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Methods of Cutting Ponderosa Pine in the Southwest

ESTABLISHMENT REPORT

EVEN-AGED YIELD STUDY, PLOT 11

By

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PURPOSE

The objective of the study is to obtain information on the growth and yield of even-aged stands of different stocking levels. The plot will also serve as the start of a detailed growing stock study for the ponderosa pine region.

GENERAL DESCRIPTION

The study area (Taylor Woods) is located in Sec. 23, R6E, T22N, in Unit 1 of the Fort Valley Experimental Forest. This plot, of about 90 acres along the west side of the Snow Bowl Road, was covered with an even-aged stand of 1914 and 1919 origin and sawtimber. Except for a few small areas, the young even-aged sapling-small pole and the sawtimber occurred as separate groups. About 10 percent of the area was unstocked.

The site quality is low. The average height of measured 43-year-old dominant and codominant trees was about 30 feet. This would indicate a site index of about 60,[1/] which is representative of an appreciable area in the Southwest.

1/ Yield of even-aged stands of ponderosa pine. U.S. Dept. Agr. Tech. Bul. 630, by Walter H. Meyer.

The young sapling-small pole stands vary in density from 2,000 to over 11,000 stems per acre. Diameter growth in these dense stands has been low. Over 94 percent of the trees in the young stands at Taylor Woods are less than 5 inches in diameter at breast height (table 1).

The sawtimber groups had been cut twice prior to final harvest in 1962. In 1925 the tract was cut by the group selection method. This in part accounts for some of the unstocked areas. In 1942 the area received an improvement selection cut that reduced the stocking within groups. The residual stand following the 1942 cut left a volume of about 1,800 board feet per acre. The volume had increased during the 20-year period (1942 to 1962) to 2,800 per acre. On a per-acre basis, the annual growth was 50 board feet per acre; however, this is not indicative of the tree growth potential since the sawtimber occupied only about one-fourth of the area. Furthermore, this growth does not include trees under 12 inches d.b.h.

During the summer and fall of 1962 all sawtimber was harvested except for a few trees near the entrance to the plot along the Snow Bowl Road. This small sawtimber group will be thinned to remove poor quality trees at a later date.

Logging slash from the sawtimber harvest was treated two ways. Where groups were clear cut the slash was piled for burning. Slash from trees cut within the young even-age stands was lopped and scattered. About one-third of the slash piles were burned during the winter of 1962-63. The remaining piles will be burned during the winter of 1963-64 if burning can be done safely.

Table 1.--Stand table of Taylor Woods growing stock level plots (original trees), April 1962

Subplot No.	Diameter classes																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	18	21	Total	Per A.
	Number of trees[1/]																
1	249	193	71	44	24	12	17	4	4	--	2	—	--	--	--	620	6,200
2	401	200	51	34	23	13	12	4	5	1	--	--	--	--	—	744	7,440
3	177	137	89	64	37	15	8	3	1	—	--	—	—	—	—	531	5,310
4	249	167	88	43	23	21	6	8	6	0	1	—	—	—	--	612	6,120
5	231	173	88	42	30	15	10	4	—	1	1	—	—	--	1	596	5,960
6	484	251	149	72	23	13	--	2	—	—	--	—	--	—	—	994	9,940
7	423	230	114	74	27	11	7	3	3	—	—	—	--	1	—	893	8,930
8	128	232	120	83	49	18	13	2	1	—	--	—	—	--	—	646	6,460
9	236	254	111	51	33	6	7	3	1	2	1	--	—	—	—	705	7,050
10	151	251	191	71	41	19	6	3	2	1	1	—	1	--	--	738	7,380
11	158	179	47	24	18	15	15	9	3	2	1	--	1	--	—	473	4,730
12	127	83	32	29	34	27	12	8	7	1	—	2	--	—	—	362	3,620
13	255	233	140	80	44	14	9	4	1	1	--	--	—	—	--	781	7,810
14	132	147	100	51	27	16	16	6	1	4	—	—	—	--	--	500	5,000
15	85	67	47	49	22	21	5	8	9	1	—	—	--	--	—	314	3,140
16	101	77	79	57	26	19	13	2	1	--	—	—	--	—	--	375	3,750
17	66	59	39	22	20	9	16	6	4	3	—	1	—	--	--	245	2,450
18	123	97	71	46	25	9	11	6	1	1	1	2	—	--	--	391	3,910
Total	3,776	3,030	1,627	936	526	273	183	85	50	18	8	5	2	1	1	10,520	105,200
$\bar{X}$	210	168	90	52	29	15	10	5	3	1	.4	.3	.1	.05	.05	584	5,844
Per A.	2,098	1,683	904	520	292	152	102	47	28	10	4	3	1	.5	.5		

1/ Based on two 0.05-acre sample areas per subplot.

SUBPLOT SIZE AND LOCATIONS

The study plan indicated the establishment of 18 subplots in the young even-aged stands, each about 2 acres in size and located irregularly throughout the tract to get well-stocked uniform areas of even-aged timber. However, the tract was too broken up with unstocked areas and sawtimber groups to lay out 2-acre plots of uniform stocking that would leave a buffer strip of trees around the plot. The subplot sizes and locations were as follow (fig. 1):

Subplot No.	Size (Acres)	Subplot No.	Size (Acres)
1	0.80	10	0.75
2	.80	11	.75
3	.80	12	.75
4	1.00	13	.75
5	.80	14	.75
6	.82	15	.75
7	1.24	16	.75
8	1.00	17	.75
9	.75	18	1.00

BEFORE THINNING INVENTORY

These records give numbers of trees and basal area per acre for the subplots prior to treatment. They were obtained from two 0.05-acre sample areas per subplot, measured after the 1961 growing season.

