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VENEER RECOVERY FROM SECOND-GROWTH DOUGLAS-FIR

[*Pseudotsuga menziesii]

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ABSTRACT

Veneer was produced from 768 blocks cut from second-growth Douglas-fir from the Coast Ranges in northwestern Oregon. Timber was selected from a variety of stand ages and conditions. The recovery ratio was higher and the veneer grade lower for blocks peeled into 1/6-inch than for 1/10-inch veneer. Densely grown stands had a much higher veneer grade recovery than open grown stands, with no loss in recovery ratios. Block and log data are given in Scribner scale and gross cubic volume.

KEYWORDS: Veneers (recovery), stand age, Douglas-fir.

CONTENTS

INTRODUCTION

Second-growth stands of Douglas-fir are producing a rapidly increasing proportion of the commercial timber available in the Pacific Northwest. In the Coast Ranges, there are large areas of these 40- to 100-year-old stands. These are the result of a series of large fires and extensive early logging. Little information is available on the recovery of forest products to be expected from this resource.

In 1971, the Pacific Northwest Forest and Range Experiment Station, Region 6 of National Forest System, and the Oregon Office of the Bureau of Land Management, in cooperation with Riverside Lumber Company, Champion International, and the Miami Corporation, began a study of veneer and lumber recoveries from this resource. This report contains the veneer recovery information derived from the study. This information will be useful to mill operators and resource managers in allocating limited resources to their most appropriate use. The log and block information will serve as a guide to allocating cut logs and to making informed bucking decisions when veneer production is a possible use.

STUDY PROCEDURES

SAMPLE SELECTION

Initially, stands were chosen for variation in age, stocking, and management (table 1). Although originally considered as a variable, site within contiguous stands varied greatly by slope position and was dropped as a stand variable. Seven individual stands and 385 trees were selected (fig. 1).

Tree selection varied with stand age. In the 40-, 50-, and 60-year-old stands, we selected trees that would normally be removed in a commercial thinning. In the 70- to 100-year-old stands, we picked trees from the entire range available, equivalent to a final harvest cut. In all stands, individual trees were selected to sample the variation in size and tree condition which was available.

Once the timber sample for the study was chosen, the subsample for the veneer portion was selected. All trees smaller than 13.6-inch d.b.h. were excluded. The remaining trees were randomly sampled

Table 1.--Characteristics of sample stands, 1971

Stand age (years)	Veneer trees	Stand level of stocking 1/	Range in d.b.h.	Management
	Number		*--Inches---*	
60	0	Medium	--	None
80	16	Dense	14-25	None
80	17	Light	15-34	None
50	11	Dense	15-24	None
70	15	Light	14-34	None
100	25	Light	17-38	Commercially thinned 1959
40	9	Medium	14-22	Precommercially thinned 1959

1/ Rate at which stands closed, based on growth rate slowing to more than 6 rings per inch, at stump for dominant and codominant trees. Dense = less than 10 years, medium = 10-20 years, and light = more than 20 years.

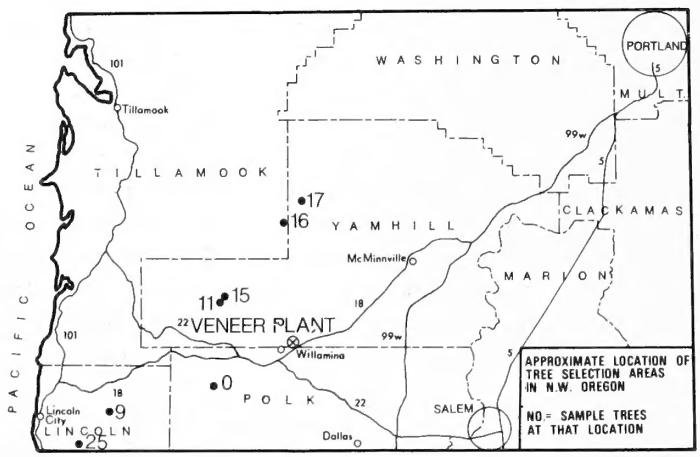

Figure 1.--Approximate location of sample areas.

to include one tree in three. Ninety-three trees, or 37 percent, were selected for the veneer subsample. The d.b.h. range of the veneer sample trees was from 14 to 30 inches.

LOGGING

Veneer trees were first marked so the cutter would know which trees to cut into peeler lengths. All the areas were cut in April of 1972. At the time of cutting, the log ends were tagged with the tree number, woods-length log number, and veneer block position within the log. All logs were taken to the Riverside Lumber Company log yard and held for sorting, scaling, and shipping to the veneer plant.

LOG SCALING AND GRADING

The woods-length veneer logs were scaled on the ground at the sawmill, then shipped to Champion International. Scaling was done by the U.S. Forest Service Regional check scaler, according to the Uniform Bureau Rules for West Side. Logs were graded by the rules for Douglas-fir logs in the standing tree.[1/] Only those defects visible on the log surface were considered in grading.

PRODUCTION FACILITIES

The Champion International Plant at Willamina, Oregon, produces a wide variety of plywood items, with a high proportion of sanded panels. Less than 10 percent of annual production is in sheathing grades. The species used is predominately Douglas-fir. The green-end equipment consists of cutoff saw, rosser-head debarker, geometric centering, automatic charger, 8-foot lathe with six trays, two clippers, and a fishtail[2/] saw. The 4-foot lathe and clipper line at the plant was not used in this study. All three of the steam-fired veneer dryers were used during the study.

BLOCK PREPARATIONS AND MEASUREMENT

The woods-length logs were brought to the study plant and dumped into the log pond the week before the study. The 225 woods-length logs were bucked into 823 nominal 8.6-foot blocks and debarked. Six woods-length logs produced no blocks large enough to peel. All logs smaller than 9 inches in diameter produced some blocks too small to peel--a total of 60. After bucking, blocks were tagged with the appropriate tree-log-block number, scaled by a Bureau of Land Management check scaler, and measured for cubic volume.

VENEER PRODUCTION

At the lathe, spur knives were set at 101 inches and blocks were peeled to a nominal 6.25-inch core. Veneer was identified by a color coding system which identified veneer by block, log, and tree.[3/]

Blocks were peeled in two thicknesses--299 blocks were peeled 1/10-inch thick (.104 green) and 469 blocks were peeled 1/6-inch thick (.174 green). The blocks were not sorted for peeling thickness. The 1/10-inch veneer was clipped for full sheets, half sheets, random widths, and fishtails. The 1/6-inch veneer was clipped for half sheets, random widths, and fishtails. The green veneer was separated

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[1/] Log grade descriptions for Douglas-fir. Form R-6 2440-19D (March 1965). Unpublished material on file at U.S. Forest Service, Region 6, Portland, Oregon.

[2/] Fishtail veneer is less-than-full-block length, produced during block roundup. This veneer was later cut to 4-foot length for use as crossbands.

[3/] Paul H. Lane. Identifying veneer in recovery studies. Forest Products Journal 21(6): 32-33. 1971.

into items and drying sorts. Study crewmembers re-marked the fishtails if the color codes would be cut off at the fishtail saw.

DRYING

Study material was dried in the three steam dryers. Dryer times and temperatures followed usual mill practice. Time in the dryer ranged from 7 minutes for 1/10-inch heartwood to 17 minutes for 1/6-inch sapwood. Maximum temperature was 360° to 370° F. During the approximately 48 dryer-hours necessary to dry all the study material, no veneer was lost from dryer jam or fire. Dryer loss on this study is below normal for veneer drying.

VENEER GRADING

Dry veneer was graded by company graders under the supervision of an American Plywood Association quality supervisor. All veneer was sorted into six grades--A, A Patch, B, B Patch, C, and D. A, B, C, and D grades are as described in P. S. 1-66.[4/] An A Patch 4- by 8-foot sheet of veneer could contain up to 14 patchable defects and B Patch up to 20 patchable defects. Narrower widths were allowed proportionately fewer defects.

VENEER TALLY

Each piece of study veneer was individually tallied by tree, log, and block. Full and half sheets were graded and tallied as they were sorted on the dry chain. Both 4- and 8-foot random-width sheets were pulled by grade and tallied later. Veneer with excessive moisture after drying was tallied as it was pulled without redrying. Dry veneer that was below grade was either pencil clipped[5/] or tallied separately as reject.

DATA COMPILATION AND STATISTICS

Recovery data were compiled by two computer programs specifically developed for processing veneer recovery data.[6/]

The cubic volume of veneer blocks is based on measurements of the debarked bucked blocks. The average diameter is to tenth of inch on both ends and the nominal length to tenth of foot. Volume was computed by the following formula:

$$\text{Gross cubic volume} = \frac{\pi L (D_s^2 + D_s D_l + D_l^2)}{4 \cdot 3 \cdot 144}$$

where π = constant 3.1416

D_s = average diameter small end

D_l = average diameter large end

L = nominal block length (8.6 feet).

Individual peeler block volumes were summed to provide log cubic volumes. Blocks which were not peeled are not included in the log cubic volume.

Veneer and reject cubic volume is the volume of dry untrimmed grade and reject veneer. Core volume is based on

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[4/] American Plywood Association. U.S. product standard P. S. 1-66 for softwood plywood--construction and industrial--together with DFPA grade--trademarks, 28 p., 1961.

[5/] Veneer pieces pulled out of the dryer which were below grade but predominately of a recognized veneer grade were tallied as random-width strips of the appropriate grade.

