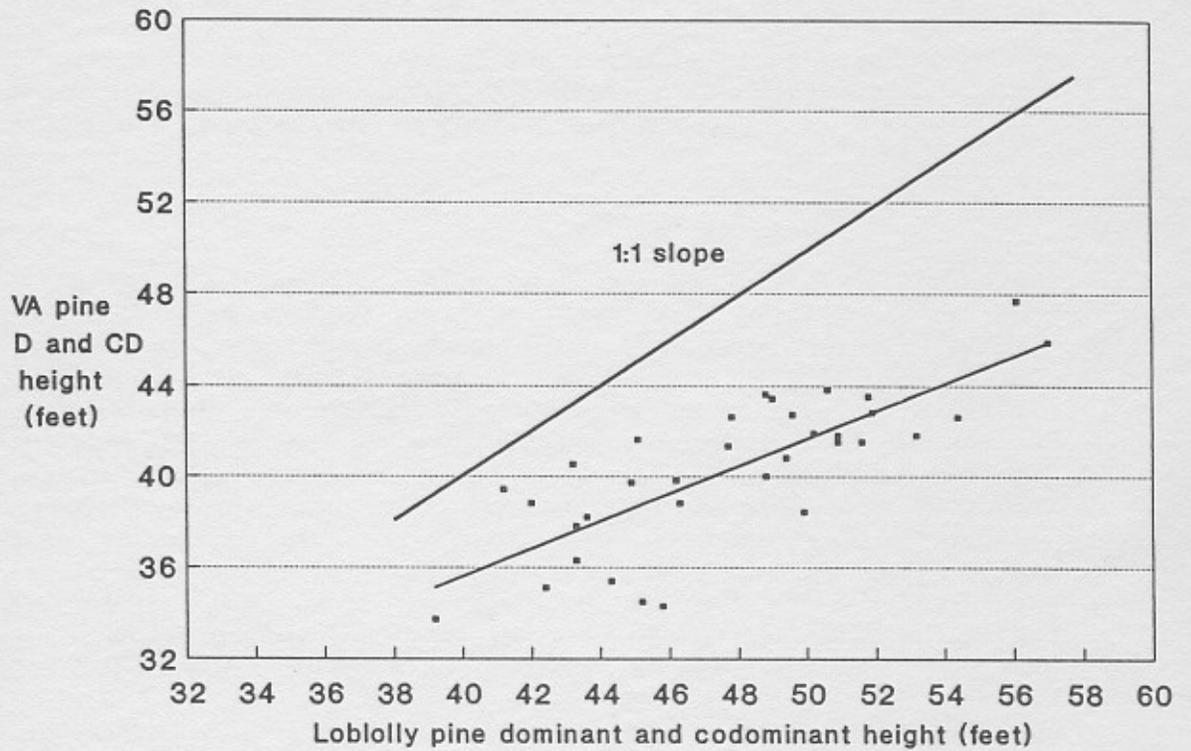


COMPARISON OF LOBLOLLY AND VIRGINIA PINE YIELDS



Virginia
Department of Forestry



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By: Thomas A. Dierauf

ABSTRACT

Loblolly and Virginia pine were planted on paired, 1/5-acre plots in 1966 and 1967. Thirty-four pairs of these plots were suitable for measuring yields at age 19 to 21.

Pulpwood yields averaged 90 percent greater on loblolly pine plots, and loblolly yields exceeded Virginia pine yields on 33 of the 34 plot pairs. Average height of dominant and codominant trees averaged 7.5 feet greater on loblolly pine plots, and loblolly heights exceeded Virginia pine heights on all 34 plot pairs. Average diameters at breast height were greater on loblolly pine plots; 1.1 inches greater considering all trees and 1.6 inches greater considering only the 100 largest trees per acre.

At age 19 to 21, most of the loblolly plots were ready for pulpwood thinning, but none of the Virginia pine plots could have been thinned economically.