The sample areas were located in advance so that one area would appear near the middle of each half of the subplot. They were not moved around to miss the small openings that could not be avoided on the subplots, or shifted to sample average appearing areas. Each sample

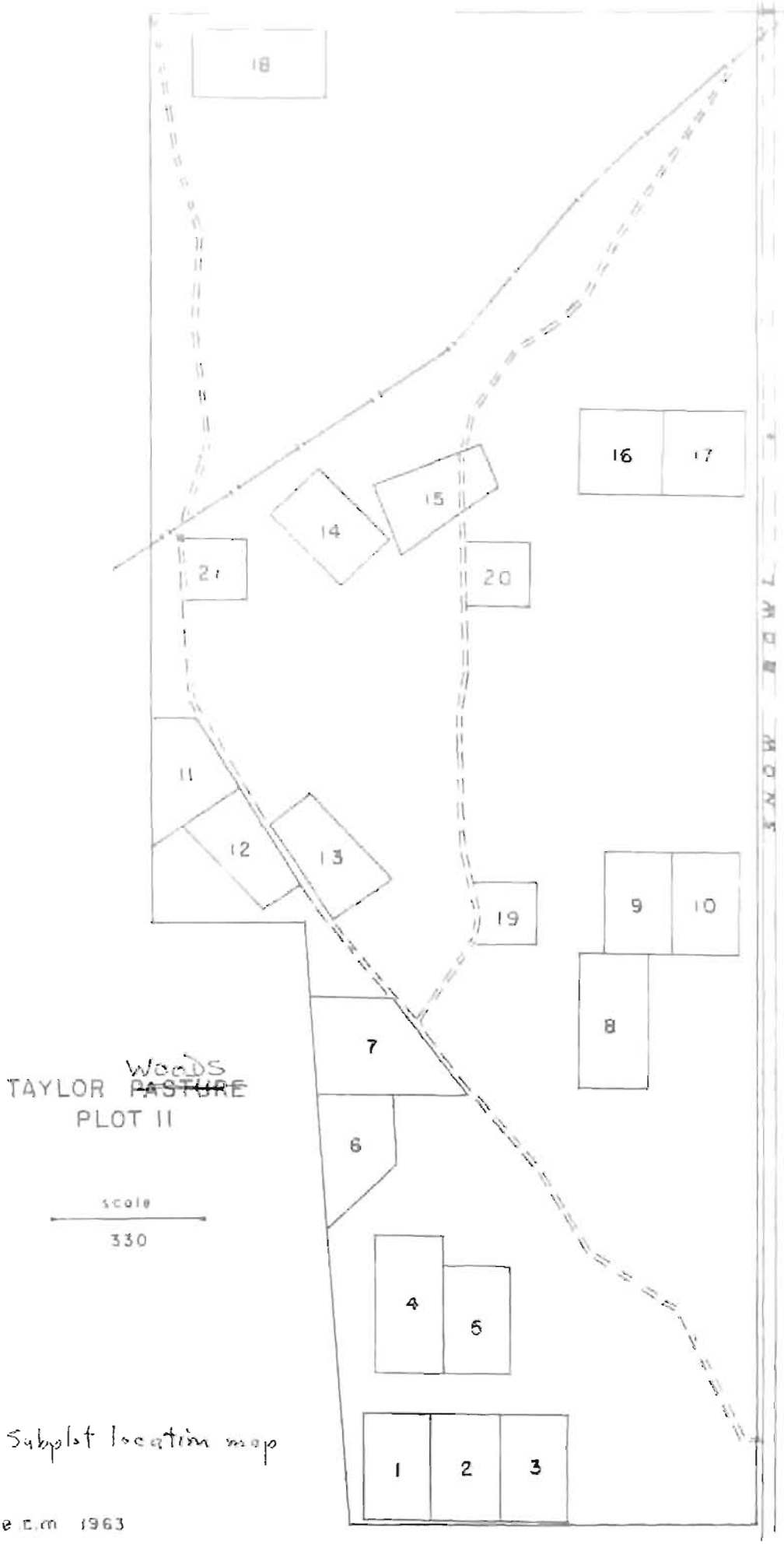


Figure 1. -- Subplot location map

e.c.m 1963

area was placed in the location computed in advance regardless of stand conditions. The sample areas were square.

All live trees were measured to the nearest 0.1-inch d.b.h., regardless of their present condition or potential. The dead trees, not measured, were surprisingly few considering the stand density.

Basal areas were computed by multiplying the number of trees in each inch class by the basal area of the class midpoint. Inch classes are "full inch," e.g., 10.0-10.9, 11.0-11.9, etc.

There are three sets of data for the subplot: two obtained by raising each sampling area to an acre basis, one obtained by raising the sum of the two sampling areas to an acre basis. This provides a subplot total and an indication of the variation within the plot.

Table 1 indicates the number of trees in each d.b.h. class per subplot and the number of trees on a per-acre basis. Under the crowded conditions of 2,450 to 9,940 trees per acre, diameter growth has been extremely slow. Over 80 percent of the trees were less than 3 inches in diameter. Considering all trees over 5 inches d.b.h. as pulpwood, only about 6 percent of the stems had grown to pulpwood size in over 40 years.

Table 2 indicates the variability of stocking on the two sample areas on each subplot for all trees and for trees 3 to 7 inches in diameter. The averages for both samples for all subplots were very close; however, there was considerable variation between samples within the same subplot and between subplots. The average tree diameter for all stems was 2.6 inches with very little difference between subplots.

Table 2.--Number of trees and average tree diameter for Taylor Woods levels of growing stock study (original stand)