[6/] Richard O. Woodfin, Jr., and Mary Anne Mei. Computer program for calculating veneer recovery volume and value. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon, 39 p., 1967.

the green core diameter as dropped from the lathe. Residual volume includes spur, roundup, clipper, and dryer losses, and veneer shrinkage and is determined by subtraction.

RESULTS

The results of the study are contained primarily in recovery tables. The interpretation of these tables is highly dependent on pricing and production assumptions. The data are presented to allow the user to apply price and production input to the recovery data.

The No. 3 Peeler and Special Peeler block data have been combined for statistical analysis because of the limited number and small diameter range of these grades in the sample. Other than diameter, the grading specifications are identical. Block recovery will be discussed, followed by the woods-length logs.

BLOCK RECOVERY AND PEELING THICKNESS

Veneer grade.-- Veneer was peeled in two thicknesses, 1/10-inch and 1/6-inch, during the study. A different clipping pattern was used for each. The two groups had similar block grade and diameter distributions (appendix 1). The 1/10-inch veneer was clipped to obtain the maximum full sheets of grades A through C. Normally the sapwood and outer portion of the heartwood were clipped into full sheets, and the inner heartwood was clipped into half sheets. The 1/6-inch veneer was clipped to produce maximum half sheets of grades D and better. There is a marked difference in recovery by veneer item and grade (tables 2 and 3) due to clipping practice.

The total percent of veneer in grades A through C was higher for the 1/10-inch peel (59 percent) than for the 1/6-inch peel (52 percent). Linear regression analyses were run by block grade to test whether the sources of the difference were block grade and diameter or mill processes. Appendix 2 contains the percent by veneer grade, item, and block grade.

Veneer grade recovery by block grade and diameter.-- The recovery of veneer grades A through C varied by block diameter (table 3) and block grade. For the combined No. 3 Peeler and Special Peeler block grades there was no difference in veneer grade recovery between the two peeling thicknesses and no change related to block diameter. Veneer recovery was consistently 82-percent grades A through C regardless of size or clipping pattern. For blocks graded No. 2 or No. 3 Sawmill, there was a significant[7/] correlation of veneer grade recovery with block diameter (fig. 2). For blocks peeled 1/10-inch,

7/ Significant correlation as used is at the 5-percent probability level. Highly significant is the 1-percent probability level.

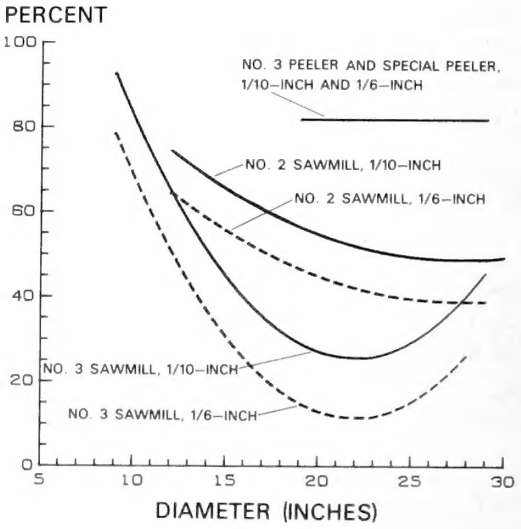

Figure 2.--Veneer grades A through C as a percent of total graded veneer, by block grade and peeling thickness over diameter.

Table 2.--Volume and percent of veneer recovery, by veneer grade, item, and thickness

Veneer grade	Veneer item									
	Full sheets		Half sheets		Random width, 8 feet		Random width, 4 feet		Total	
	Volume, 3/8-inch basis	Percent	Volume, 3/8-inch basis	Percent	Volume, 3/8-inch basis	Percent	Volume, 3/8-inch basis	Percent	Volume, 3/8-inch basis	Percent
	Square feet		*Square feet*		*Square feet*		*Square feet*		*Square feet*	
					1/10-INCH VENEER					
A	88	0.13	0	--	43	0.06	0	--	131	0.19
A Patch	117	.17	0	--	11	.02	0	--	128	.19
B	20	.03	0	--	856	1.25	0	--	876	1.28
B Patch	1,478	2.15	456	0.66	11	.02	0	--	1,945	2.83
C	18,404	26.82	5,919	8.62	10,425	15.19	2,497	3.64	37,245	54.27
D	13,797	20.10	7,213	10.51	6,081	8.86	1,213	1.77	28,304	41.24
Total	33,904	49.40	13,588	19.80	17,427	25.39	3,710	5.41	68,629	1/ 100.00
Reject 2/	1,256	1.83	2,570	3.74	1,761	2.57	0	0	5,587	8.14
					1/6-INCH VENEER					
A	0	--	0	--	0	--	0	--	0	--
A Patch	0	--	0	--	0	--	0	--	0	--
B	0	--	68	0.06	578	0.52	0	--	646	0.58
B Patch	0	--	5,238	4.71	0	--	0	--	5,238	4.71
C	0	--	37,645	33.88	11,545	10.39	2,509	2.26	51,699	46.53
D	0	--	38,726	34.85	12,463	11.22	2,345	2.11	53,534	48.18
Total	0	--	81,677	73.50	24,586	22.13	4,854	4.37	111,117	1/ 100.00
Reject 2/	0	--	2,122	1.91	7,446	6.70	66	.06	9,634	8.65

1/ Cross totals may not add due to rounding.

2/ Reject expressed as a percent of grade veneer.

Table 3.--Percent of veneer recovery by veneer grade and thickness, and diameter of all sound blocks

Block diameter (inches)	Number of blocks	Total veneer, 3/8-inch basis	Veneer grade					
			A	A Patch	B	B Patch	C	D
		Square feet	*Percent*					
			1/10-INCH VENEER					
9	1	22	0	0	0	0	77.3	22.7
10	14	768	0	0	2.2	0	67.9	29.9
11	20	1,516	0	0	1.1	.7	82.0	16.2
12	35	3,339	0	0	.4	1.2	69.7	28.7
13	26	3,230	.1	0	.4	.3	77.3	21.9
14	32	4,820	0	0	.4	0	71.9	27.7
15	32	5,613	0	0	.4	.3	68.3	31.0
16	22	4,781	0	0	.3	.6	71.2	27.9
17	16	3,688	0	0	.2	.3	60.8	38.7
18	16	4,385	0	.2	.3	.6	41.0	57.9
19	17	5,251	.2	0	.4	.9	53.5	45.0
20	16	5,482	.2	0	1.0	2.0	44.4	52.4
21	10	4,198	.1	.2	2.0	4.5	60.3	32.9
22	14	5,992	.1	.2	1.8	3.4	44.3	50.2
23	8	4,005	.4	.5	3.5	7.9	33.6	54.1
24	7	2,868	2.4	1.4	2.6	7.5	39.2	46.9
25	6	3,236	.3	1.2	4.4	7.7	32.1	54.3
26	2	1,243	.2	0	2.6	5.1	7.6	84.5
27	0	--	--	--	--	--	--	--
28	1	836	0	0	4.1	4.1	17.9	73.9
29	3	2,393	0	0	.2	.4	50.9	48.5
30	1	963	0	0	4.8	38.4	50.4	6.4
Total or average	299	68,629	.2	.2	1.3	2.8	54.3	41.2
			1/6-INCH VENEER					
9	1	42	0	0	0	0	76.2	23.8
10	15	1,047	0	0	0	0	56.3	43.7
11	50	3,908	0	0	0	.6	60.2	39.2
12	56	5,254	0	0	0	.6	61.9	37.5
13	51	6,022	0	0	.1	1.4	63.2	35.3
14	43	6,418	0	0	.3	2.4	55.9	41.4
15	41	7,363	0	0	.2	.2	46.5	53.1
16	38	8,814	0	0	.1	1.0	46.2	52.7
17	32	8,904	0	0	0	1.5	49.2	49.3
18	28	8,954	0	0	.6	4.5	49.8	45.1
19	23	7,505	0	0	.3	2.0	41.1	56.6
20	24	9,437	0	0	.6	8.7	49.7	41.0
21	10	4,435	0	0	.8	2.1	43.5	53.6
22	11	4,619	0	0	.2	1.5	33.1	65.2
23	8	4,483	0	0	.1	3.4	36.1	60.4
24	10	5,651	0	0	.7	9.6	37.5	52.2
25	8	5,198	0	0	.7	11.7	52.5	35.1
26	7	3,976	0	0	1.5	16.0	29.8	52.7
27	5	2,426	0	0	1.3	4.9	20.4	73.4
28	6	4,690	0	0	1.6	10.6	32.1	55.7
29	2	1,971	0	0	8.5	31.8	43.6	16.1
Total or average	469	111,117	0	0	.6	4.7	46.5	48.2

the percent of A through C grade veneer was consistently higher than for blocks peeled 1/6-inch, regardless of diameter. The difference was 9.9 percent for block grade No. 2 Sawmill and 14.2 percent for block grade No. 3 Sawmill. Statistically, these differences were highly significant. Appendix 3 contains the summary by diameter on which this analysis was based.

Block recovery ratios.-- Recovery ratio is square feet of veneer on a 3/8-inch basis per board foot of net Scribner scale. The recovery ratio of all noncull blocks (table 4) is lower for 1/10-inch veneer (2.60) than for 1/6-inch veneer (2.72). Regression analysis showed there was a significant correlation between diameter and recovery ratio (fig. 3) and that the 1/10-inch recovery ratio was 0.16 lower for all diameters. This difference is highly significant. Appendix 4 contains the basic data by grade and diameter class.

