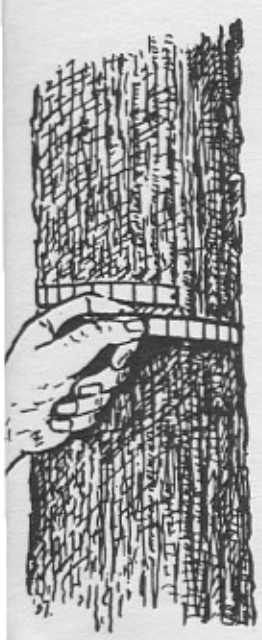

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LOBLOLLY PINE RELEASE STUDY

REPORT NUMBER

17

Virginia
Department of Forestry

LOBLOLLY PINE RELEASE
Report #17
By Thomas A. Dierauf

ABSTRACT

This study included three treatments: no release and basal spraying with 2,4,5-T in fuel oil at dilution rates of either 1:40 or 1:20. Basal spraying was done in the winter, following the first growing season in the field. The release treatments were ineffective on the yellow-poplar and sweetgum that provided most of the competition. At age 18, 1:40 plots averaged 10 percent more basal area and 13 percent more volume in standard cords than check plots, and 1:20 plots averaged 16 percent more basal area and 23 percent more volume than check plots. The differences in pulpwood yields were not statistically significant. Cordwood yields of loblolly pine at age 18 were not related to the amount of hardwood present, but there was a weak relationship with a free-to-grow index estimated at age 2.

INTRODUCTION

This is the seventeenth in a series of Occasional Reports concerning release of loblolly pine seedlings from hardwood competition. This study was installed on the privately-owned Wert tract in Lunenburg County, in the south-central Piedmont of Virginia. The previous stand was mixed pine and hardwood. Site preparation consisted of drum-chopping and burning during the summer of 1970, followed by planting in the spring of 1971.

Basal spraying was done on January 17 and 18, 1972, after the first growing season in the field. Seven swaths, each two chains wide, were established (Figure 1). Two swaths were basal sprayed using a 1:40 dilution of 2,4,5-T in fuel oil, two swaths were basal sprayed using a 1:20 dilution, and three swaths were left unsprayed as controls. The 2,4,5-T contained 4 pounds of active ingredient per gallon.

The basal spraying was only marginally effective, noticeably less effective than on other basal-sprayed release studies. Part of the reason was that the main competitors were species that are resistant to basal spraying with 2,4,5-T. Yellow-poplar was the most severe competitor, followed by sweetgum, and both of these are difficult to control by basal spraying. Blackgum and sourwood were also resistant to the spraying. However, even red maple and oak, which are generally well controlled by basal spraying, survived in many instances.

GROWTH PLOT INSTALLATION

Plots were installed and first measured at age 2, during the winter following basal spraying. A total of fourteen 1/10-acre plots were installed,

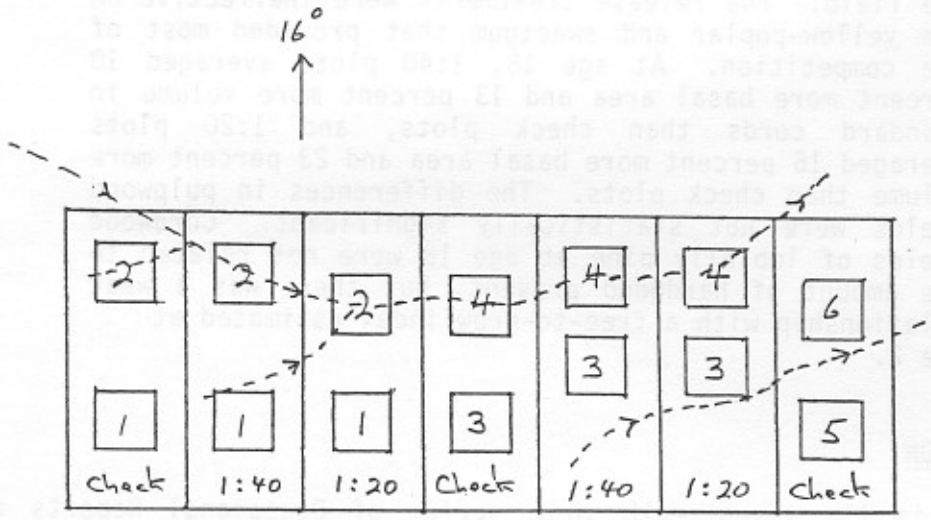

Figure 1. Layout of growth plots. Dashed lines indicate shallow drainages that are usually dry, except for 1:40 plot 4 and 1:20 plot 4.

two in each of the seven swaths, for a total of four plots in each of the release treatments and six check plots. Volunteer pine seedlings were pulled up when the plots were installed.