Plot No.	All trees			Trees 3 to 7 inches in diameter			Average diameter of trees between 3 to 7 inches			Average diameter of all trees
	Sample 1	Sample 2	Average	Sample 1	Sample 2	Average	Sample 1	Sample 2	Average	
	Number per acre						Inches			
1	8,500	3,900	6,200	1,260	760	1,010	4.8	4.8	4.8	2.5
2	8,420	6,460	7,440	760	960	860	4.2	5.2	4.8	2.1
3	6,160	4,460	5,310	1,140	1,400	1,270	4.4	4.4	4.4	2.6
4	4,320	7,920	6,120	1,100	920	1,010	4.8	4.8	4.8	2.5
5	6,360	5,560	5,960	1,340	680	1,010	4.6	4.9	4.7	2.6
6	8,540	11,340	9,940	720	1,480	1,100	3.7	4.3	4.1	1.9
7	7,580	10,280	8,930	1,500	940	1,220	4.6	3.8	4.3	2.2
8	8,620	4,300	6,460	1,660	1,640	1,650	4.1	4.7	4.4	2.7
9	5,940	8,160	7,050	1,200	800	1,000	4.6	4.0	4.4	2.3
10	7,000	7,760	7,380	1,340	1,460	1,400	4.4	4.3	4.4	2.6
11	4,660	4,800	4,730	720	900	810	5.2	5.3	5.3	2.8
12	3,260	3,980	3,620	820	1,380	1,100	5.5	4.8	5.1	3.4
13	5,580	10,040	7,810	1,160	1,860	1,510	4.9	4.0	4.4	2.4
14	4,640	5,360	5,000	1,100	1,220	1,160	5.3	4.3	4.8	2.9
15	3,260	3,020	3,140	1,040	1,060	1,050	4.9	4.5	4.7	3.4
16	4,100	3,400	3,750	1,200	1,140	1,170	4.5	4.6	4.6	2.9
17	2,780	2,120	2,450	700	760	730	5.2	5.2	5.2	3.5
18	5,540	2,280	3,910	1,000	940	970	4.5	4.9	4.7	2.9
$\bar{X}$	5,848	5,841	5,844	1,098	1,128	1,110	4.7	4.6	4.6	2.6

Table 3 indicates the variability in basal areas between samples and subplots. Both samples had the same average basal area (209 sq. ft.) for all trees and only a slight difference for trees 3 to 7 inches in diameter. This agreement would be expected from the distribution of diameter classes indicated in table 1 and the number of stems in table 2.

GROWING STOCK LEVELS AND TREATMENT ASSIGNMENT

Six growing stock levels were to be installed. These were: 30, 60, 80, 100, 120, and 150 square feet basal area per acre when the average tree diameter was 10 inches. Each growing stock level was to be replicated three times.

The close proximity of subplots and the irregular stand conditions made it impossible to make random assignments. As installed, the treatments were assigned on the basis of the original stand conditions and adjacent treatments.

A number of subplots have common boundaries. This condition was unavoidable. It would have been preferable had it been possible to leave a buffer strip between subplots. To reduce the adverse effect of one treatment on another, the treatment assignments in adjoining subplots were made to avoid extreme differences in growing stock levels on adjacent subplots. The existing stand structure also complicated the experimental layout in that all six treatments could not be assigned to a specific area to properly assess possible site differences.

Table 3.--Average basal areas of original stand for Taylor Woods growing stock level study

Plot number	Original stand					
	Basal area for all trees on plot			Basal area for trees 3 to 7 inches		
	Sample		Average	Sample		Average
	1	2		1	2	
	Square feet per acre					
1	244	168	206	157	97	127
2	136	227	182	75	144	109
3	180	199	190	119	153	136
4	213	209	211	136	118	127
5	217	207	212	154	88	121
6	140	239	190	54	149	101
7	254	199	226	172	74	123
8	262	239	251	155	196	175
9	229	167	198	141	71	106
10	261	284	272	146	148	147
11	205	206	205	106	140	123
12	216	231	223	135	173	154
13	215	279	247	150	166	158
14	254	192	223	166	125	146
15	204	183	194	138	118	128
16	174	178	176	133	134	134
17	179	153	166	104	110	107
18	175	193	184	110	124	117
$\bar{X}$	209	209	209	131	129	130

SELECTION OF RESIDUAL TREES

Within each basal area level treatment trees were selected on a basis of diameter, spacing, crown position, and tree condition. All trees with mistletoe were marked for cut. Trees with poor form, excessive limbiness, porcupine damage, and poor vigor were all marked for cut unless no other trees were available. On some subplots many of the best trees had porcupine damage. Whenever a porcupined tree was left, it was the best tree available with the least amount of damage.

In general the best dominant and codominant trees from 3 to 8 inches in diameter at the proper spacing were left. Trees less than 3 inches or greater than 8 inches were left only when there were no 3- to 8-inch trees of good quality available. Trees 9 inches and over represented only about 0.3 percent of the stems on the subplots.

Table 5 in the study plan indicated the number of trees required for proper stocking at each density level for trees under 4 inches d.b.h. and the square foot basal area for trees 4 inches and over. The basal area levels (30, 60, 80, 100, 120, and 150) indicate the square foot basal areas per acre when the average stand diameter is 10 inches or larger. Stands with an average tree diameter under 10 inches have lower basal areas than the basal area levels.

The basal area for each diameter class under 10 inches d.b.h. was related to the number of trees required for full stocking at each stocking level. The number of trees required at each diameter class forms a straight line when plotted on semilogarithmic paper. This relationship was used to develop basal areas (table 4) and number of

Table 4.—Basal area requirements per acre for various growing stock levels and average d.b.h.

D.b.h.	Basal area level									
	20	30	40	50	60	70	80	100	120	150
Inches	Square feet									
1.0	0.9	1.4	1.8	2.3	2.8	3.2	3.7	4.6	5.5	6.9
2.0	3.1	4.7	6.2	7.8	9.3	10.8	12.4	15.5	18.6	23.3
3.0	5.9	8.8	11.8	14.7	17.6	20.6	23.6	29.5	35.4	44.2
4.0	8.8	13.2	17.6	22.0	26.4	30.8	35.2	44.0	52.6	66.0
5.0	11.6	17.4	23.2	29.0	34.8	40.6	46.4	58.0	69.6	87.0
6.0	14.1	21.2	28.2	35.3	42.4	49.4	56.4	70.6	84.7	105.8
7.0	16.3	24.4	32.6	40.7	48.8	57.0	65.2	81.4	97.8	122.2
8.0	18.0	27.0	36.0	45.0	54.0	63.0	72.0	90.0	108.0	135.0
9.0	19.2	28.8	38.4	48.0	57.6	67.2	76.8	96.0	115.2	144.0
10.0+	20.0	30.0	40.0	50.0	60.0	70.0	80.0	100.0	120.0	150.0

trees (table 5) for each diameter size class in each basal area stocking level.