INTRODUCTION

A two-year Virginia pine direct seeding study was installed in 1966 and 1967 on sites prepared by prescribed burning. Plots were established on 15 different tracts on the Prince Edward, Cumberland, and Appomattox-Buckingham State Forests, all located in the central Piedmont of Virginia. The main purpose of the original study was to test Virginia pine direct seeding on sites prepared at minimum cost. We tested rates of 1/2 and 1 pound of seed per acre, using 1/5-acre square plots. Non-stratified seed was sown by hand during February using a cyclone seeder. In 1967, seeding loblolly pine at a rate of one pound per acre was added as a treatment. For comparison with direct seeding, both Virginia pine and loblolly pine seedlings were planted on 1/5-acre plots at a rate of about 1,000 seedlings per acre, in both years. Stocking results were reported in Occasional Report 37 (only 12 of the 15 tracts on which the study was installed were usable for this report on stocking).

The yield study reported here is based only on the planted Virginia and loblolly pine plots. In the original direct seeding study, a single replication of the seeding and planting treatments was installed on 15 different tracts. Additional paired, planted plots of Virginia and loblolly pine were installed on most of these tracts, and a total of 34 pairs on 13 different tracts were suitable for measuring yields.

During the winter of 1970-71, 5 and 4 years after installing the 1966 and 1967 studies respectively, a tally was made of surviving seedlings on each planted plot, and all volunteer pines on the planted plots were cut down at the same time. Numbers of surviving seedlings averaged 742 per acre for the loblolly plots (ranging from 420 to 1,070) and 802 per acre for the Virginia pine plots (ranging from 535 to 1,255).

SAMPLING YIELDS

The planted plots were measured over a three-year period when ages ranged from 19 to 21 years since planting. All pines on each 1/5-acre plot were measured for DBH to the nearest inch, and a sample of trees in each diameter class (starting with the 5-inch class) was measured for total height, noting which trees were dominant or codominant. All hardwoods in crown classes intermediate or better were measured for DBH to the nearest inch, and a large sample was measured for total height.

RESULTS

Average stand data is presented in Table 1 and individual plot data in Table 2. Loblolly pine, at age 19 to 21, had produced almost twice the pulpwood yield of Virginia pine.^{1/} Loblolly yields were greater than Virginia pine on 33 of the 34 plot pairs.

Most of the loblolly plots were ready for a pulpwood thinning when the final measurement was made, and many of them could have been thinned several years earlier. None of the Virginia pine plots could have been thinned economically, due to diameters being too small and volumes insufficient to support a thinning. Compared to loblolly, Virginia pine has poor natural pruning ability, which also makes it difficult to thin. Measurement of diameters was considerably slower on the Virginia pine plots because dead branches were usually still present at eye level. Thinning of Virginia pine is a questionable practice anyway, because of its susceptibility to windthrow.

Loblolly pine made better height growth than Virginia pine on all 34 plot pairs, with an average difference in dominant and codominant height of 7.5 feet.^{2/} The height difference varied with site quality: the better the site, the greater the difference in height. In Figure 1, average dominant and codominant Virginia pine heights are plotted over loblolly heights for each of

- 1/ Pulpwood yields were subjected to a t test for paired plots, and loblolly yields were significantly greater than Virginia pine yields (probability of a larger t = 4.3×10^{-15}).
- 2/ Average dominant and codominant heights were subjected to a t test for paired plots, and loblolly heights were significantly greater than Virginia pine heights (probability of a larger t = 1.3×10^{-17}).

Table 1. Average stand data at age 19, 20 or 21.

	Loblolly <u>Pine</u>	Virginia <u>Pine</u>	Differences: <u>Loblolly minus Va. Pine</u>
<u>Planted Pine</u>			
Number per acre	649	711	-62
Basal area per acre	129.8	95.3	34.5
Standard cords per acre ¹	23.9	12.6	11.3
Dominant and codominant			
height	47.8	40.3	7.5
Average DBH:			
All trees	5.9	4.8	1.1
100 largest per acre	8.1	6.5	1.6
<u>Canopy Hardwoods - intermediate or better</u>			
Number per acre	36	104	-68
Basal area per acre	4.3	8.5	-4.2
Height	39.7	35.6	4.1

¹Volume tables used:

Nelson, T.C., J.L. Clutter, and L.E. Chaiken. 1961. Yield of Virginia pine. SEFES Station Paper No. 124, Table 1. (We assumed 90 cubic feet per standard cord).