Plots were measured four times, during establishment at age 2, and at ages 9, 13, and 18. At age 2, 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 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 18, 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 almost 90 percent of the intermediate and all of the codominant hardwoods (there were no dominant hardwoods).

By the age 9 measurement, hardwood "brush" was very heavy on most plots. Check plot 2 was an exception, and this plot was atypical of the tract.

RESULTS AND DISCUSSION

A summary of loblolly pine data for the four measurements is presented in Table 1. At age 18, 1:40 plots averaged 3.3 standard cords per acre and 1:20 plots averaged 5.7 standard cords per acre more than check plots./2 Growth was noticeably reduced by excessive wetness along the drainage in 1:20 plot 4 (Figure 1). Differences due to release increased with time, with the exception of basal area on the 1:40 plots between ages 13 and 18 (Table 2). Table 3 presents stand tables for loblolly pine at age 18.

A summary of average hardwood data at the final measurement at age 18 is presented in Tables 4 and 5, and individual plot data is presented in Table 6. There were just as many hardwoods on the released plots as on the check plots at age 18, and also just as much hardwood basal area.

There were only 6 codominant hardwoods (and no dominant hardwoods) on the 14 plots, 3 on the six check plots and 3 on the eight released plots. Five of these trees were yellow-poplar and the sixth was a bigtooth aspen. The yellow-poplar ranged from 40 to 49 feet tall and the bigtooth aspen was 52 feet tall. Some of these trees may be able to maintain a position in the canopy, but all 14 plots should end up essentially pure loblolly pine in the canopy.

Cordwood yields of loblolly pine at age 18 were not related to the amount of hardwood present. Figure 2 shows pine cordwood yields relative to

1/ See Occasional Report 78 (Release Report 11) for a description and discussion of this classification system.

2/ Standard cords at age 18 were subjected to an analysis of variance. Yields on released plots were not significantly greater than check plots, (probability of a larger F = .179).

Table 1. A summary of loblolly data at ages 2, 9, 13, and 18: number of trees per acre, average DBH, basal area per acre, standard cords per acre, and average height of dominant and codominant trees.*