The number of trees (table 5) and the average spacing for different numbers of trees per acre (table 6) were used as guides in marking leave trees for each stocking level treatment. For example, at the 30 square foot basal area level table 5 indicates the number of trees required for each diameter class and table 6 indicates the proper spacing for that number of trees per acre. These spacing distances were then used as guides for the different size leave trees on the subplot. At the 30 basal area level, 1-inch trees require a spacing of 14 feet, 4-inch trees 17 feet, and 8-inch trees 21 feet. The spacing requirement for other size trees at the 30 level and at other levels were similarly determined by the number of trees required in different diameter size classes. Spacing distances for numbers of trees not tabulated in table 6 may be determined from figure 2.

CALCULATION OF AVERAGE DIAMETER AND ACTUAL BASAL AREAS

After all leave trees were marked on the subplot, a diameter frequency table was prepared. The number of trees in each inch diameter class was multiplied by the square foot basal area for the diameter class midpoint (1.5, 2.5, 3.5, etc.). The basal areas were then totaled and the total divided by the number of trees on the subplot to determine the average diameter.

The next step was to determine the basal area needed for the subplot. Two sets of basal areas were calculated: one for the size subplot treated and the other on a per-acre basis. It is advisable to make a quick check on a plot basis immediately after marking so

Table 5.—Number of trees required per acre for various growing stock levels and average d.b.h. classes

D.b.h.	Basal area level									
	20	30	40	50	60	70	80	100	120	150
	Number trees per acre									
1.0	165	250	330	420	500	580	665	835	1,005	1,260
2.0	140	210	285	355	420	495	565	705	845	1,070
3.0	120	180	240	300	355	420	480	595	715	900
4.0	101	151	202	252	302	353	403	504	603	756
5.0	85	128	170	213	255	298	340	425	510	638
6.0	72	108	144	180	216	252	287	360	431	539
7.0	61	91	122	152	183	213	244	305	366	457
8.0	52	77	103	129	155	180	206	258	309	387
9.0	43	65	87	109	130	152	174	217	261	326
10.0	37	55	73	92	110	128	147	183	220	275
11.0	30	45	61	76	91	106	121	152	182	227
12.0	25	38	51	64	76	89	102	127	153	191
13.0	22	33	43	54	65	76	87	108	130	163
14.0	19	28	37	47	56	65	75	94	112	140
15.0	16	24	33	41	49	57	65	81	98	122
16.0	14	21	29	36	43	50	57	72	86	107
17.0	13	19	25	32	38	44	51	63	76	95
18.0	11	17	23	28	34	40	45	57	68	85
19.0	10	15	20	25	30	36	41	51	61	76
20.0	9	14	18	23	28	32	37	46	55	69
21.0	8	12	17	21	25	29	33	42	50	62
22.0	8	11	15	19	23	27	30	38	45	57
23.0	7	10	14	17	21	24	28	35	42	52
24.0	6	10	13	16	19	22	25	32	38	48

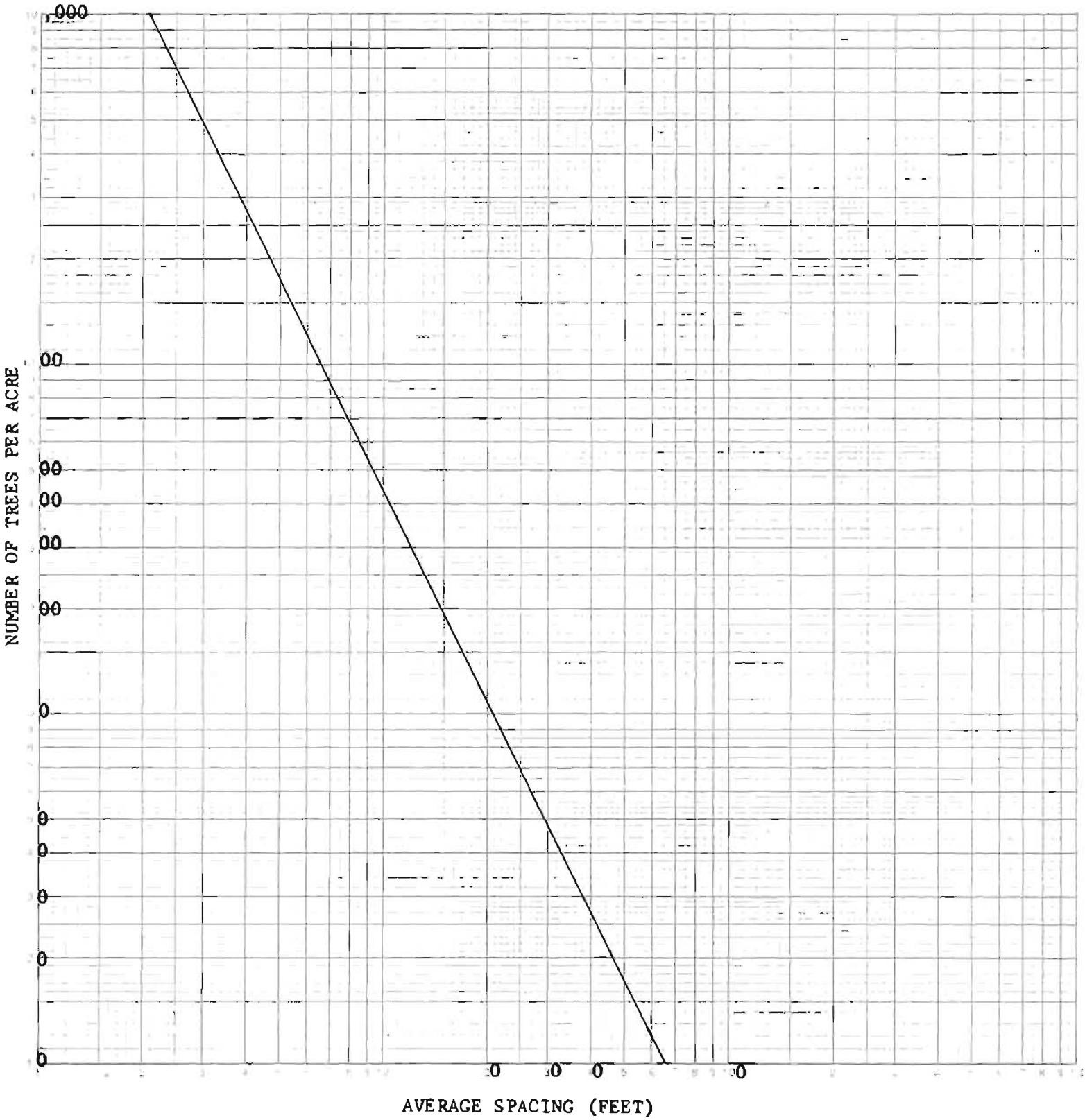
Table 6.--Number of trees and approximate spacing in feet

