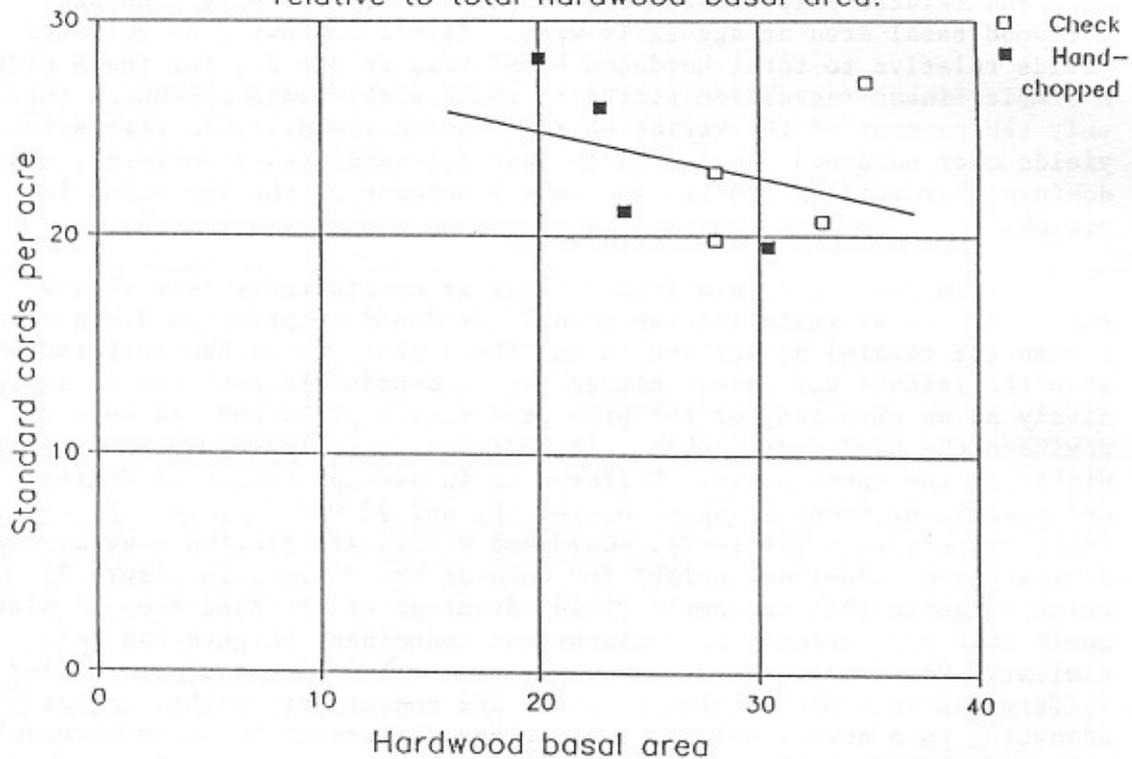


Figure 3. Pine cordwood yields at age 21 relative to dominant and codominant height.