Cubic volumes of veneer, reject veneer, core, and residual were analyzed as a percent of block cubic volume for both peeling thicknesses (figs. 4 and 5). The percent of the block cubic volume (table 4) varied with diameter for veneer, reject veneer, and core. The residual component stayed constant for all diameters.

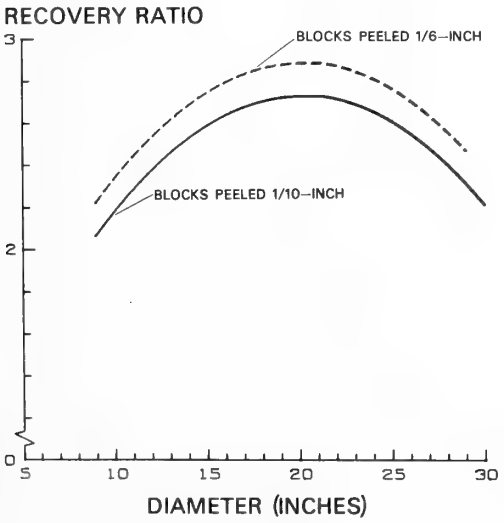

Figure 3.--Recovery ratio, square feet of veneer (3/8-inch basis) per board foot of net Scribner block scale by diameter.

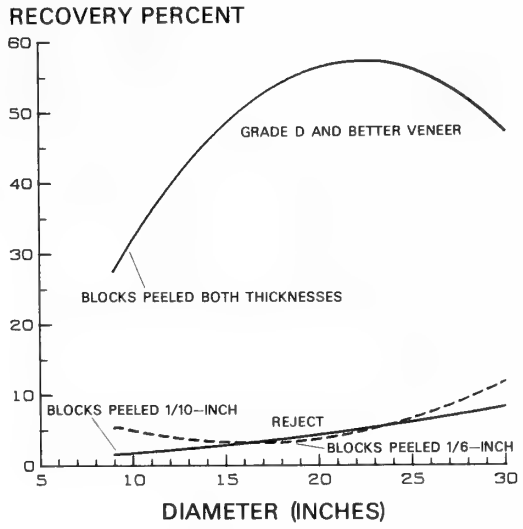

Figure 4.--Veneer cubic recovery as a percent of cubic volume.

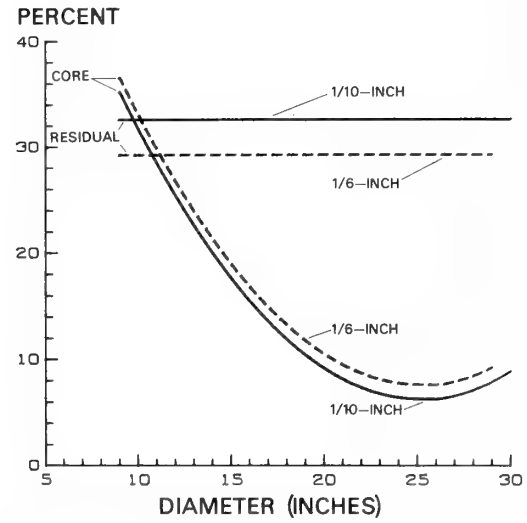

Figure 5.--Cubic volume of nonveneer components as a percent of block cubic volume residual; includes chippable volume, shrinkage, and waste.

Figure 6 gives the cumulative volumes for 1/10- and 1/6-inch veneer.

Between veneer thicknesses, there was no significant difference in the recovery ratios for veneer but a significant difference in the ratios for reject veneer (fig. 4). This difference varied with diameter class. Peeling 1/10-inch veneer resulted in 1.3 percent less of block volume in core and 3.4 percent more of block volume in the residual portion (fig. 5). These differences were significant and consistent for all diameters. The basic data for this analysis are summarized in table 4. Appendix 4 contains summary by block grade and diameter.

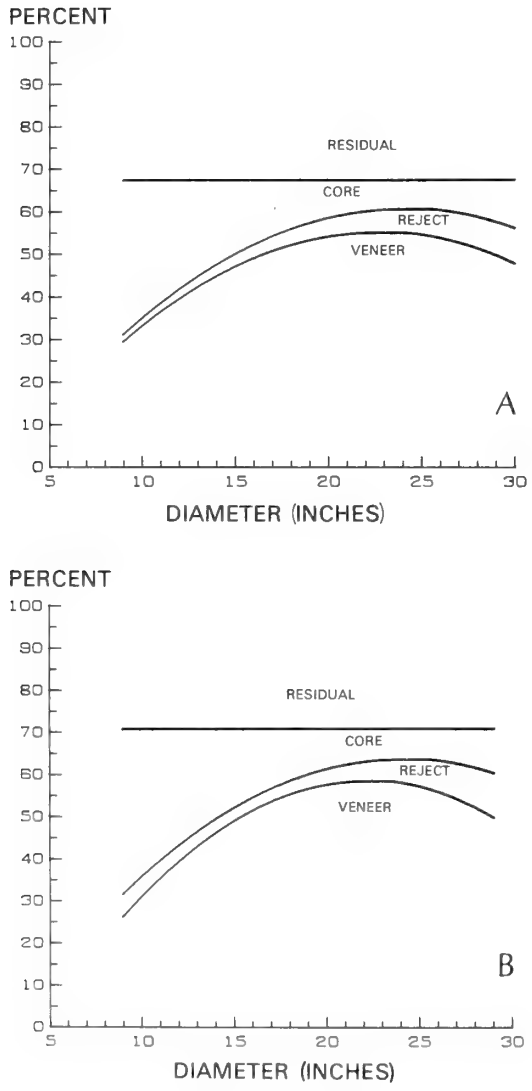

Figure 6.--Cumulative cubic volume of block components as a percent of block cubic volume by block grade; A, 1/10-inch veneer, B, 1/6-inch veneer.

RECOVERY BY LOG

Veneer recovery by log is reported with both veneer thicknesses combined. Log recovery totals are slightly higher than block recovery totals. The six cull blocks came from otherwise sound logs, and the veneer from these blocks is included in log totals.

Cubic volumes for logs are the sum of the block volumes and do not include the volume of blocks which were not peeled. The Scribner scale is the long log scale before bucking and does include blocks not peeled.

Veneer grade and item.--The veneer recovery by veneer grade and item is contained in table 5. Appendix 5 contains the volumes by grade and item for individual log grades. The high percentage of half sheets (53 percent) is largely a result of the clipping pattern followed with 1/6-inch veneer.

Veneer grade recovery by log grade and diameter.-- The veneer recovery percent in grades A through C veneer varied widely by log grade (table 6). Regression analyses were run on each grade and on all log grades combined. For log grade No. 3 Sawmill, there was a significant correlation between percent of A through C grade veneer and log diameter