Trees	Spacing	Trees	Spacing	Trees	Spacing
Number	Feet	Number	Feet	Number	Feet
10	66	45	31	400	10
11	63	50	30	420	10
12	60	55	28	440	10
13	58	60	27	460	10
14	56	65	26	480	10
15	54	70	25	500	9
16	52	75	24	520	9
17	51	80	23	540	9
18	49	85	23	560	9
19	48	90	22	580	9
20	47	95	21	600	9
21	46	100	21	620	8
22	45	110	20	640	8
23	44	120	19	650	8
24	43	130	18	680	8
25	42	140	18	700	8
26	41	150	17	720	8
27	40	160	17	740	8
28	39	170	16	760	8
29	39	180	16	780	7
30	38	190	15	800	7
31	37	200	15	820	7
32	37	220	14	840	7
33	36	240	14	860	7
34	36	260	13	880	7
35	35	280	13	900	7
36	35	300	12	920	7
37	34	320	12	940	7
38	34	340	11	960	7
39	33	360	11	980	7
40	33	380	11	1,000	7

Table 6.5.--Spacing guide for trees 1 to 12 inches d.b.h. for several basal area levels

D.b.h.	Basal area levels									
	20	30	40	50	60	70	80	100	120	150
Inches	Feet									
1	16	14	12	10	9	9	8	7	7	6
2	18	15	13	11	10	9	9	8	7	7
3	19	16	14	12	11	10	10	9	8	7
4	21	17	15	14	12	11	10	9	9	8
5	23	18	16	15	14	12	11	10	9	8
6	25	20	17	16	15	13	12	11	10	9
7	27	22	19	17	16	14	14	12	11	10
8	30	24	21	18	17	16	15	13	12	11
9	32	26	23	20	18	17	16	14	13	12
10	34	28	25	22	20	18	17	16	14	13
11	38	31	27	24	22	20	19	17	16	14
12	42	33	30	26	24	22	21	18	17	15

Figure 2.-- SPACING GUIDE FOR VARIOUS NUMBER OF TREES PER ACRE



an adjustment can be made while the location of potential cut or leave trees are known.

Basal areas were adjusted proportionately for the average diameter for the subplot. For example, the per-acre basal area needed at stocking level of 30 and an average diameter of 5.4 inches would be: 21.2 - 17.4 = 3.8 x 0.4 = 1.1, so the basal area needed is 17.4 + 1.1 = 18.5 square feet. This value of 18.5 square feet is then multiplied by the subplot size in acres to obtain the amount needed for the subplot. On an acre basis the basal area present was always within 5 square feet maximum tolerance allowed in the study plan.

THINNING AND SLASH DISPOSAL

At Taylor Woods all "cut trees" were dropped in the same direction to facilitate lopping. Trees under 2 inches d.b.h. were cut with a circular brush saw. All larger trees were cut with a chain saw with a bow bar attachment.

Slash disposal consisted of "lop and scatter." Even though up to 10,000 trees were cut on some subplots the residual slash was all reduced to a layer often less than 1 foot deep (fig. 3). Since it was impossible to make a pulpwood sale, many of the larger trees added to the slash disposal problems. About 20 trees of sawtimber size also had to be cut and left on the plots. The removal of these few trees would have resulted in more damage to the residual stand than they were worth.

The slash disposal treatment used was the best method possible at Taylor Woods. Close spacing of residual trees and stumps ruled out

Figure 3.--All slash was lopped and scattered. Trees were dropped in the same direction to minimize handling required to get all slash knocked down to a thin layer.

a chipper. The long distances to open areas for burning ruled out this method.

The treatment plots were thinned in 1962 following completion of the season's growth. About half the buffer strip was thinned in 1962 and the remainder in the summer of 1963. Buffer strips are 1 chain wide and thinned to the same growing stock level as the adjacent treatment plot.