MacKinney, A.L. and L.E. Chaiken. 1946. Volume, yield, and growth of loblolly pine in the Mid-Atlantic Coastal Region. SEFES Technical Note No. 33, Table 5.

Table 2. Stand data for each plot, expressed on a per acre basis: number of trees (No.), basal area (BA), Standard cords (Cds.), mean height of dominant and codominant trees (D & CD Ht.), average DBH of all trees and of the 100 largest per acre.

Tract	Age	Pair	Pine						Hardwoods			
			No.	BA	Cds.	D&CD HT.	Mean All	DBH 100	No.	I, CD & D BA	Ht.	
Cheatham 4-24	21	A	Va.	505	81.7	13.8	43.4	5.3	6.9	110	7.7	38.5
			Lob.	380	74.7	14.3	49.0	5.8	7.7	55	4.6	39.0
		B	Va.	705	107.2	16.6	41.9	5.1	7.0	50	3.0	33.4
			Lob.	680	137.6	27.5	50.2	5.8	8.4	10	1.4	40.5
		C	Va.	625	100.1	16.2	42.6	5.3	6.8	20	1.6	36.5
			Lob.	715	130.2	22.8	47.8	5.6	7.9	20	1.6	39.0
Flippin 6-4	20	A	Va.	660	109.7	17.7	43.6	5.4	7.2	135	7.0	35.2
			Lob.	545	114.0	21.4	48.8	5.9	8.4	35	2.8	34.1
		B	Va.	890	116.3	15.2	40.8	4.8	6.4	50	2.8	36.2
			Lob.	595	132.7	25.6	49.4	6.2	8.6	20	1.2	36.0
		C	Va.	455	70.3	10.2	41.3	5.2	7.2	125	7.3	34.7
			Lob.	720	153.5	28.3	47.7	6.0	8.4	70	4.0	35.1
Rock Quarry 11-38	21	A	Va.	565	69.9	8.2	38.8	4.6	6.0	205	16.6	35.3
			Lob.	535	109.4	19.3	46.3	5.8	8.4	15	2.0	42.0
		B	Va.	595	75.9	8.4	35.4	4.7	6.4	15	1.2	26.0
			Lob.	550	122.4	21.6	44.3	6.1	7.6	30	2.8	35.7
		C	Va.	625	76.5	8.4	34.5	4.5	6.4	25	2.0	32.2
			Lob.	615	134.4	24.4	45.2	6.1	8.4	5	.7	34.0
		D	Va.	660	83.4	9.8	38.2	4.7	6.1	65	5.0	31.7
			Lob.	600	108.7	17.6	43.6	5.6	7.6	15	2.0	37.7
		E	Va.	655	82.4	9.0	34.3	4.7	6.2	5	.4	28.0
			Lob.	695	129.8	21.8	45.8	5.6	7.8	25	2.1	31.0
Smith 28-42	21	A	Va.	840	112.4	13.9	39.4	4.8	6.8	60	3.4	31.8
			Lob.	740	104.8	13.9	41.2	4.8	7.4	5	.2	33.0
Juckoff 14-15	19	A	Va.	750	102.8	12.9	38.4	4.9	6.3	55	5.7	37.5
			Lob.	845	146.8	26.2	49.9	5.5	7.8	40	5.8	46.6
		B	Va.	725	91.8	11.6	41.8	4.7	6.2	105	9.8	38.5
			Lob.	900	160.3	31.3	50.9	5.6	7.4	5	.7	45.0
		C	Va.	715	92.1	11.4	40.0	4.7	6.4	40	2.9	35.5
			Lob.	670	141.0	26.9	48.8	6.1	8.0	0	-	-
Lipscomb 6-18	20	A	Va.	580	100.5	16.2	41.8	5.5	7.4	45	3.6	34.0
			Lob.	465	143.7	32.8	53.2	7.4	9.4	0	-	-
		B	Va.	840	124.5	18.9	43.5	5.1	6.2	30	2.0	37.2
			Lob.	680	144.5	29.6	51.8	6.0	8.4	5	.7	43.0

