

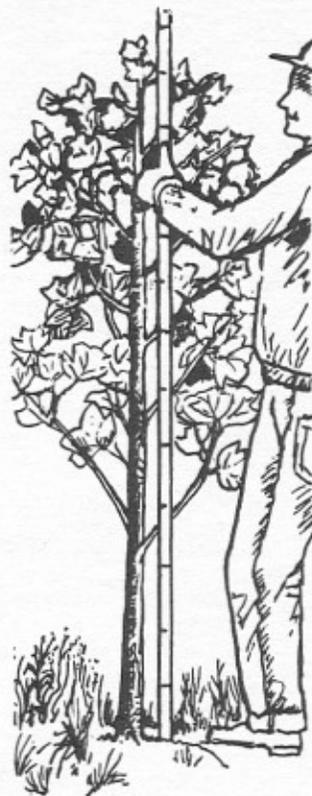
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LOBLOLLY PINE RELEASE STUDY

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LOBLOLLY PINE RELEASE
Report #16
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ABSTRACT

This study included two treatments: no release and aerial release using 2 pounds active ingredient of 2,4,5-T per acre during the third growing season. Hardwood competition was light on most of the study area. At age 15, released plots averaged slightly less basal area and only .4 cords more volume per acre than check plots. Cordwood yields were related to hardwood basal area at age 15 ($r^2 = .481$) and to a free-to-grow index estimated at age 3 ($r^2 = .367$).

INTRODUCTION

This is the sixteenth in a series of Occasional Reports concerning release of loblolly pine seedlings from hardwood competition. This particular study was installed on the Olsson tract in Buckingham County, in the central Piedmont of Virginia. The previous stand was mostly hardwood, primarily oak. After harvest, the area was site prepared by drum-chopping and burning during the summer of 1972. The tract was planted in the spring of 1973. The tract was aerial sprayed in July of 1975, during the third growing season, applying 2 pounds per acre active ingredient of 2,4,5-T in a total volume of about 10 gallons per acre. Hardwood competition was light on most of the tract.

GROWTH PLOT INSTALLATION

Permanent 1/10-acre growth plots were installed in December of 1975, during the winter following release. Ten plots were installed, 5 each in the released and unreleased portions of the tract (Figure 1). Volunteer Virginia and shortleaf pine seedlings were cut down when the plots were installed. Hardwood competition was light on plots 1 through 4, and moderate on plots 5 (both check and released), with most of the competition provided by chestnut oak and scarlet oak stump sprouts.

Measurements were made at age 3, when the plots were installed, and at ages 7, 11, and 15. At age 3, all loblolly pine seedlings were measured for height to the nearest foot, and classified as to free-to-grow status, using a four part classification system.^{1/} At later measurements, diameter at breast height of each loblolly pine was measured to the nearest inch, and a sample of

1/ See Occasional Report No. 78 (Release Report No. 11) for a description and discussion of this classification system.