Table 4.--Volume and percent of veneer recovery by diameter of all sound blocks

Block diameter (inches)	Number of blocks	Scribner scale		Percent sound	Veneer, 3/8-inch basis	Recovery ratio	Block volume	Veneer		Reject		Core		Residual	
		Gross	Net					Volume	Percent	Volume	Percent	Volume	Percent	Volume	Percent
		--Board feet--			*Square feet*		*----Cubic feet----*			*Cubic feet*		*Cubic feet*		*Cubic feet*	
							1/10-INCH VENEER								
9	1	20	20	100	22	1.10	5.86	0.67	11.4	0.11	1.9	1.85	31.6	3.23	1/55.1
10	14	420	420	100	768	1.83	77.79	23.35	30.0	1.26	1.6	26.13	33.6	27.05	34.8
11	20	600	600	100	1,516	2.53	123.88	45.79	37.0	2.68	2.2	37.02	29.9	38.39	31.0
12	35	1,400	1,400	100	3,339	2.38	259.02	101.11	39.0	9.04	3.5	62.51	24.1	86.36	33.3
13	26	1,300	1,280	98	3,230	2.52	223.92	97.73	43.6	3.80	1.7	47.52	21.2	74.87	33.4
14	32	1,920	1,900	99	4,820	2.54	309.68	145.84	47.1	6.73	2.2	54.84	17.7	102.27	33.0
15	32	2,240	2,240	100	5,613	2.51	358.55	170.05	47.4	11.04	3.1	57.65	16.1	119.81	33.4
16	22	1,760	1,750	99	4,781	2.73	280.56	144.80	51.6	6.32	2.2	38.14	13.6	91.30	32.5
17	16	1,440	1,360	94	3,688	2.71	235.95	111.82	47.4	7.42	3.1	35.34	15.0	81.37	34.5
18	16	1,760	1,720	98	4,385	2.55	258.59	133.07	51.5	9.56	3.7	27.88	10.8	88.08	34.1
19	17	2,040	1,890	93	5,251	2.78	306.20	159.11	52.0	8.79	2.9	44.87	14.6	93.43	30.5
20	16	2,240	2,080	93	5,482	2.64	323.90	166.08	51.3	12.82	4.0	44.94	13.9	100.06	30.9
21	10	1,500	1,410	94	4,198	2.98	212.87	127.29	59.8	6.18	2.9	17.79	8.4	61.61	28.9
22	14	2,380	2,280	96	5,992	2.63	331.93	181.65	54.7	23.10	7.0	25.31	7.6	101.87	30.7
23	8	1,520	1,480	97	4,005	2.71	210.53	121.47	57.7	11.04	5.2	14.03	6.7	63.99	30.4
24	7	1,470	1,290	88	2,868	2.22	192.76	86.93	45.1	24.58	12.8	13.18	6.8	68.07	35.3
25	6	1,380	1,340	97	3,236	2.41	198.32	98.05	49.4	14.13	7.1	12.75	6.4	73.39	37.0
26	2	500	480	96	1,243	2.59	74.04	37.65	50.8	2.19	3.0	10.53	14.2	23.67	32.0
27	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
28	1	290	220	76	836	3.80	47.91	25.33	52.9	2.57	5.4	3.07	6.4	16.94	35.4
29	3	930	890	96	2,393	2.69	120.58	72.49	60.1	4.70	3.9	5.23	4.3	38.16	31.6
30	1	330	330	100	963	2.92	49.33	29.18	59.2	.74	1.5	2.27	4.6	17.14	34.8
Total or average	299	27,440	26,380	96	68,629	2.60	4,202.17	2,079.46	49.5	168.80	4.0	582.85	13.9	1,371.06	32.6
							1/6-INCH VENEER								
9	1	20	20	100	42	2.10	5.07	1.26	24.8	.04	.8	2.02	39.8	1.75	34.5
10	15	440	440	100	1,047	2.38	88.51	31.31	35.4	3.10	3.5	28.86	32.6	25.24	28.5
11	50	1,510	1,480	98	3,908	2.64	320.23	16.88	36.5	14.24	4.4	98.77	30.8	90.34	28.2
12	56	2,240	2,180	97	5,254	2.41	412.87	156.77	38.0	17.57	4.3	111.52	27.0	127.01	30.8
13	51	2,550	2,490	98	6,022	2.42	435.51	179.66	41.2	16.76	3.8	105.82	24.3	133.27	30.6
14	43	2,580	2,490	97	6,418	2.58	427.27	191.57	44.8	13.29	3.1	88.59	20.7	133.82	31.3
15	41	2,870	2,840	99	7,363	2.59	459.83	219.76	47.8	14.45	3.1	80.85	17.6	144.77	31.5
16	38	3,040	3,010	99	8,814	2.93	493.72	262.78	53.2	12.78	2.6	76.96	15.6	141.20	28.6
17	32	2,880	2,830	98	8,904	3.15	472.57	265.83	56.2	12.86	2.7	68.01	14.4	125.87	26.6
18	28	3,080	3,020	98	8,954	2.96	455.27	267.24	58.7	11.09	2.4	55.46	12.2	121.48	26.7
19	23	2,760	2,630	95	7,505	2.85	415.79	223.90	53.8	17.58	4.2	66.00	15.9	108.31	26.0
20	24	3,360	3,340	99	9,437	2.83	489.53	281.44	57.5	23.37	4.8	47.25	9.6	137.47	28.1
21	10	1,500	1,440	96	4,435	3.08	229.59	132.06	57.5	4.80	2.1	20.77	9.0	71.96	31.3
22	11	1,870	1,870	100	4,619	2.47	262.63	137.86	52.5	19.44	7.4	22.59	8.6	82.74	31.5
23	8	1,520	1,520	100	4,483	2.95	207.74	133.51	64.3	5.93	2.8	17.28	8.3	51.02	24.6
24	10	2,100	2,100	100	5,651	2.69	291.40	168.52	57.8	12.92	4.4	21.09	7.2	88.87	30.5
25	8	1,840	1,780	97	5,198	2.92	261.91	154.95	59.2	7.76	3.0	20.50	7.8	78.70	30.0
26	7	1,750	1,750	100	3,976	2.27	247.84	118.53	47.8	29.59	11.9	16.28	6.6	83.44	33.7
27	5	1,350	1,350	100	2,426	1.80	183.74	72.38	39.4	33.56	18.3	13.35	7.3	64.45	35.1
28	6	1,740	1,660	95	4,690	2.83	242.46	139.90	57.7	14.74	6.1	14.36	5.9	73.46	30.3
29	2	620	620	100	1,971	3.18	88.47	58.76	66.4	1.25	1.4	4.48	5.1	23.98	27.1
Total or average	469	41,620	40,860	98	111,117	2.72	6,491.95	3,314.87	51.1	287.12	4.4	980.81	15.1	1,909.15	29.4

1/ Cross totals may not add to 100.0 percent due to rounding.

Table 5.--Volume and percent of veneer recovery by grade and item

Veneer grade	Veneer item									
	Full sheets		Half sheets		Random width, 8 feet		Random width, 4 feet		Total	
	Volume, 3/8-inch basis	Percent	Volume, 3/8-inch basis	Percent	Volume, 3/8-inch basis	Percent	Volume, 3/8-inch basis	Percent	Volume, 3/8-inch basis	Percent
	Square feet		*Square feet*		*Square feet*		*Square feet*		*Square feet*	
A	88	0.05	0	--	43	0.02	0	--	131	0.07
A Patch	117	.06	0	--	11	.01	0	--	128	.07
B	20	.01	68	0.04	1,466	.81	0	--	1,554	.86
B Patch	1,478	.82	5,694	3.16	11	.01	0	--	7,183	3.98
C	18,404	10.21	43,701	24.24	22,034	12.22	5,077	2.82	89,216	49.48
D	13,797	7.65	46,065	25.55	18,656	10.35	3,583	[illegible]	82,101	45.53
Total	33,904	18.80	95,528	52.98	42,221	23.42	8,660	4.80	180,313	1/100.00
Reject 2/	1,256	.70	4,731	2.62	9,263	5.14	66	.04	15,316	8.49

1/ Cross totals may not add due to rounding.

2/ Reject expressed as a percent of grade veneer.

Table 6.--Veneer grade recovery by log grade and diameter

Log diameter (inches)	Number of logs	Volume, 3/8-inch basis	Veneer grade					
			A	A Patch	B	B Patch	C	D
		Square feet	*Percent*					
			SPECIAL PEELER					
18	1	1,659	0	0	2.8	1.0	81.7	14.5
19	0	--	--	--	--	--	--	--
20	0	--	--	--	--	--	--	--
21	2	4,396	2.0	.9	4.4	8.8	62.2	21.7
Total or average	3	6,055	1.4	.6	3.9	6.7	67.7	19.7
			NO. 2 SAWMILL					
12	18	9,312	0	0	.4	1.2	55.5	42.9
13	17	9,985	0	0	.6	1.0	67.5	30.9
14	21	18,244	.1	0	.1	.8	56.5	42.4
15	10	8,077	0	0	0	.8	68.7	30.5
16	15	15,655	0	0	.3	.9	37.9	60.9
17	7	8,936	.1	.1	.8	4.3	55.6	39.1
18	9	13,692	0	0	.7	7.9	51.5	39.9
19	10	14,001	0	0	.7	1.1	42.8	55.4
20	4	8,601	0	0	.2	2.3	51.0	46.5
21	3	6,366	.2	1.1	4.1	21.1	39.9	33.6
22	3	6,583	0	0	1.2	15.2	44.9	38.7
23	1	2,940	.1	0	2.7	3.5	10.0	83.7
24	3	5,306	0	0	1.1	3.7	23.4	71.8
25	1	2,230	0	0	2.5	20.1	27.8	49.6
26	0	--	--	--	--	--	--	--
27	1	3,806	0	0	5.0	17.3	34.9	42.8
28	1	2,601	0	0	1.9	14.6	56.8	26.7
Total or average	124	136,335	0	.1	.9	4.8	48.8	45.4
			NO. 3 SAWMILL					
6	1	49	0	0	0	0	42.9	57.1
7	4	781	0	0	.9	0	55.1	44.0
8	13	2,131	0	0	1.0	1.2	56.6	41.2
9	17	4,228	0	0	.2	0	55.3	44.5
10	24	6,947	0	0	.1	.5	69.7	29.7
11	26	12,347	0	0	.1	1.0	59.9	39.0
12	0	--	--	--	--	--	--	--
13	0	--	--	--	--	--	--	--
14	0	--	--	--	--	--	--	--
15	2	1,925	0	0	0	0	16.3	83.7
16	0	--	--	--	--	--	--	--
17	1	1,471	0	0	0	0	12.6	87.4
18	0	--	--	--	--	--	--	--
19	1	1,304	0	0	0	0	15.8	84.2
20	0	--	--	--	--	--	--	--
21	0	--	--	--	--	--	--	--
22	1	1,131	0	.6	2.7	0	7.3	89.4
23	0	--	--	--	--	--	--	--
24	2	4,640	0	0	.2	2.2	31.8	65.8
25	0	--	--	--	--	--	--	--
26	0	--	--	--	--	--	--	--
27	1	969	0	0	0	0	4.2	95.8
Total or average	93	37,923	0	0	.3	.7	48.9	50.1
			ALL GRADES					
6	1	49	0	0	0	0	42.9	57.1
7	4	781	0	0	.9	0	55.1	44.0
8	13	2,131	0	0	1.0	1.2	56.6	41.2
9	17	4,228	0	0	.2	0	55.3	44.5
10	24	6,947	0	0	.1	.5	69.7	29.7
11	26	12,347	0	0	.1	1.0	59.9	39.0
12	18	9,312	0	0	.4	1.2	55.5	42.9
13	17	9,985	0	0	.6	1.0	67.5	30.9
14	21	18,244	.1	0	.1	.8	56.6	42.4
15	12	10,002	0	0	0	.6	58.6	40.8
16	15	15,655	0	0	.3	.9	37.9	60.9
17	8	10,407	.1	.1	.7	3.7	49.5	45.9
18	10	15,351	0	0	1.0	7.2	54.6	37.2
19	11	15,305	0	0	.7	1.0	40.5	57.8
20	4	8,601	0	0	.2	2.3	51.0	46.5
21	5	10,762	.9	1.0	4.2	16.1	49.1	28.7
22	4	7,714	0	.1	1.4	13.0	39.4	46.1
23	1	2,940	.1	0	2.7	3.5	10.0	83.7
24	5	9,946	0	0	.6	3.0	27.3	69.1
25	1	2,230	0	0	2.5	20.1	27.8	49.6
26	0	--	--	--	--	--	--	--
27	2	4,775	0	0	4.0	13.8	28.7	53.5
28	1	2,601	0	0	1.9	14.6	56.8	26.7
Total or average	220	180,313	.1	.1	.9	4.0	49.4	45.5

(fig. 7). For the Special Peeler and No. 2 Sawmill grades there was no correlation with diameter. The correlation with diameter for all log grades was largely a result of No. 3 Sawmill logs.