	Check Plots						1:40 Released						1:20 Released				
Age	Plot	No.	DBH	B.A.	Cds.	Ht.	Plot	No.	DBH	B.A.	Cds.	Ht.	Plot	No.	DBH	B.A.	Cds.	Ht.
2	1	510	-	-	-	3.1	1	490	-	-	-	3.1	1	510	-	-	-	2.7
	2	400	-	-	-	2.9	2	490	-	-	-	3.6	2	510	-	-	-	2.9
	3	430	-	-	-	2.7	3	550	-	-	-	2.7	3	570	-	-	-	2.7
	4	610	-	-	-	3.1	4	500	-	-	-	2.6	4	440	-	-	-	2.4
	5	540	-	-	-	2.8												
	6	560	-	-	-	3.0												
Means		508	-	-	-	3.0		508	-	-	-	3.0		508	-	-	-	2.7
9	1	470	3.89	42.3	-	25.9	1	470	4.51	54.1	-	24.8	1	510	4.46	58.3	-	25.7
	2	400	4.28	41.9	-	26.7	2	490	4.70	59.0	-	27.7	2	510	4.59	57.8	-	25.6
	3	430	3.77	35.7	-	22.1	3	530	4.08	50.6	-	23.7	3	570	3.94	48.2	-	24.1
	4	520	3.95	50.0	-	26.4	4	490	3.90	46.0	-	24.4	4	420	3.46	32.5	-	24.8
	5	520	3.02	29.8	-	23.8												
	6	560	3.95	51.1	-	24.6												
Means		483	3.81	41.8	-	24.9		495	4.30	52.4	-	25.2		502	4.11	49.2	-	25.0
13	1	470	5.19	74.8	9.2	37.2	1	470	5.74	88.0	11.3	35.9	1	480	6.31	109.2	16.4	38.9
	2	400	5.68	74.1	9.6	37.3	2	490	6.00	99.7	15.0	39.6	2	510	5.98	102.0	14.0	37.2
	3	420	5.64	77.3	9.6	34.9	3	530	5.91	105.4	13.9	36.4	3	570	5.56	101.7	12.4	36.2
	4	500	5.58	94.4	13.1	37.5	4	480	5.62	89.0	11.4	35.4	4	410	5.66	80.3	10.3	35.9
	5	480	4.56	62.3	6.3	35.9												
	6	550	5.42	94.9	12.0	37.0												
Means		470	5.34	79.6	10.0	36.6		492	5.82	95.5	12.9	36.8		492	5.88	98.3	13.3	37.0
18	1	450	6.31	104.9	18.6	45.4	1	460	6.96	126.1	23.6	44.7	1	470	7.77	162.0	35.2	49.6
	2	390	6.92	107.4	21.2	46.5	2	470	7.11	134.7	29.4	50.5	2	490	7.24	144.5	30.2	49.4
	3	400	7.38	126.4	25.3	46.4	3	500	7.36	156.1	33.6	49.6	3	500	7.10	145.8	31.2	50.2
	4	450	7.29	143.2	30.1	49.6	4	470	6.96	133.2	26.5	48.0	4	370	7.68	126.4	26.2	49.1
	5	430	6.58	113.4	23.1	49.6												
	6	540	6.94	152.8	31.5	50.0												
Means		443	6.90	124.7	25.0	47.9		475	7.10	137.5	28.3	48.1		458	7.45	144.7	30.7	49.6

*Except at age 2, where heights presented are for all trees.

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

	1:40 minus Check		1:20 minus Check	
Age	Basal Area	Std. Cds.	Basal Area	Std. Cds.
9	10.6	-	7.4	-
13	15.9	2.9	18.7	3.3
18	12.8	3.3	20.0	5.7

Table 3. Average number of loblolly pines per acre by diameter class at age 18.

DBH	Check Plots	1:40 Released Plots	1:20 Released Plots
2	7	2	
3	15	15	10
4	35	15	18
5	45	33	30
6	93	90	50
7	63	125	115
8	78	93	135
9	75	83	55
10	25	17	33
11	2	2	7
12	3		5
13	2		
Totals	443	475	458

Table 4. Average numbers of hardwoods per acre by species and diameter class at age 18.

Check Plots

Species	DBH 1	2	3	4	5	6	Totals
Yellow-poplar	80	57	18	25	13	5	198
Sweetgum	275	113	33	5			426
Red maple	365	63	10	2			440
Red oak	222	63	12				297
White oak	135	42	13	5			195
Black cherry	37	33	30				100
Hickory	146	22	2				170
Blackgum	303	12					315
Dogwood	175	10					185
Sourwood	54	8					62
Hornbeam	55	10					65
Miscellaneous	162						162
Totals	2009	433	118	37	13	5	2615

1:40 Plots

Species	DBH 1	2	3	4	5	6	Totals
Yellow-poplar	287	60	23	13	5	2	390
Sweetgum	173	122	30	15	5		345
Red maple	207	18					225
Red oak	215	27					242
White oak	202	52	2		3	3	262
Black cherry	28	13	15		2		58
Hickory	265	10					275
Blackgum	275	3					278
Dogwood	230	8					238
Sourwood	93	5					98
Hornbeam	42						42
Miscellaneous	225	17					242
Totals	2242	335	70	28	15	5	2695

1:20 Plots

Species	DBH 1	2	3	4	5	6	Totals
Yellow-poplar	245	65	15	18		3	346
Sweetgum	355	138	60	7	10		570
Red maple	388	35	5	2	3		433
Red oak	160	5	2				167
White oak	142	15	5				162
Black cherry	8	10	5	3	2		28
Hickory	252	13					265
Blackgum	318	12					330
Dogwood	188	15					203
Sourwood	37	5					42
Hornbeam	150	8					158
Bigtooth aspen				2			2
Miscellaneous	270	12					282
Totals	2513	333	92	32	15	3	2988

Table 5. Average numbers of hardwoods per acre by diameter class and crown class, and basal area by crown class, at age 18.