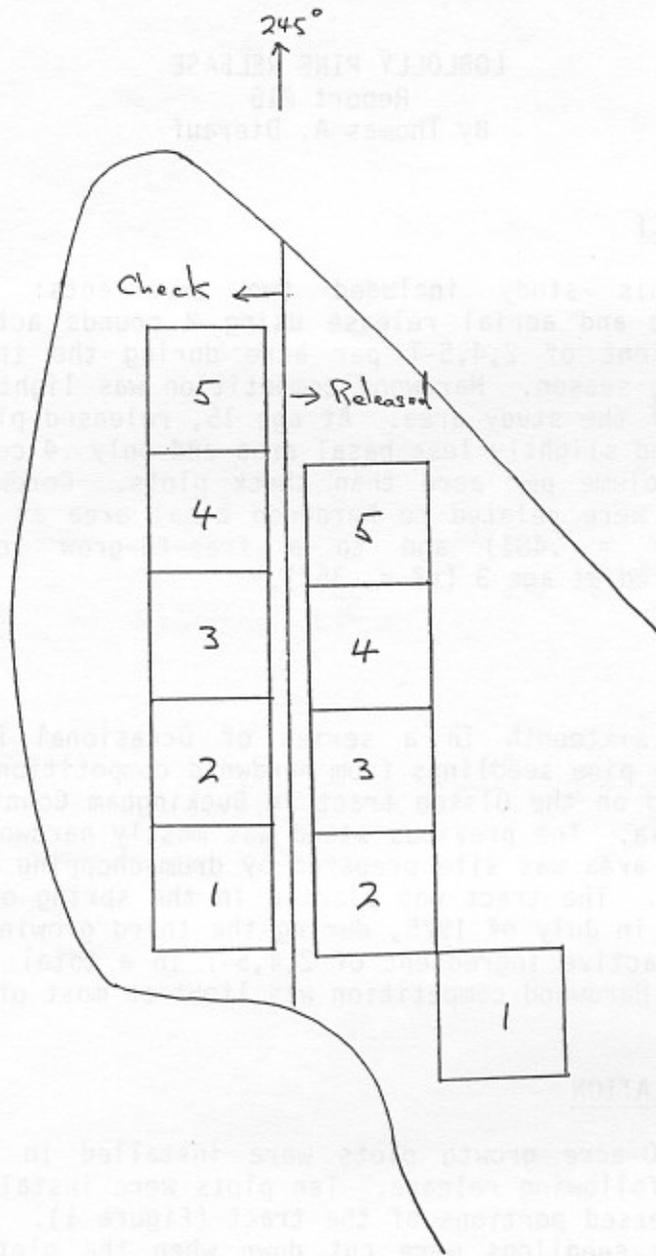


Figure 1. Layout of growth plots.

trees in each diameter class was measured for total height to the nearest foot, noting which trees were dominant or codominant. For the final measurement at age 15, all hardwoods over .5 inch DBH were tallied by species, 1-inch diameter class, and crown class. Total height to the nearest foot was measured on about 80 percent of the intermediate and all codominant hardwoods (there were no dominant hardwoods).

RESULTS AND DISCUSSION

A summary of loblolly pine data for the four measurements is presented in Table 1. At age 15, released plots averaged only .4 standard cords per acre more than check plots. Pine stocking was higher on the check plots than the released plots at age 3, 478 compared to 414 pines per acre (Table 1), and at age 15, pulpwood yields were related to numbers of seedlings present at age 3 (Figure 2). The simple linear regression lines in Figure 2 were fitted separately to the check and released plots. When covariance analysis was used to adjust for the different numbers of seedlings present on each plot at age 3, the average difference in yields at age 15 was increased from .4 cords to 2.9 cords, but this difference was still not statistically significant (probability of a larger F = .113).

Differences between check plots and released plots remained relatively constant over time (Table 2). Table 3 presents stand tables for loblolly pine at age 15.

A summary of average hardwood data at the final measurement at age 15 is presented in Tables 4 and 5, and individual plot data is presented in Table 6. Check plots, on the average, had almost twice as many hardwoods and twice as much hardwood basal area.

Even though release did not significantly increase cordwood yields of loblolly pine, pine yields were still related to the amount of hardwood present. Figure 3 shows pine cordwood yields relative to hardwood basal area at age 15, for the 10 plots. A simple linear regression fitted to these data accounted for 48 percent of the variation in yields.^{2/}

Pine cordwood yields were also correlated with the average free-to-grow index for each plot at age 3. Table 7 shows the percent of trees in each free-to-grow class, for each plot, at age 3. In Figure 4, cordwood yields for each plot at age 15 are plotted over average free-to-grow index at age 3. A simple linear regression fitted to these data accounted for 37 percent of the variation in cordwood yields.^{3/}

2/ Estimated standard cords = 14.66 - .2280 (hardwood basal area), $r^2 = .481$, probability of a larger F = .026.

3/ Estimated standard cords = 19.51 - 4.8323 (free-to-grow index at age 3), $r^2 = .367$, probability of a larger F = .063.