Log recovery ratio.-- The recovery ratio of square feet of dry untrimmed veneer (3/8-inch basis) per board foot of net log scale showed a significant correlation with diameter (fig. 8) when all log grades were combined. The drop in recovery ratio for large-diameter logs is due to the low recovery in large No. 3 Sawmill logs (table 7) and the large percentage of this grade in the upper diameters. No. 2 Sawmill logs, which would comprise a larger proportion of a random sample, had an average recovery ratio of 3.27 which did not change with diameter.

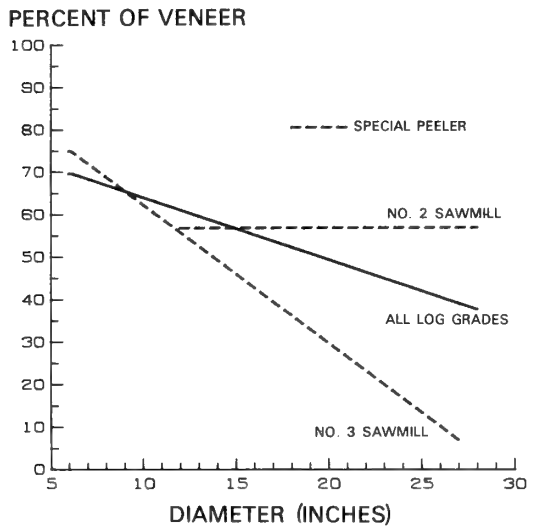

Figure 7.--Veneer grades A through C as a percent of total veneer for all log grades and for individual log grades.

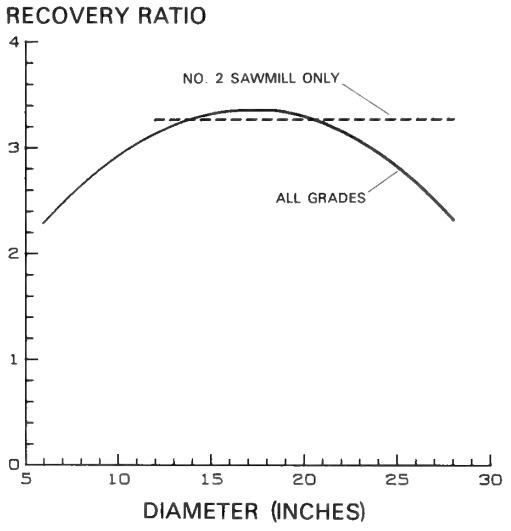

Figure 8.--Recovery ratio, square feet of dry, untrimmed veneer (3/8-inch basis) per board foot of net Scribner log scale by diameter.

Table 7.--Volume and percent of veneer recovery by block diameter and log grade

Block diameter (inches)	Number of blocks	Scribner scale		Percent sound	Veneer, 3/8-inch basis	Recovery ratio	Block volume	Veneer		Reject		Core		Residual	
		Gross	Net					Volume	Percent	Volume	Percent	Volume	Percent	Volume	Percent
		---Board feet---			*Square feet*		*---Cubic feet---*			*Cubic feet*		*Cubic feet*		*Cubic feet*	
							SPECIAL PEELER								
18	1	450	450	100	1,659	3.69	78.50	49.46	63.0	.44	0.6	8.02	10.2	20.58	26.2
19	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
21	2	1,300	1,280	98	4,396	3.43	214.13	133.29	62.2	9.33	4.4	14.06	6.6	57.45	26.8
Total or average	3	1,750	1,730	99	6,055	3.50	292.63	182.75	62.4	9.77	3.3	22.08	7.5	78.03	26.7
							NO. 2 SAWMILL								
12	18	2,790	2,700	97	9,312	3.45	609.80	279.40	45.8	13.86	2.3	127.18	20.9	189.36	31.0
13	17	3,480	3,420	98	9,985	2.92	649.72	299.63	46.1	15.29	2.4	127.95	19.7	206.85	31.8
14	21	5,300	5,180	98	18,244	3.52	1,051.43	546.32	52.0	25.03	2.4	175.26	16.7	304.82	29.0
15	10	2,850	2,690	94	8,077	3.00	503.81	244.09	48.4	15.37	3.0	77.08	15.3	167.27	33.2
16	15	4,780	4,710	99	15,655	3.32	858.64	469.49	54.7	25.79	3.0	116.26	13.5	247.10	28.8
17	7	2,640	2,560	97	8,936	3.49	487.53	268.35	55.0	17.44	3.6	63.19	13.0	138.55	28.4
18	9	4,300	4,080	95	13,692	3.36	737.31	410.39	55.7	21.71	2.9	92.72	12.6	212.49	28.8
19	10	5,070	4,590	91	14,001	3.05	839.95	421.19	50.1	59.57	7.1	86.20	10.3	272.99	32.5
20	4	2,660	2,660	100	8,601	3.23	405.01	258.28	63.8	6.97	1.7	31.61	7.8	108.15	26.7
21	3	1,950	1,910	98	6,366	3.33	335.44	190.75	56.9	17.02	5.1	25.05	7.5	102.62	30.6
22	3	1,960	1,850	94	6,583	3.56	328.54	196.25	59.7	9.18	2.8	24.17	7.4	98.94	30.1
23	1	800	710	89	2,940	4.14	144.27	89.11	61.8	4.92	3.4	8.48	5.9	41.76	28.9
24	3	1,950	1,640	84	5,306	3.24	314.46	158.24	50.3	25.59	8.1	23.34	7.4	107.29	34.1
25	1	980	920	94	2,230	2.42	152.42	66.53	43.6	24.14	15.8	9.87	6.5	51.88	34.0
26	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
27	1	1,160	1,160	100	3,806	3.28	162.96	113.50	69.6	2.12	1.3	8.62	5.3	38.72	23.8
28	1	950	950	100	2,601	2.74	127.99	78.78	61.6	4.61	3.6	5.67	4.4	38.93	30.4
Total or average	124	43,620	41,730	96	136,335	3.27	7,709.28	4,090.30	53.0	288.61	3.7	1,002.65	13.0	2,327.72	30.2
							NO. 3 SAWMILL								
6	1	60	60	100	49	.82	5.96	1.45	24.3	.24	4.0	1.95	32.7	2.32	38.9
7	4	320	310	97	781	2.52	71.82	23.52	32.7	2.64	3.7	18.15	25.3	27.51	38.3
8	13	830	820	99	2,131	2.60	185.06	64.25	34.7	5.35	2.9	52.72	28.5	62.74	33.9
9	17	1,600	1,510	94	4,228	2.80	352.81	126.99	36.0	7.21	2.0	95.17	27.0	123.44	35.0
10	24	2,480	2,470	100	6,947	2.81	524.87	208.33	39.7	22.60	4.3	141.71	27.0	152.23	29.0
11	26	3,980	3,930	99	12,347	3.14	870.84	370.18	42.5	37.53	4.3	192.17	22.1	270.96	31.1
12	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
14	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
15	2	620	620	100	1,925	3.10	130.09	57.56	44.2	6.50	5.0	16.69	12.8	49.34	37.9
16	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17	1	390	390	100	1,471	3.77	82.45	44.55	54.0	6.54	7.9	6.89	8.4	24.47	29.7
18	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
19	1	390	390	100	1,304	3.34	71.82	38.93	54.2	3.46	4.8	5.93	8.3	23.50	32.7
20	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
21	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
22	1	710	710	100	1,131	1.59	117.08	34.24	29.2	24.34	20.8	8.02	6.8	50.48	43.1
23	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24	2	1,720	1,660	97	4,640	2.80	270.55	139.45	51.5	12.15	4.5	24.64	9.1	94.31	34.9
25	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
26	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
27	1	890	810	91	969	1.20	103.89	28.87	27.8	31.87	30.7	8.26	8.0	34.89	33.6
Total or average	93	13,990	13,680	98	37,923	2.77	2,787.24	1,138.32	40.8	160.43	5.8	572.30	20.5	916.19	32.9
							ALL GRADES								
6	1	60	60	100	49	.82	5.96	1.45	24.3	.24	4.0	1.95	32.7	2.32	38.9
7	4	320	310	97	781	2.52	71.82	23.52	32.7	2.64	3.7	18.15	25.3	27.51	38.3
8	13	830	820	99	2,131	2.60	185.06	64.25	34.7	5.35	2.9	52.72	28.5	62.74	33.9
9	17	1,600	1,510	94	4,228	2.80	352.81	126.99	36.0	7.21	2.0	95.17	27.0	123.44	35.0
10	24	2,480	2,470	100	6,947	2.81	524.87	208.33	39.7	22.60	4.3	141.71	27.0	152.23	29.0
11	26	3,980	3,930	99	12,347	3.14	870.84	370.18	42.5	37.53	4.3	192.17	22.1	270.96	31.1
12	18	2,790	2,700	97	9,312	3.45	609.80	279.40	45.8	13.86	2.3	127.18	20.9	189.36	31.0
13	17	3,480	3,420	98	9,985	2.92	649.72	299.63	46.1	15.29	2.4	127.95	19.7	206.85	31.8
14	21	5,300	5,180	98	18,244	3.52	1,051.43	546.32	52.0	25.03	2.4	175.26	16.7	304.82	29.0
15	12	3,470	3,310	95	10,002	3.02	633.90	301.65	47.6	21.87	3.4	93.77	14.8	216.61	34.2
16	15	4,780	4,710	99	15,655	3.32	858.64	469.49	54.7	25.79	3.0	116.26	13.5	247.10	28.8
17	8	3,030	2,950	97	10,407	3.53	569.98	312.90	54.9	23.98	4.2	70.08	12.3	163.02	28.6
18	10	4,750	4,530	95	15,351	3.39	815.81	459.85	56.4	22.15	2.7	100.74	12.4	233.07	28.6
19	11	5,460	4,980	91	15,305	3.07	911.77	460.12	50.5	63.03	6.9	92.13	10.1	296.49	32.5
20	4	2,660	2,660	100	8,601	3.23	405.01	258.28	63.8	6.97	1.7	31.61	7.8	108.15	26.7
21	5	3,250	3,190	98	10,762	3.37	549.57	324.04	59.0	26.35	4.8	39.11	7.1	160.07	29.1
22	4	2,670	2,560	96	7,714	3.01	445.62	230.49	51.7	33.52	7.5	32.19	7.2	149.42	33.5
23	1	800	710	89	2,940	4.14	144.27	89.11	61.8	4.92	3.4	8.48	5.9	41.76	28.9
24	5	3,670	3,300	90	9,946	3.01	585.01	297.69	50.9	37.74	6.4	47.98	8.2	201.60	34.5
25	1	980	920	94	2,230	2.42	152.42	66.53	43.6	24.14	15.8	9.87	6.5	51.88	34.0
26	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
27	2	2,050	1,970	96	4,775	2.42	266.85	142.37	53.4	33.99	12.7	16.88	6.3	73.61	27.6
28	1	950	950	100	2,601	2.74	127.99	78.78	61.6	4.61	3.6	5.67	4.4	38.93	30.4
Total or average	220	59,360	57,140	96	180,313	3.16	10,789.15	5,411.37	50.2	458.81	4.2	1,597.03	14.8	3,321.94	30.8