Tract	Age	Pair	No.	Pine						Hardwoods		
				BA	Cds.	D&CD HT.	Mean DBH All 100	No.	I, CD & D BA	Ht.		
Lipscomb 6-20	20	A	Va.	815	108.2	14.4	39.8	4.8	6.6	75	7.8	37.7
			Lob.	410	92.5	16.4	46.2	6.2	8.5	20	2.1	42.0
		B	Va.	930	115.7	15.2	41.5	4.6	6.8	160	10.9	37.4
			Lob.	665	149.4	30.4	50.9	6.2	8.4	30	3.6	41.8
		C	Va.	920	114.2	13.6	39.7	4.6	6.2	80	8.0	38.5
			Lob.	600	124.0	21.2	44.9	5.9	8.2	15	1.8	39.5
Mt. Creek 1-5	20	A	Va.	560	82.8	13.8	45.9	5.0	6.8	350	41.7	44.2
			Lob.	485	128.8	31.4	57.0	6.8	9.2	150	29.6	55.9
		B	Va.	585	79.0	11.4	42.6	4.8	6.3	195	21.7	42.2
			Lob.	455	111.4	26.0	54.4	6.5	8.8	110	19.6	53.3
		C	Va.	605	75.1	10.8	47.7	4.6	6.3	255	33.7	50.0
			Lob.	455	111.6	26.3	56.1	6.5	8.5	95	16.7	54.9
Mt. Creek 1-22	19	A	Va.	505	71.6	9.4	40.5	5.0	6.4	40	3.6	31.8
			Lob.	800	133.7	19.8	43.2	5.3	7.7	0	-	-
		B	Va.	650	99.5	13.8	38.8	5.2	6.8	100	4.2	32.0
			Lob.	800	142.2	21.6	42.0	5.5	7.9	15	1.0	33.3
		C	Va.	640	101.6	15.8	41.6	5.3	7.0	140	7.2	34.1
			Lob.	750	140.8	22.0	45.1	5.6	8.2	10	.5	30.5
No. Branch 10-17	19	A	Va.	1,055	119.1	13.2	42.8	4.4	6.2	120	9.0	39.8
			Lob.	630	118.0	23.2	51.9	5.7	7.8	155	15.2	44.2
		B	Va.	785	106.1	15.2	43.8	4.8	6.8	195	12.6	42.4
			Lob.	585	141.2	30.1	50.6	6.5	8.4	65	6.0	44.8
		C	Va.	1,055	135.8	17.8	41.5	4.8	6.3	145	7.4	37.1
			Lob.	690	158.1	32.0	51.6	6.3	9.0	20	1.4	38.2
Holiday Lake 14-13	20	A	Va.	510	82.8	13.4	42.7	5.3	7.2	175	21.8	38.2
			Lob.	580	116.8	22.9	49.6	5.8	8.0	45	8.0	42.1
Gallion 2-23	20	A	Va.	715	85.5	9.0	36.3	4.6	6.0	70	4.8	31.2
			Lob.	600	114.3	18.4	43.3	5.6	7.8	55	3.9	34.5
Mt. Airy 6-15	19	A	Va.	690	82.3	9.2	37.8	4.5	6.3	180	8.9	32.7
			Lob.	925	154.4	24.4	43.3	5.4	7.3	35	2.3	35.6
		B	Va.	810	88.4	7.7	33.7	4.4	6.0	75	2.6	27.5
			Lob.	880	148.0	19.6	39.2	5.4	7.2	15	.8	31.3
		C	Va.	955	93.4	7.0	35.1	4.1	6.0	55	2.6	29.9
			Lob.	820	138.9	20.7	42.4	5.4	7.4	20	1.2	36.5