Table 1. A summary of loblolly data at ages 3, 7, 11, and 15: number of trees per acre, average DBH, basal area per acre, standard cords per acre, and average height of dominant and codominant trees.*

Age	Plot	No.	Check Plots				Released Plots					
			DBH	B.A.	Cds.	Ht.	Plot	No.	DBH	B.A.	Cds.	Ht.
3	1	450	-	-	-	6.4	1	330	-	-	-	4.4
	2	510	-	-	-	5.5	2	460	-	-	-	6.1
	3	480	-	-	-	5.5	3	490	-	-	-	5.7
	4	510	-	-	-	6.2	4	410	-	-	-	5.2
	5	440	-	-	-	6.3	5	380	-	-	-	5.2
	Means		478	-	-	-	6.0		414	-	-	-
7	1	420	3.56	29.4	-	20.2	1	330	2.55	13.1	-	17.0
	2	450	3.02	23.1	-	20.5	2	450	3.51	31.3	-	20.1
	3	470	3.07	26.4	-	19.4	3	460	3.28	28.8	-	20.0
	4	490	3.20	28.6	-	20.2	4	410	2.84	20.3	-	18.4
	5	430	2.61	17.6	-	19.8	5	340	2.91	16.7	-	18.1
	Means		452	3.09	25.0	-	20.0		398	3.02	22.0	-
11	1	420	5.22	63.5	6.3	33.2	1	320	4.62	39.7	2.8	28.0
	2	450	4.66	55.4	4.4	31.7	2	450	5.44	74.6	7.2	30.2
	3	460	4.67	57.4	4.1	30.6	3	460	5.09	67.8	6.3	32.2
	4	480	4.83	63.4	5.3	31.1	4	410	4.66	52.4	4.0	29.2
	5	410	4.00	38.7	2.0	29.5	5	340	5.00	48.6	4.4	30.6
	Means		444	4.68	55.7	4.4	31.2		396	4.96	56.6	4.9
15	1	420	6.14	91.2	14.2	40.4	1	310	5.71	58.4	7.6	37.8
	2	450	5.56	81.7	11.4	39.2	2	450	6.22	97.5	14.2	38.5
	3	460	5.65	84.3	10.9	37.5	3	460	6.07	96.3	13.9	39.9
	4	480	5.73	89.4	12.0	38.5	4	410	5.73	78.7	11.0	38.3
	5	400	5.10	60.8	6.7	36.9	5	340	6.00	70.7	10.2	37.9
	Means		442	5.64	81.5	11.0	38.5		394	5.95	80.3	11.4

*Except at age 3, where heights presented are for all trees.