The percent of log cubic volume recovered as veneer, reject, core, and residual (figs. 9 and 10) shows essentially the same pattern as for blocks. Much of the drop in veneer recovery for large-diameter logs is associated with single 27-inch-diameter No. 3 Sawmill log (table 7).

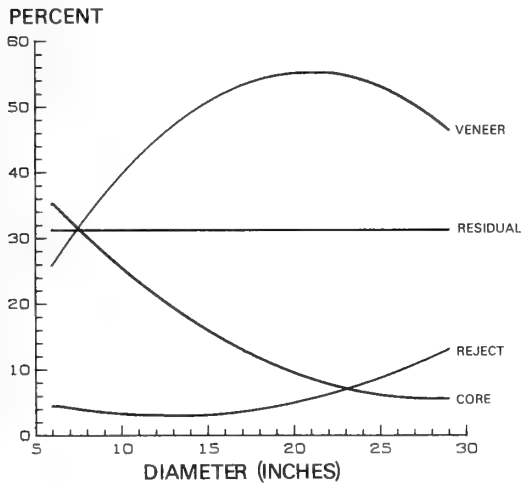

Figure 9.--Cubic volume of log components as a percent of log cubic volume over scaling diameter.

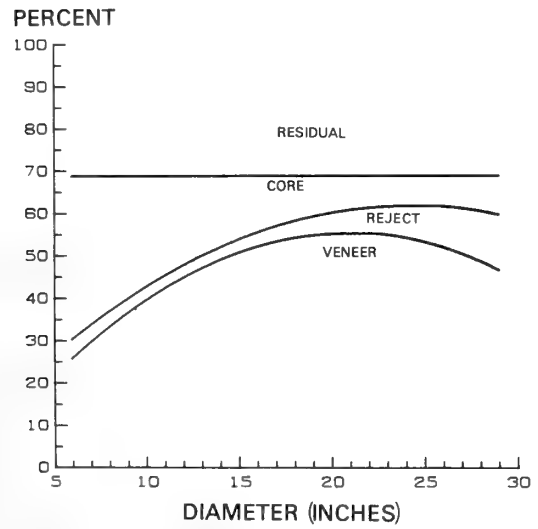

Figure 10.--Cumulative cubic volume of log components as a percent of log cubic volume.

RECOVERY BY STAND

Stand conditions and veneer recovery.-- Originally, the sample was set up to test whether there was any difference in yield between thinned and unthinned stands, or between the fast-growing, lightly-stocked stands and those with moderate to slow growth rates.

The fact that the two peeling thicknesses were different in both recovery ratio and grade complicates this comparison. Almost all of the timber from the thinned stands was peeled into 1/10-inch veneer. A large majority of the timber from stands with either slow or moderate early-growth rates was peeled into 1/6-inch veneer.

Veneer from thinned and unthinned stands.-- Linear regression analyses were run on the grade No. 2 Sawmill blocks peeled 1/10-inch from thinned and unthinned stands.

Dependent variables were:

1. Recovery ratio: square feet veneer (3/8-inch basis) per board feet (Scribner scale).
2. Cubic volume of veneer as a percent of block cubic volume.
3. Cubic volume of reject as a percent of block cubic volume.
4. Cubic volume of veneer and reject as a percent of block cubic volume with diameter as the independent variable.

Analysis of covariance determined that there was no statistically significant difference between the blocks from thinned and unthinned stands in any of these tests.

Fast-growing and slow-growing timber.--The same analyses were run on the lightly stocked and moderately or densely stocked stands, with all of the blocks peeled into 1/6-inch veneer. Again,

there were no significant differences in the amounts of veneer recovered.

Veneer grade and growth rate.--Linear regression and analysis of covariance were run to test if there was any difference in veneer grade recovery between the lightly stocked and the moderately or densely stocked stands. The dependent variable was percent of grades A through C veneer with diameter as the independent variable. Both the slopes of the lines and the means of the lines (fig. 11) were different at the 1-percent probability level.

OTHER PRODUCTS

From the long logs brought to the mill for peeling there were 763 8-foot blocks peeled. In addition, there were sixty 8-foot blocks from 7 to 11 inches in diameter with a net scale of 1,290 feet which were not peelable but were suitable for studs, and thirteen 4-foot blocks from 11 to 18 inches with a gross scale of 360 board feet suitable for peeling on a core lathe. There were also 739 peeler cores suitable for making studs and 34 suitable only for chipping.

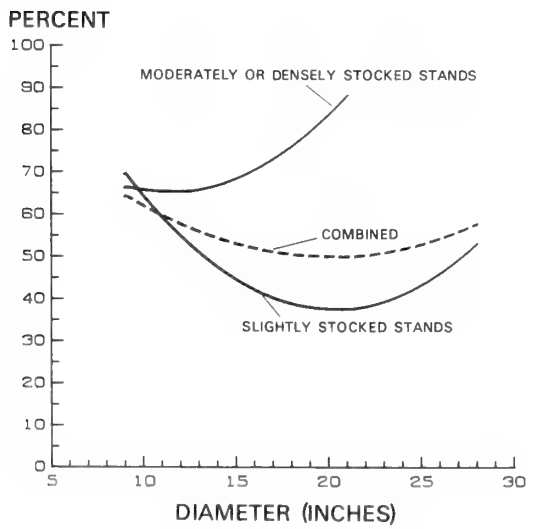

Figure 11.--Percent of veneer in grades A through C over diameter for blocks peeled 1/6-inch, by stocking.

SUMMARY AND CONCLUSIONS

Second-growth Douglas-fir does represent a resource suitable for the production of veneer, particularly in the structural sheathing grades.

The combination of peeling thickness and clipping patterns produced different veneer grade mixes, with a higher percentage of grades A through C being produced by clipping for these grades.

Clipping for grade caused a significant decline in the recovery ratio but no significant drop in the percent of block cubic volume recovered as veneer.

The differences in grade and recovery are partially a function of intended use. Veneer peeled 1/6-inch is used primarily for core and centers, and there is a tendency to "stretch" grade at the clipper. Full sheets of 1/10-inch veneer are much more susceptible to handling loss than are half sheets of 1/6-inch veneer, particularly in the lower grades. These two factors partially explain the differences in grade and volume recovery.

The lack of effect of thinning on recovery was expected. These thinnings were done only 12 years before cutting and, being the first in the area, were conservative.

The loss in grade associated with growth rate indicates the need for more and better information on this problem.