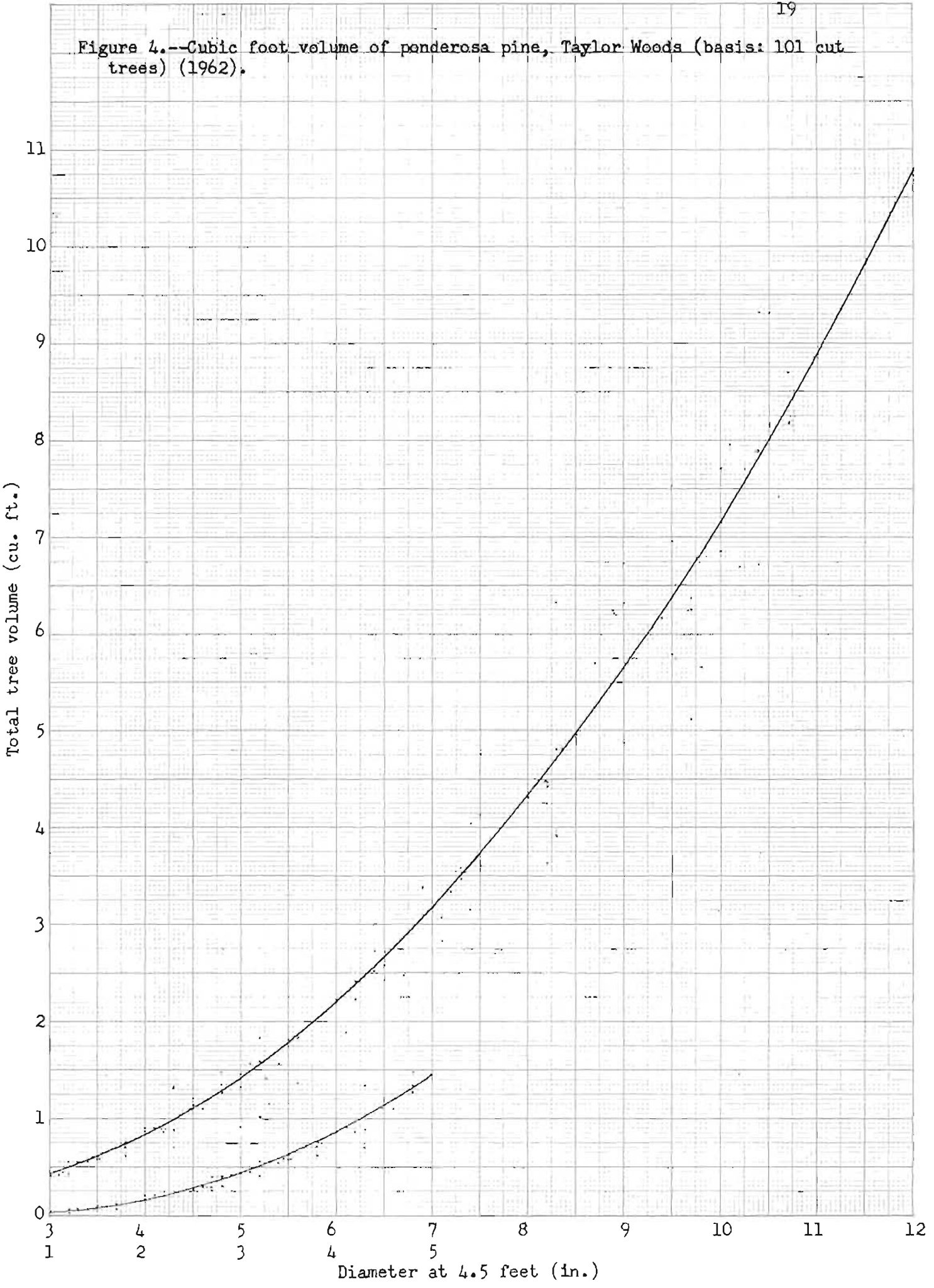
VOLUME TABLE

Ten trees in each inch diameter class were cut for cubic volume determination. The calculated volumes based on total tree heights were plotted on arithmetic (fig. 4) and logarithmic (fig. 5) graph paper. The curves were drawn to give the best fit based on average volumes and diameters for each inch class. Table 7 gives the tabulated cubic-foot volumes by 0.1 inch intervals based on adjusted data from figure 5.for diameters of 1.0 to 12.0 inches.

Height curves were derived from the 101 trees cut for the volume table plus 990 standing trees measured on the 18 subplots (fig. 6). Tree heights averaged 1 to 2 feet higher below 3 inches d.b.h. from felled trees than for measurements of standing trees. Heights were identical for trees 3 inches d.b.h. and over. Felled trees were measured with a steel tape while standing leave trees on each subplot were measured with a long pole graduated in half-foot intervals and read to the nearest full foot.

The average tree heights as read from the height curve (fig. 6) for the average tree diameter of each subplot were as follows:

Figure 4.--Cubic foot volume of ponderosa pine, Taylor Woods (basis: 101 cut trees) (1962).