Check Plots

DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	2009				2009
2	433				433
3	98	20			118
4	7	30			37
5		11	2		13
6		2	3		5
Totals	2547	63	5		2615
BA	25.8	5.5	.9		32.2

1:40 Plots

DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	2242				2242
2	335				335
3	68	2			70
4	8	20			28
5		15			15
6		3	2		5
Totals	2653	40	2		2695
BA	23.6	4.5	.4		28.4

1:20 Plots

DBH	Over-topped	Intermediate	Codominant	Dominant	Totals
1	2513				2513
2	333				333
3	87	5			92
4	5	25	2		32
5	5	10			15
6			3		3
Totals	2943	40	5		2988
BA	26.4	3.8	.6		30.9

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

DBH	O	I	CD	D	Totals
1	197				197
2	53				53
3	10	3			13
4	1	1			2
5					
6			1		1
Totals	261	4	1		266
BA	2.81	.24	.20		3.24

Plot - Check #2

DBH	O	I	CD	D	Totals
1	93				93
2	8				8
3					
4					
5		1			1
6					
Totals	101	1			102
BA	.68	.14			.82

Plot - Check #3

DBH	O	I	CD	D	Totals
1	243				243
2	54				54
3	14	3			17
4	1	2			3
5		1	1		2
6					
Totals	312	6	1		319
BA	3.28	.46	.14		3.87

Plot - Check #4

DBH	O	I	CD	D	Totals
1	192				192
2	39				39
3	6	2			8
4		12			12
5		2			2
6					
Totals	237	16			253
BA	2.19	1.42			3.61

Plot - Check #5

DBH	O	I	CD	D	Totals
1	248				248
2	62				62
3	17	3			20
4	1	3			4
5		1			1
6		1	1		2
Totals	328	8	1		337
BA	3.63	.74	.20		4.56

Plot - Check #6

DBH	O	I	CD	D	Totals
1	232				232
2	44				44
3	12	1			13
4	1				1
5		2			2
6					
Totals	289	3			292
BA	2.90	.32			3.22

Table 6 (Continued).

Plot - 1:40 #1

DBH	O	I	CD	D	Totals
1	190				190
2	16				16
3	4	1			5
4		1			1
5					
6					
Totals	210	2			212
BA	1.58	.14			1.72

Plot - 1:40 #2

DBH	O	I	CD	D	Totals
1	186				186
2	39				39
3	8				8
4	1	4			5
5		3			3
6		1	1		2
Totals	234	8	1		243
BA	2.34	.95	.20		3.50

Plot - 1:40 #3

DBH	O	I	CD	D	Totals
1	227				227
2	24				24
3	3				3
4		1			1
5					
6					
Totals	254	1			255
BA	1.91	.09			2.00

Plot - 1:40 #4

DBH	O	I	CD	D	Totals
1	294				294
2	55				55
3	12				12
4	2	2			4
5		3			3
6					
Totals	363	5			368
BA	3.57	.58			4.15

Plot - 1:20 #1

DBH	O	I	CD	D	Totals
1	332				332
2	26				26
3	3	1			4
4			1		1
5					
6					
Totals	361	1	1		363
BA	2.52	.05	.09		2.66

Plot - 1:20 #2

DBH	O	I	CD	D	Totals
1	285				285
2	28				28
3	4				4
4		4			4
5					
6			1		1
Totals	317	4	1		322
BA	2.36	.35	.20		2.91

Plot - 1:20 #3

DBH	O	I	CD	D	Totals
1	231				231
2	41				41
3	14				14
4	1	4			5
5	2	2			4
6					
Totals	289	6			295
BA	3.20	.62			3.82

Plot - 1:20 #4

DBH	O	I	CD	D	Totals
1	157				157
2	38				38
3	14	1			15
4	1	2			3
5		2			2
6					
Totals	210	5			215
BA	2.46	.50			2.96