APPENDIX TABLES

Appendix 1.--Block distribution by veneer thickness, diameter, and grade

(Number)

Block diameter (inches)	1/10-inch veneer					1/6-inch veneer				
	No. 3 Peeler and Special Peeler	No. 2 Sawmill	No. 3 Sawmill	Cull	All grades	No. 3 Peeler and Special Peeler	No. 2 Sawmill	No. 3 Sawmill	Cull	All grades
9	0	0	1	0	1	0	0	1	0	1
10	0	0	14	0	14	0	0	15	0	15
11	0	0	20	0	20	0	0	50	0	50
12	0	35	0	0	35	0	56	0	0	56
13	0	25	1	1	27	0	51	0	1	52
14	0	30	2	0	32	0	43	0	0	43
15	0	31	1	0	32	0	41	0	1	42
16	0	22	0	0	22	0	37	1	0	38
17	0	15	1	1	17	0	31	1	0	32
18	0	14	2	0	16	0	27	1	0	28
19	0	17	0	0	17	1	21	1	0	23
20	2	13	1	0	16	1	21	2	0	24
21	0	10	0	1	11	1	9	0	0	10
22	3	9	2	1	15	0	10	1	0	11
23	2	4	2	0	8	1	6	1	0	8
24	3	3	1	0	7	1	8	1	0	10
25	2	3	1	0	6	1	6	1	0	8
26	0	1	1	0	2	0	4	3	0	7
27	0	0	0	0	0	1	2	2	0	5
28	0	1	0	0	1	0	3	3	0	6
29	0	2	1	0	3	2	0	0	0	2
30	0	1	0	0	1	0	0	0	0	0
Total	12	236	51	4	303	9	376	84	2	471

Appendix 2a.--Veneer recovery by grade, item, and block grade, blocks peeled 1/10-inch

(Square feet)

Veneer item	Veneer grade						Total	Reject
	A	A Patch	B	B Patch	C	D		
				NO. 3 PEELER				
Full sheets	68	68	0	311	1,040	506	1,993	29
Half sheets	0	0	0	146	228	88	462	82
Random width, 8 feet	11	4	165	0	265	63	508	57
Random width, 4 feet	0	0	0	0	66	22	88	0
Total	79	72	165	457	1,599	679	3,051	168
				SPECIAL PEELER				
Full sheets	10	19	10	311	1,713	283	2,346	49
Half sheets	0	0	0	49	258	87	394	39
Random width, 8 feet	8	0	164	7	327	64	570	52
Random width, 4 feet	0	0	0	0	109	35	144	0
Total	18	19	174	367	2,407	469	3,454	140
				NO. 2 SAWMILL				
Full sheets	10	30	10	827	14,905	11,333	27,115	867
Half sheets	0	0	0	261	4,941	5,928	11,130	1,873
Random width, 8 feet	24	7	467	4	8,373	4,780	13,655	1,406
Random width, 4 feet	0	0	0	0	2,018	962	2,980	0
Total	34	37	477	1,092	30,237	23,003	54,880	4,146
				NO. 3 SAWMILL				
Full sheets	0	0	0	29	746	1,675	2,450	311
Half sheets	0	0	0	0	492	1,110	1,602	576
Random width, 8 feet	0	0	60	0	1,460	1,174	2,694	246
Random width, 4 feet	0	0	0	0	304	194	498	0
Total	0	0	60	29	3,002	4,153	7,244	1,133
				CULL				
Full sheets	0	0	0	0	0	0	0	0
Half sheets	0	0	0	0	10	25	35	39
Random width, 8 feet	0	0	32	0	49	42	123	45
Random width, 4 feet	0	0	0	0	46	22	68	0
Total	0	0	32	0	105	89	226	84

Appendix 2b.--Veneer recovery by grade, item, and block grade, blocks peeled 1/6-inch

(Square feet)

Veneer item	Veneer grade						Total	Reject
	A	A Patch	B	B Patch	C	D		
NO. 3 PEELER								
Half sheets	0	0	68	1,302	1,033	313	2,716	76
Random width, 8 feet	0	0	160	0	505	79	744	274
Random width, 4 feet	0	0	0	0	85	10	95	0
Total	0	0	228	1,302	1,623	402	3,555	350
SPECIAL PEELER								
Half sheets	0	0	0	93	956	389	1,438	51
Random width, 8 feet	0	0	38	0	151	135	324	23
Random width, 4 feet	0	0	0	0	52	28	80	0
Total	0	0	38	93	1,159	552	1,842	74
NO. 2 SAWMILL								
Half sheets	0	0	0	3,304	32,971	32,946	69,221	1,691
Random width, 8 feet	0	0	327	0	9,236	9,942	19,505	5,105
Random width, 4 feet	0	0	0	0	2,044	1,940	3,984	20
Total	0	0	327	3,304	44,251	44,828	92,710	6,816
NO. 3 SAWMILL								
Half sheets	0	0	0	539	2,685	5,078	8,302	304
Random width, 8 feet	0	0	53	0	1,653	2,307	4,013	2,044
Random width, 4 feet	0	0	0	0	328	367	695	46
Total	0	0	53	539	4,666	7,752	13,010	2,394
CULL								
Half sheets	0	0	0	0	127	101	228	0
Random width, 8 feet	0	0	0	0	15	70	85	11
Random width, 4 feet	0	0	0	0	25	3	28	0
Total	0	0	0	0	167	174	341	11

Appendix 3a.--Percent of veneer recovery by veneer grade and block grade, 1/10-inch veneer

Block diameter (inches)	Number of blocks	Total veneer, 3/8-inch basis	Veneer grade					
			A	A Patch	B	B Patch	C	D
		Square feet	*Percent*					
			NO. 3 PEELER					
24	3	1,747	3.9	2.2	3.2	12.2	46.4	32.1
25	2	1,304	.8	2.5	8.4	18.6	60.6	9.1
Total or average	5	3,051	2.6	2.4	5.4	15.0	52.3	22.3
			SPECIAL PEELER					
20	2	867	0	0	.6	7.3	77.2	14.9
21	0	--	--	--	--	--	--	--
22	3	1,441	0	0	2.6	.3	75.8	21.3
23	2	1,146	1.6	1.7	11.5	26.1	56.2	2.9
Total or average	7	3,454	.5	.6	5.0	10.6	69.7	13.6
			NO. 2 SAWMILL					
12	35	3,339	0	0	.4	1.2	69.7	28.7
13	25	3,086	.1	0	.5	.3	77.3	21.8
14	30	4,606	0	0	.2	0	71.1	28.7
15	31	5,425	0	0	.4	.4	69.0	30.2
16	22	4,781	0	0	.3	.6	71.2	27.9
17	15	3,484	0	0	.3	.3	60.5	38.9
18	14	3,805	0	.3	.4	.7	46.7	51.9
19	17	5,251	.2	0	.4	.9	53.5	45.0
20	13	4,306	.3	0	1.1	1.0	40.2	57.4
21	10	4,198	.1	.2	2.0	4.5	60.3	32.9
22	9	3,885	.1	.3	1.8	5.1	36.6	56.1
23	4	2,036	0	0	.4	0	31.7	67.9
24	3	981	0	0	1.0	0	31.4	67.6
25	3	1,428	0	.5	2.2	.4	4.8	92.1
26	1	832	.4	0	3.2	1.7	7.3	81.4
27	0	--	--	--	--	--	--	--
28	1	836	0	0	4.1	4.1	17.9	73.9
29	2	1,638	0	0	.2	.6	60.6	38.6
30	1	963	0	0	4.8	38.4	50.4	6.4
Total or average	236	54,880	.1	.1	.9	2.0	55.0	41.9
			NO. 3 SAWMILL					
9	1	22	0	0	0	0	77.3	22.7
10	14	768	0	0	2.2	0	67.9	29.9
11	20	1,516	0	0	1.1	.7	82.0	16.2
12	0	--	--	--	--	--	--	--
13	1	144	0	0	0	0	76.4	23.6
14	2	214	0	0	3.3	0	90.6	6.1
15	1	188	0	0	0	0	46.8	53.2
16	0	--	--	--	--	--	--	--
17	1	204	0	0	0	0	65.2	34.8
18	2	580	0	0	0	0	3.3	96.7
19	0	--	--	--	--	--	--	--
20	1	309	0	0	0	0	11.0	89.0
21	0	--	--	--	--	--	--	--
22	2	666	0	0	.3	0	20.7	79.0
23	2	823	0	0	.1	2.3	6.7	90.9
24	1	140	0	0	6.4	0	3.6	90.0
25	1	504	0	0	.4	0	36.3	63.3
26	1	411	0	0	1.2	0	8.3	90.5
27	0	--	--	--	--	--	--	--
28	0	--	--	--	--	--	--	--
29	1	755	0	0	0	0	30.1	69.9
Total or average	51	7,244	0	0	.8	.4	41.4	57.4
			CULL					
13	1	70	0	0	14.3	0	58.6	27.1
14	0	--	--	--	--	--	--	--
15	0	--	--	--	--	--	--	--
16	0	--	--	--	--	--	--	--
17	1	8	0	0	0	0	25.0	75.0
18	0	--	--	--	--	--	--	--
19	0	--	--	--	--	--	--	--
20	0	--	--	--	--	--	--	--
21	1	79	0	0	27.8	0	48.1	24.1
22	1	69	0	0	0	0	34.8	65.2
Total or average	4	226	0	0	14.2	0	46.4	39.4