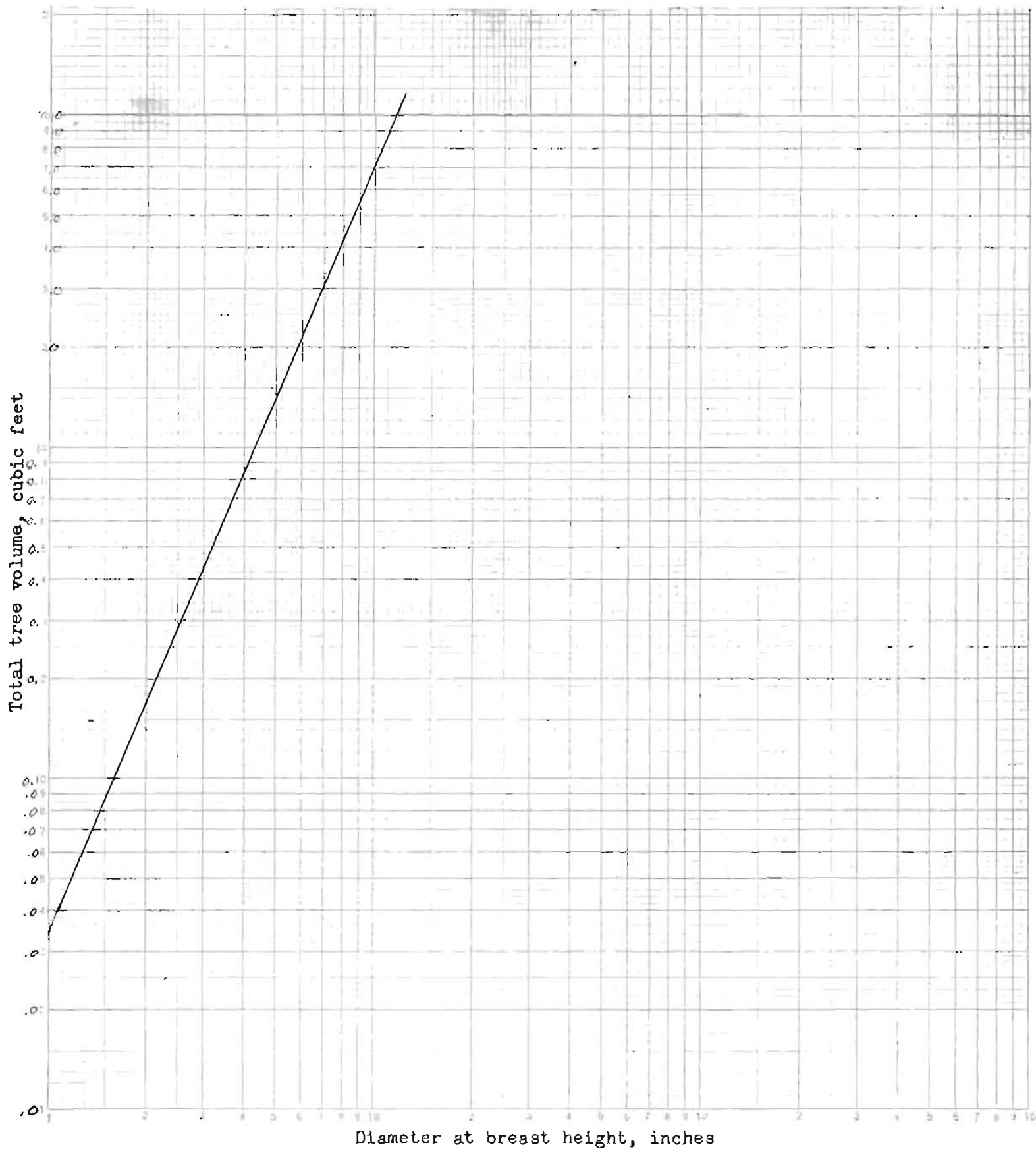
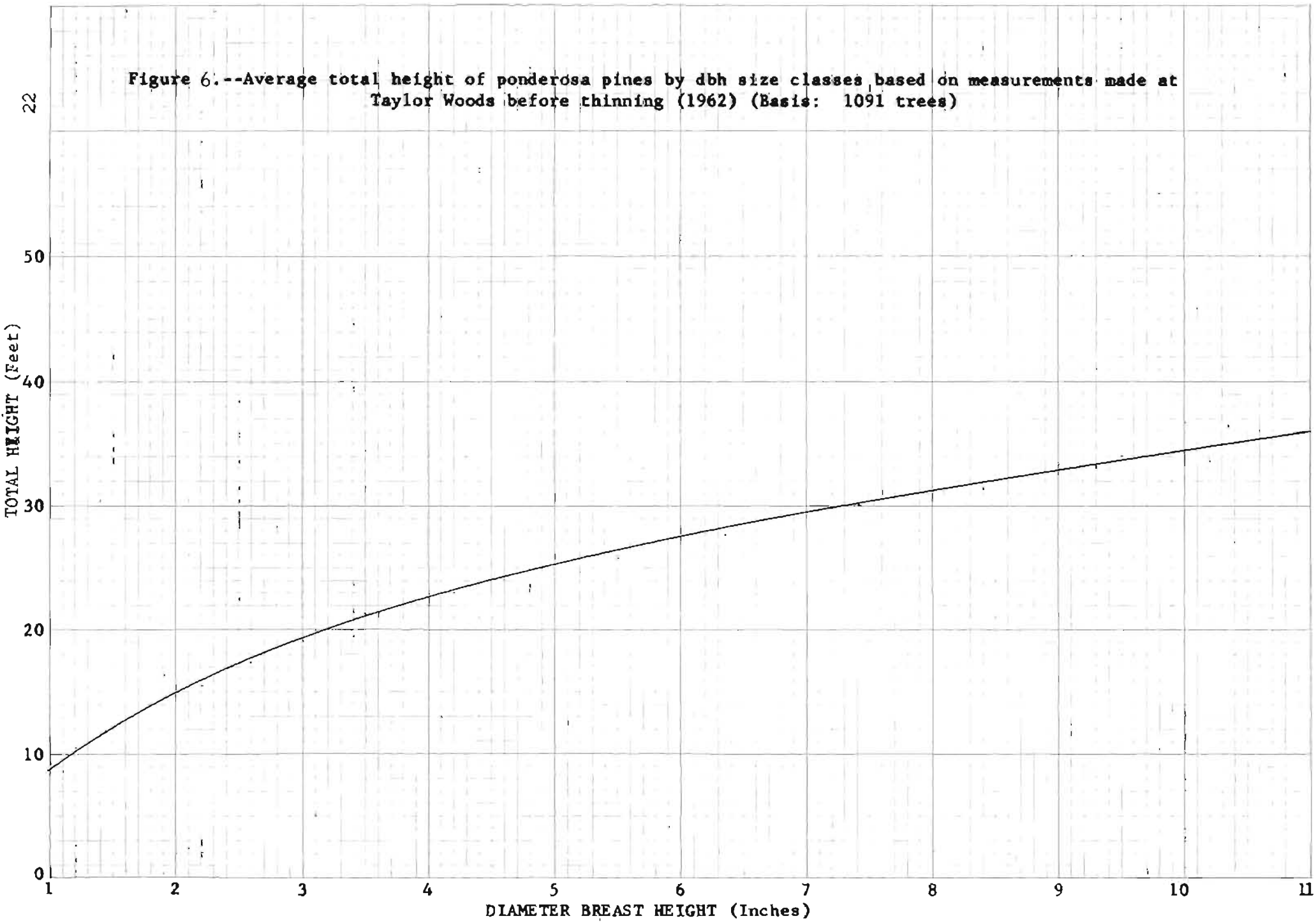


Figure 5.—Cubic foot volume of ponderosa pines 1.0 to 12.0 inches in diameter at breast height, Taylor Woods, 1962.