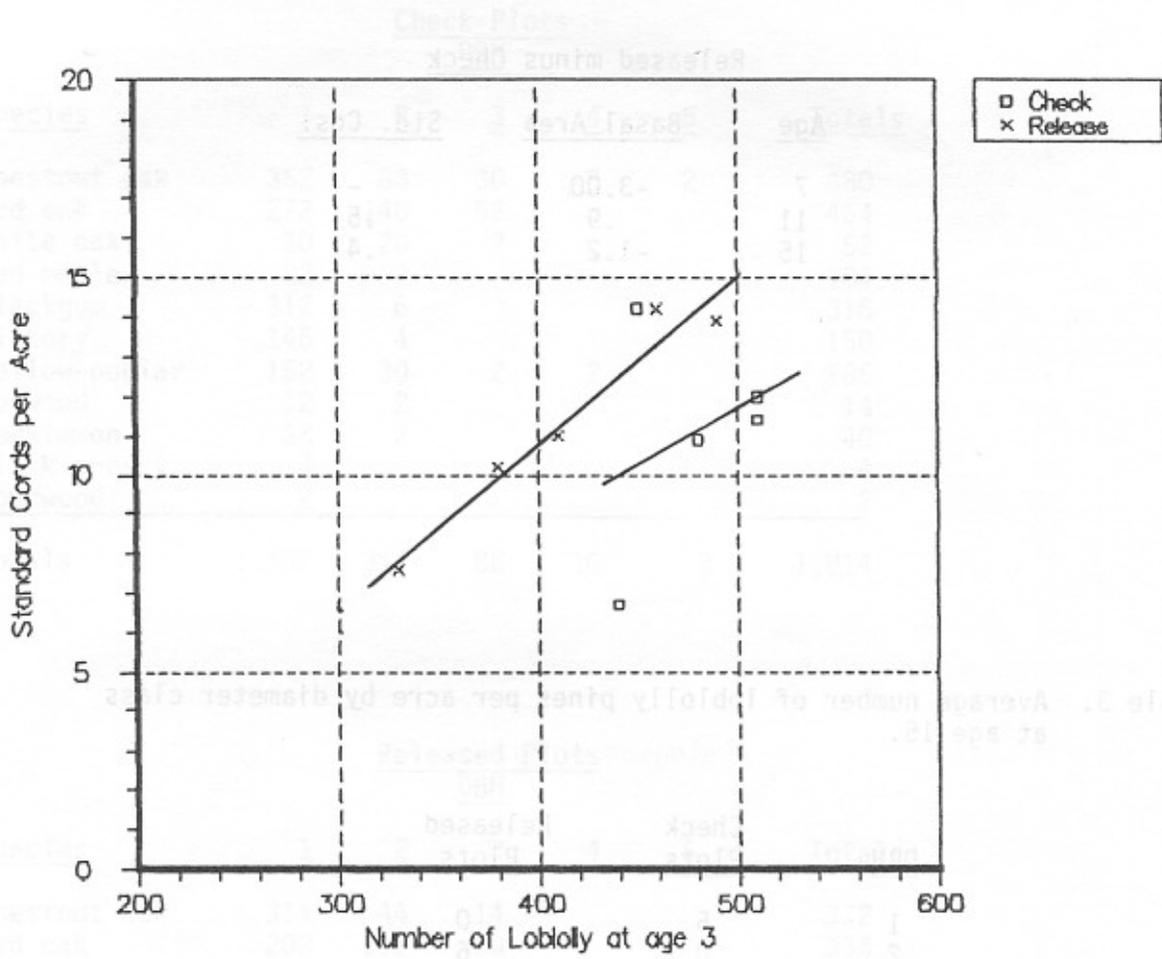


Figure 2. Pine cordwood yields at age 15 related to number of loblolly at age 3.

Table 2. Average differences between check and released plots at each measurement, for basal area and standard cords per acre.

Released minus Check

Age	Basal Area	Std. Cds.
7	-3.00	-
11	.9	.5
15	-1.2	.4

Table 3. Average number of loblolly pines per acre by diameter class at age 15.

DBH	Check Plots	Released Plots
1	5	0
2	0	6
3	28	16
4	56	20
5	110	68
6	115	135
7	96	112
8	26	32
9	6	5
Totals	442	394

Table 4. Average numbers of hardwoods per acre by species and diameter class at age 15.

Species	Check Plots					Totals
	DBH					
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	
Chestnut oak	352	88	30	8	2	480
Red oak	272	140	52			464
White oak	30	20	2			52
Red maple	82	22				104
Blackgum	312	6				318
Hickory	146	4				150
Yellow-poplar	152	30	2	2		186
Dogwood	12	2				14
Persimmon	38	2				40
Black cherry	4					4
Sourwood	2					2
Totals	1,402	314	86	10	2	1,814

Species	Released Plots					Totals
	DBH					
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	
Chestnut oak	314	44	14			372
Red oak	202	112	20			334
White oak	42	8				50
Red maple	48	6				54
Blackgum	70					70
Hickory	114	8	2			124
Yellow-poplar	8	2	2			12
Dogwood	16					16
Persimmon	14					14
Black cherry		2				2
Sassafras	6					6
Totals	834	182	38			1,054

Table 5. Average numbers of hardwoods per acre by diameter class and crown class, and basal area by crown class, at age 15.

Check Plots					
DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	1,402				1,402
2	304	10			314
3	14	72			86
4		8	2		10
5			2		2
Totals	1,720	90	4		1,814
B.A.	15.0	4.5	.4		19.9

Released Plots					
DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	834				.834
2	182				182
3	8	30			38
Totals	1,024	30			1,054
B.A.	8.9	1.5			10.4

Table 6. Numbers of hardwoods by diameter class and crown class, and basal area by crown class, on each 1/10-acre plot.