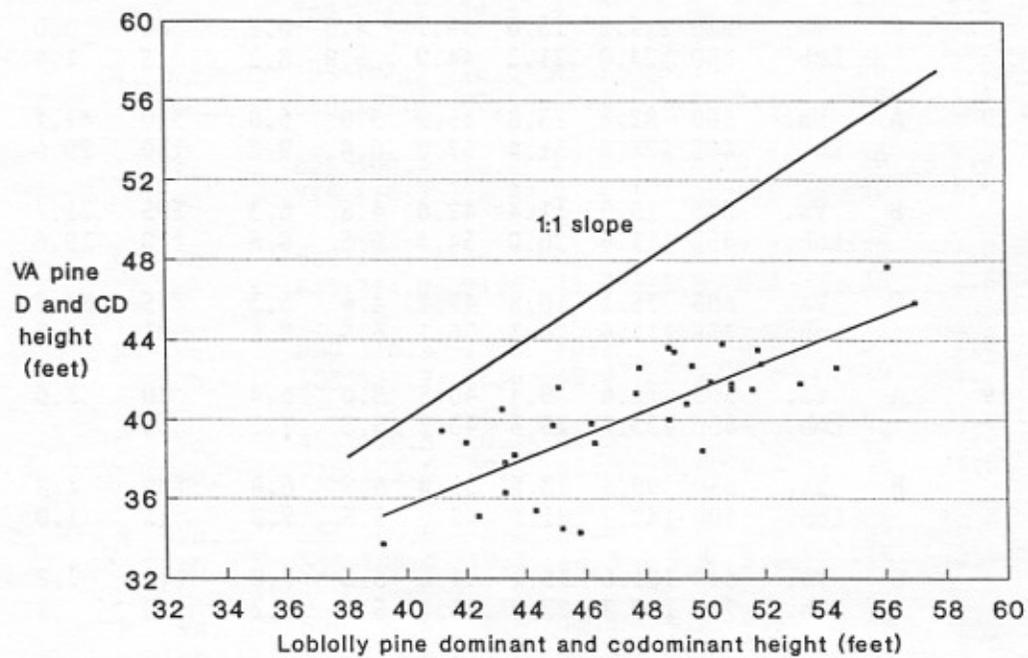


Figure 1. Relationship between dominant and codominant heights of Virginia pine and loblolly pine on each of the 34 plot pairs.

the 34 plot pairs. The slope of the linear regression line fitted to this data is significantly different from a 1:1 slope.^{3/}

Loblolly pine also grew faster in diameter. Considering all trees, the average difference was 1.1 inches, and considering just the 100 largest trees per acre, the difference was 1.6 inches. This faster diameter growth resulted in higher basal areas. At age 19 to 21, the loblolly pine plots averaged 34.5 square feet more basal area per acre than the Virginia pine plots. Individually, loblolly pine basal area exceeded Virginia pine basal area on 30 of 34 plot pairs.

Hardwoods were present in the canopy on many plots, as trees of intermediate or better crown class. They were more abundant on Virginia pine than loblolly pine plots. Basal area in canopy hardwoods was more than 10 percent of pine basal area on 9 of 34 Virginia pine and 4 of 34 loblolly pine plots. The greatest amount of hardwood basal area for both Virginia and loblolly pine occurred on a single pair of plots (Table 2: Mt. Creek 1-5, Pair A) where hardwood basal area was 50 and 23 percent of pine basal area for Virginia pine and loblolly pine, respectively. Hardwoods originated as sprouts or seedlings following site preparation, as all residual hardwoods were girdled when plots were installed.

Loblolly pine produced denser shade than Virginia pine, which resulted in more understory vegetation on Virginia pine plots. Greenbriars were a notable example; they were plentiful on many of the Virginia pine plots and sometimes presented problems in measuring diameters, but were scarce on loblolly plots. Even blackberry was still present on some of the Virginia pine plots. This difference in shading may partly explain the greater numbers of canopy hardwoods on the Virginia pine plots, although the slower height growth of Virginia pine also permitted more hardwoods to retain a position in the crown canopy.

CONCLUSIONS

If these 34 plot pairs are representative of the central Piedmont of Virginia, they support the present practice of planting loblolly pine almost exclusively in this region. Not only will loblolly pine produce greater pulpwood yields on a short rotation basis, but it also has a much greater potential, with proper thinning, to produce valuable sawtimber in longer rotations.

^{3/} Estimated Virginia pine height = $11.5096 + .60296$ (loblolly height), $r^2 = .620$. The 99% confidence interval on the slope = $\pm .204$.