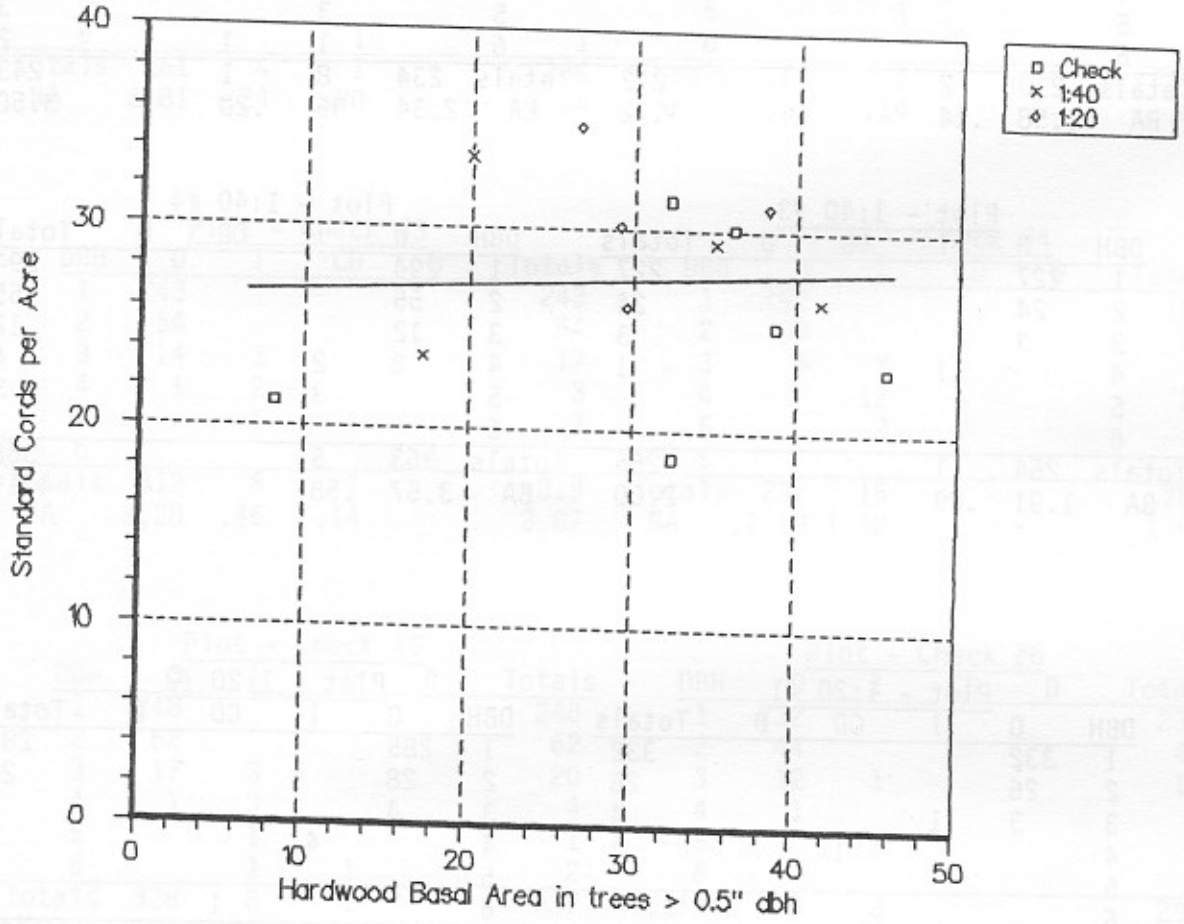

Figure 2. Pine cordwood yields at age 18 related to hardwood basal area.

hardwood basal area at age 18, for the 14 plots. There was a weak relationship, however, between cordwood yields at age 18 and the average free-to-grow index for each plot at age 2. Table 7 shows, for each plot, the percent of trees in each free-to-grow class at age 2. In Figure 3, pine cordwood yields for each plot at age 18 are plotted over free-to-grow index at age 2. A simple linear regression fitted to these data, however, accounted for little of the variation in cordwood yields./3

When we made the free-to-grow estimates at age 2, one full growing season after basal spraying, we were too optimistic when rating the released plots. Many of the yellow-poplar and sweetgum were partially girdled by the basal spraying, but apparently a greater percentage survived and recovered than we expected.

Table 7. Percent of trees by free-to-grow class for each plot, at age 2.