Plot - Check #1						Plot - Check #2					
DBH	0	I	CD	D	Totals	DBH	0	I	CD	D	Totals
1	146				146	1	168				168
2	25				25	2	39				39
3	3	4			7	3	2	2			4
Totals	174	4			178	Totals	209	2			211
B.A.	1.49	.20			1.69	B.A.	1.86	.10			1.96

Plot - Check #3						Plot - Check #4					
DBH	0	I	CD	D	Totals	DBH	0	I	CD	D	Totals
1	146				146	1	111				111
2	22	1			23	2	28				28
3		4			4	3	1	2			3
4						4		1			1
Totals	168	5			173	Totals	140	3			143
B.A.	1.28	.22			1.50	B.A.	1.26	.19			1.45

Plot - Check #5					
DBH	0	I	CD	D	Totals
1	130				130
2	38	4			42
3	1	24			25
4		3	1		4
5			1		1
Totals	169	31	2		202
B.A.	1.59	1.53	.22		3.34

Plot - Released #1						Plot - Released #2					
DBH	0	I	CD	D	Totals	DBH	0	I	CD	D	Totals
1	133				133	1	33				33
2	24				24	2	10				10
3		4			4						
Totals	157	4			161	Totals	43				43
B.A.	1.25	.20			1.45	B.A.	.40				.40

Plot - Released #3						Plot - Released #4					
DBH	0	I	CD	D	Totals	DBH	0	I	CD	D	Totals
1	50				50	1	77				77
2	15				15	2	19				19
3	1	2			3	3	2	3			5
Totals	66	2			68	Totals	98	3			101
B.A.	.65	.10			.75	B.A.	.93	.15			1.08

Plot - Released #5					
DBH	0	I	CD	D	Totals
1	124				124
2	23				23
3	1	6			7
Totals	148	6			154
B.A.	1.23	.29			1.52