Table 7.--Local ponderosa pine cubic-foot volume table (total tree volume) from data plotted on logarithmic graph, Taylor Woods, 1962

D.b.h.	Volume	D.b.h.	Volume	D.b.h.	Volume	D.b.h.	Volume
1.0	0.04	4.0	0.87	7.0	3.18	10.0	7.17
1.1	.04	4.1	.92	7.1	3.29	10.1	7.34
1.2	.05	4.2	.97	7.2	3.40	10.2	7.50
1.3	.06	4.3	1.03	7.3	3.50	10.3	7.67
1.4	.07	4.4	1.08	7.4	3.62	10.4	7.84
1.5	.09	4.5	1.14	7.5	3.73	10.5	8.01
1.6	.10	4.6	1.20	7.6	3.84	10.6	8.18
1.7	.12	4.7	1.26	7.7	3.96	10.7	8.36
1.8	.13	4.8	1.33	7.8	4.08	10.8	8.53
1.9	.15	4.9	1.39	7.9	4.20	10.9	8.71
2.0	.17	5.0	1.46	8.0	4.32	11.0	8.89
2.1	.19	5.1	1.53	8.1	4.45	11.1	9.08
2.2	.21	5.2	1.60	8.2	4.57	11.2	9.26
2.3	.24	5.3	1.67	8.3	4.70	11.3	9.45
2.4	.26	5.4	1.75	8.4	4.83	11.4	9.64
2.5	.29	5.5	1.82	8.5	4.97	11.5	9.83
2.6	.32	5.6	1.90	8.6	5.10	11.6	10.02
2.7	.34	5.7	1.98	8.7	5.23	11.7	10.22
2.8	.38	5.8	2.06	8.8	5.37	11.8	10.41
2.9	.41	5.9	2.14	8.9	5.51	11.9	10.61
3.0	.44	6.0	2.23	9.0	5.65	12.0	10.82
3.1	.48	6.1	2.32	9.1	5.80		
3.2	.51	6.2	2.40	9.2	5.94		
3.3	.55	6.3	2.50	9.3	6.09		
3.4	.59	6.4	2.59	9.4	6.24		
3.5	.63	6.5	2.68	9.5	6.39		
3.6	.68	6.6	2.78	9.6	6.54		
3.7	.72	6.7	2.88	9.7	6.70		
3.8	.77	6.8	2.98	9.8	6.85		
3.9	.82	6.9	3.08	9.9	7.01		

Figure 6.--Average total height of ponderosa pines by dbh size classes based on measurements made at Taylor Woods before thinning (1962) (Basis: 1091 trees)



Subplot No.	Average tree height (Feet)	Subplot No.	Average tree height (Feet)
1	26	10	24
2	26	11	28
3	26	12	27
4	25	13	25
5	25	14	26
6	26	15	26
7	26	16	27
8	25	17	27
9	25	18	26
All subplots			26

AFTER TREATMENT MEASUREMENTS

All trees were tagged and measured prior to the 1963 growing season. Tags were nailed to the trees at breast height. Each tag indicates the subplot and tree number. Diameter measurements were recorded by full inch classes (1-in. class includes all trees from 1.0 to 1.9 in.; 2-in. class includes 2.0 to 2.9 in.; etc.).

Each tree was described as to condition class and amount of live crown. These after treatment data are summarized in table 8. Individual tree data will be entered on IBM punch cards.

FIRST YEAR LOSSES

1. Insect damage--none.

2. Snow bend or break--none.

3. Logging damage--a few leave trees were destroyed and several were slightly damaged when the few remaining sawtimber trees

Table 8.--After treatment statistics for growing stock levels study, Plot 11, Taylor Woods

Subplot number	Subplot basis						Per-acre basis				Tree condition			
	Stocking level (sq. ft.)	Average d.b.h. (inches)	Size of plot (acres)	Number of trees	Basal area present (sq. ft.)	Basal area needed (sq. ft.)	Number of trees	Volume (cu. ft.)	Basal area present (sq. ft.)	Basal area needed (sq. ft.)	Undamaged (percent)	Porcupine damage (percent)	Logging damage (percent)	Average amount of crown (percent)
1	100	5.5	0.80	299	48.7	51.6	374	696	60.8	64.5	92	6	2	50
2	120	5.4	.80	376	60.4	60.8	470	858	75.4	76.0	96	1	3	45
3	60	5.1	.80	218	30.8	28.8	272	425	38.5	35.7	91	8	1	40
4	150	4.7	1.00	672	81.5	80.7	672	889	81.5	80.7	88	10	2	43
5	120	4.7	.80	419	49.5	51.9	524	668	61.9	64.9	93	7	0	46
6	80	5.1	.82	290	40.5	38.5	354	545	49.4	47.0	94	6	0	43
7	30	5.2	1.24	164	24.0	22.6	132	213	19.4	18.2	87	9	4	44
8	150	4.7	1.00	703	83.1	80.7	703	882	83.1	80.7	92	7	1	41
9	100	4.7	.75	332	39.8	40.4	443	577	53.1	53.8	93	7	0	44
10	150	4.3	.75	524	53.9	54.2	699	761	71.8	72.3	92	8	0	42
11	80	6.1	.75	215	42.9	42.7	287	663	57.2	56.9	75	25	0	46
12	120	5.9	.75	325	60.8	62.6	433	936	81.0	83.5	62	36	2	45
13	100	5.0	.75	346	46.5	44.5	461	682	62.0	58.0	72	27	1	45
14	80	5.3	.75	256	39.5	36.8	341	587	52.7	49.0	83	15	2	42
15	60	5.5	.75	192	31.6	28.9	256	478	42.1	38.5	82	17	1	46
16	30	5.9	.75	90	17.4	15.4	120	268	23.2	20.6	82	18	0	53
17	60	5.9	.75	165	30.9	31.0	220	475	41.1	41.3	92	8	0	48
18	30	5.5	1.00	132	21.7	19.0	132	245	21.7	19.0	71	26	3	50
		5.1									85.5	13.4	1.2	45.2

were cut after the subplots were thinned. Less than a half square foot in basal area was lost. The damaged trees were left to determine recovery. These can be cut when the plots are scheduled for the next thinning.

4. Porcupine damage--no new damage noted.

PHOTOGRAPHS

A few preliminary photos were taken of the thinned plots to show the appearance of the different levels. Permanent photo points will be located in the fall of 1963 or spring of 1964 and made a part of this establishment report.

Figure 7.--Thirty basal area level, subplot 7.

Figure 8.--Sixty basal area level, subplot 17.

Figure 9.--Eighty basal area level, subplot 6 (Oct. 1962).

Figure 10.--One hundred basal area level, subplot 13 (Oct. 1962).

Figure 11.—One hundred twenty basal area level, subplot 12 (Oct. 1962).

Figure 12.--One hundred fifty basal area level, subplot 4 (Oct. 1962).