	Plot	1	2	3	4	Means
Check	1	23	47	21	9	2.15
	2	74	23	3	0	1.29
	3	12	38	40	10	2.48
	4	19	39	34	8	2.32
	5	10	27	56	8	2.62
	6	29	54	17	0	1.88
	Means	28	38	28	6	2.12
1:40 Released	1	59	30	11	0	1.52
	2	47	47	7	0	1.60
	3	62	26	13	0	1.51
	4	16	43	37	4	2.29
	Means	46	36	17	1	1.73
1:20 Released	1	46	39	13	2	1.72
	2	49	36	15	0	1.66
	3	58	29	12	0	1.54
	4	44	29	21	6	1.88
	Means	49	33	15	2	1.70

3/ Estimated standard cords = 33.504 - 3.1501 (free-to-grow index at age 2), r^2 = .072, probability of a larger F = .352.

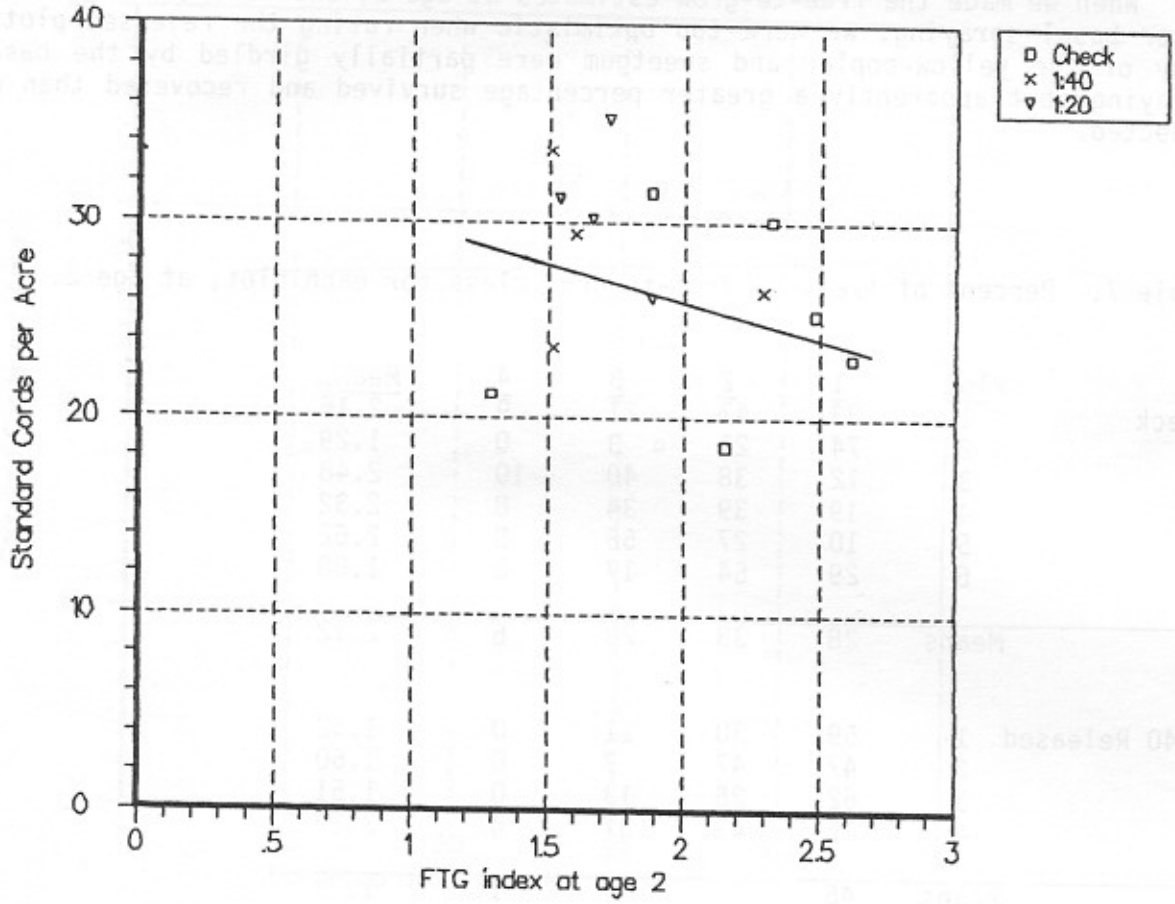

Figure 3. Pine cordwood yields at age 18 related to FTG index.