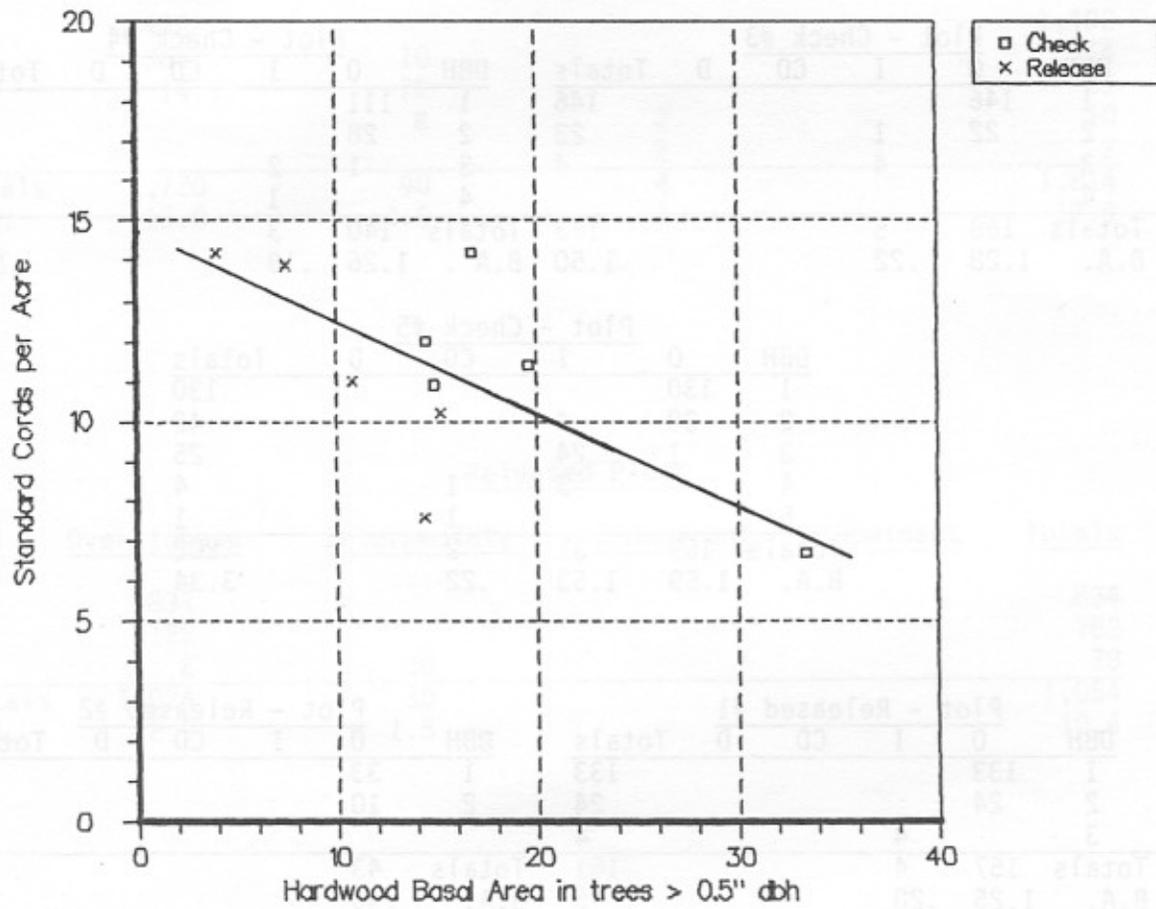


Figure 3. Pine cordwood yields at age 15 related to hardwood basal area.

Table 7. Percent of trees by free-to-grow class for each plot, at age 3.

	<u>Plot</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Means</u>
Check	1	23	74	2		1.79
	2	13	74	13		2.00
	3	22	72	7		1.85
	4	16	78	6		1.90
	5	7	77	7	9	2.18
	Means	16	75	7	2	1.94
Released	1	41	53	6		1.66
	2	91	9			1.09
	3	70	30			1.30
	4	46	49	5		1.59
	5	26	68	3	3	1.82
	Means	55	42	3	1	1.49

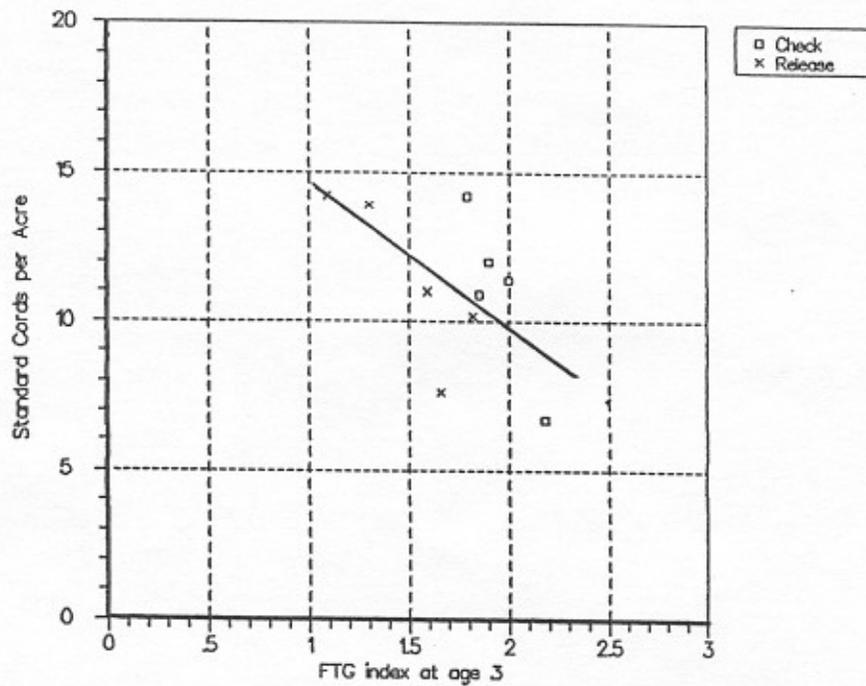


Figure 4. Pine cordwood yields at age 15 related to FTG index.

Hardwood competition was light on most of the plots, and apparently was not severe enough to justify release, with the exception of check plot 5. At age 3, 91 percent of the seedlings on the check plots and 97 percent on the released plots were in free-to-grow classes 1 or 2. The main difference between the check and released plots was in the proportion of trees in either class 1 or 2 (Table 7). There was considerably more side-shading on the check plots than the released plots at age 3, but apparently many of the hardwoods providing side-shading were over-topped relatively quickly.

The stocking on this tract was erratic. There were excellent seedling rows with high survival and poor rows with low survival. This resulted in an irregular stand. Release plot 1 had especially poor seedling distribution (as well as the lowest initial stocking). There were no holes, however, so large that they won't eventually be filled by loblolly pine crowns. There were no codominant hardwoods on any of the 5 released plots, and only two codominant hardwoods on the check plots (both of these on check plot 5). Even check plot 5 should end up eventually as pure loblolly pine.

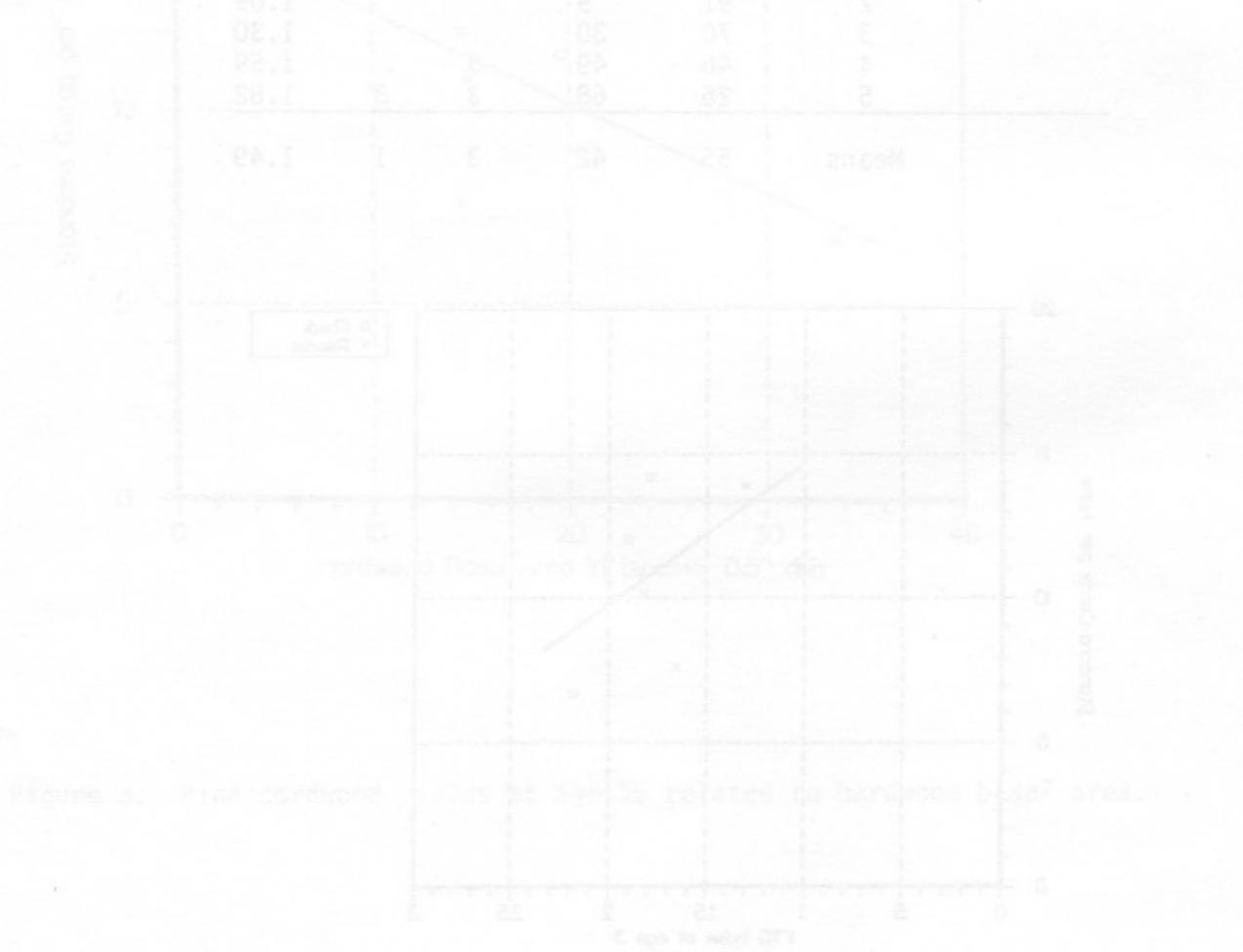


Figure 4. Pine cordwood yield at age 15 related to FTD index.