Appendix 3b.--Percent of veneer recovery by veneer grade and block grade, 1/6-inch veneer

Block diameter (inches)	Number of blocks	Total veneer, 3/8-inch basis	Veneer grade					
			A	A Patch	B	B Patch	C	D
		Square feet	*Percent*					
			NO. 3 PEELER					
24	1	621	0	0	0.8	54.4	39.3	5.5
25	1	611	0	0	4.7	54.1	38.6	2.6
26	0	--	--	--	--	--	--	--
27	1	352	0	0	7.4	2.3	80.6	9.7
28	0	--	--	--	--	--	--	--
29	2	1,971	0	0	8.5	31.8	43.6	16.1
Total or average	5	3,555	0	0	6.4	36.6	45.7	11.3
			SPECIAL PEELER					
19	1	425	0	0	.9	1.9	85.7	11.5
20	1	390	0	0	0	0	86.2	13.8
21	1	492	0	0	6.9	0	69.9	23.2
22	0	--	--	--	--	--	--	--
23	1	535	0	0	0	15.9	21.5	62.6
Total or average	4	1,842	0	0	2.1	5.0	62.9	30.0
			NO. 2 SAWMILL					
12	56	5,254	0	0	0	.6	61.9	37.5
13	51	6,022	0	0	.1	1.4	63.2	35.3
14	43	6,418	0	0	.3	2.4	55.9	41.4
15	41	7,363	0	0	.2	.2	46.5	53.1
16	37	8,723	0	0	.1	1.0	46.6	52.3
17	31	8,572	0	0	0	1.6	50.6	47.8
18	27	8,732	0	0	.6	4.6	51.1	43.7
19	21	6,983	0	0	.3	2.0	38.9	58.8
20	21	8,347	0	0	.6	9.8	51.5	38.1
21	9	3,943	0	0	0	2.3	40.2	57.5
22	10	4,241	0	0	.2	1.6	34.3	63.9
23	6	3,431	0	0	.2	2.0	41.8	56.0
24	8	4,457	0	0	.8	4.4	39.4	55.4
25	6	3,995	0	0	.2	6.8	58.0	35.0
26	4	2,577	0	0	2.3	23.0	32.9	41.8
27	2	1,247	0	0	.4	8.8	15.2	75.6
28	3	2,405	0	0	1.0	1.7	29.6	67.7
Total or average	376	92,710	0	0	.4	3.6	47.7	48.3
			NO. 3 SAWMILL					
9	1	42	0	0	0	0	76.2	23.8
10	15	1,047	0	0	0	0	56.3	43.7
11	50	3,908	0	0	0	.6	60.2	39.2
12	0	--	--	--	--	--	--	--
13	0	--	--	--	--	--	--	--
14	0	--	--	--	--	--	--	--
15	0	--	--	--	--	--	--	--
16	1	91	0	0	0	0	0	100.0
17	1	332	0	0	0	0	11.1	88.9
18	1	222	0	0	0	0	0	100.0
19	1	97	0	0	0	0	4.1	95.9
20	2	700	0	0	0	0	8.7	91.3
21	0	--	--	--	--	--	--	--
22	1	378	0	0	0	0	19.3	80.7
23	1	517	0	0	0	0	13.9	86.1
24	1	573	0	0	0	1.4	20.9	77.7
25	1	592	0	0	0	1.4	29.2	69.4
26	3	1,399	0	0	0	3.0	24.2	72.8
27	2	827	0	0	0	0	2.4	97.6
28	3	2,285	0	0	2.3	20.0	34.7	43.0
Total or average	84	13,010	0	0	.4	4.1	35.9	59.6
			CULL					
13	1	110	0	0	0	0	41.8	58.2
14	0	--	--	--	--	--	--	--
15	1	231	0	0	0	0	52.4	47.6
Total or average	2	341	0	0	0	0	49.0	51.0

Appendix 4a.--Veneer recovery and cubic volumes, by block grade and diameter, 3/8-inch basis, 1/10-inch veneer

Block diameter (inches)	Number of blocks	Scribner scale		Percent sound	Veneer, 3/8-inch basis	Recovery ratio	Block	Veneer	Reject	Core	Residual
		Gross	Net								
		---Board feet----			*Square feet*		*----------Cubic feet----------*				
					NO. 3 PEELER						
24	3	630	590	94	1,747	2.96	83.16	53.00	3.49	5.26	21.41
25	2	460	420	91	1,304	3.10	74.52	39.57	1.60	3.42	29.93
Total or average	5	1,090	1,010	93	3,051	3.02	157.68	92.57	5.09	8.68	51.34
					SPECIAL PEELER						
20	2	280	280	100	867	3.10	42.10	26.29	0	3.48	12.33
21	0	--	--	--	--	--	--	--	--	--	--
22	3	510	470	92	1,441	3.07	70.68	43.71	3.83	5.25	17.89
23	2	380	340	89	1,146	3.37	52.71	34.73	.41	3.55	14.02
Total or average	7	1,170	1,090	93	3,454	3.17	165.49	104.73	4.24	12.28	44.24
					NO. 2 SAWMILL						
12	35	1,400	1,400	100	3,339	2.38	259.02	101.11	9.04	62.51	86.36
13	25	1,250	1,230	98	3,086	2.51	215.23	93.39	3.65	45.76	72.43
14	30	1,800	1,800	100	4,606	2.56	292.19	139.37	6.17	51.38	95.27
15	31	2,170	2,170	100	5,425	2.50	346.88	164.34	10.50	55.95	116.09
16	22	1,760	1,750	99	4,781	2.73	280.56	144.80	6.32	38.14	91.30
17	15	1,350	1,310	97	3,484	2.66	221.11	105.65	6.90	33.64	74.92
18	14	1,540	1,500	97	3,805	2.54	219.66	115.49	8.44	24.16	71.57
19	17	2,040	1,890	93	5,251	2.78	306.20	159.11	8.79	44.87	93.43
20	13	1,820	1,660	91	4,306	2.59	264.21	130.45	10.22	39.77	83.77
21	10	1,500	1,410	94	4,198	2.98	212.87	127.29	6.18	17.79	61.61
22	9	1,530	1,470	96	3,885	2.64	212.88	117.75	13.18	15.96	65.99
23	4	760	760	100	2,036	2.68	105.56	61.75	3.09	7.02	33.70
24	3	630	490	78	981	2.00	81.34	29.69	12.65	5.98	33.02
25	3	690	690	100	1,428	2.07	94.07	43.22	11.98	5.46	33.41
26	1	250	250	100	832	3.33	37.60	25.24	.96	1.83	9.57
27	0	--	--	--	--	--	--	--	--	--	--
28	1	290	220	76	836	3.80	47.91	25.33	2.57	3.07	16.94
29	2	620	620	100	1,638	2.64	78.66	49.60	3.87	3.40	21.79
30	1	330	330	100	963	2.92	49.33	29.18	.74	2.27	17.14
Total or average	236	21,730	20,950	96	54,880	2.62	3,325.28	1,662.76	125.25	458.96	1,078.31
					NO. 3 SAWMILL						
9	1	20	20	100	22	1.10	5.86	.67	.11	1.85	3.23
10	14	420	420	100	768	1.83	77.79	23.35	1.26	26.13	27.05
11	20	600	600	100	1,516	2.53	123.88	45.79	2.68	37.02	38.39
12	0	--	--	--	--	--	--	--	--	--	--
13	1	50	50	100	144	2.88	8.69	4.34	.15	1.76	2.44
14	2	120	100	83	214	2.14	17.49	6.47	.56	3.46	7.00
15	1	70	70	100	188	2.69	11.67	5.71	.54	1.70	3.72
16	0	--	--	--	--	--	--	--	--	--	--
17	1	90	50	56	204	4.08	14.84	6.17	.52	1.70	6.45
18	2	220	220	100	580	2.64	38.93	17.58	1.12	3.72	16.51
19	0	--	--	--	--	--	--	--	--	--	--
20	1	140	140	100	309	2.21	17.59	9.34	2.60	1.69	3.96
21	0	--	--	--	--	--	--	--	--	--	--
22	2	340	340	100	666	1.96	48.37	20.19	6.09	4.10	17.99
23	2	380	380	100	823	2.17	52.26	24.99	7.54	3.46	16.27
24	1	210	210	100	140	.67	28.26	4.24	8.44	1.94	13.64
25	1	230	230	100	504	2.19	29.73	15.26	.55	3.87	10.05
26	1	250	230	92	411	1.79	36.44	12.41	1.23	8.70	14.10
27	0	--	--	--	--	--	--	--	--	--	--
28	0	--	--	--	--	--	--	--	--	--	--
29	1	310	270	87	755	2.80	41.92	22.89	.83	1.83	16.37
Total or average	51	3,450	3,330	97	7,244	2.18	553.72	219.40	34.22	102.93	197.17
					CULL						
13	1	50	0	0	70	--	9.65	2.14	0	6.14	1.37
14	0	--	--	--	--	--	--	--	--	--	--
15	0	--	--	--	--	--	--	--	--	--	--
16	0	--	--	--	--	--	--	--	--	--	--
17	1	90	0	0	8	--	18.97	.25	0	0	18.72
18	0	--	--	--	--	--	--	--	--	--	--
19	0	--	--	--	--	--	--	--	--	--	--
20	0	--	--	--	--	--	--	--	--	--	--
21	1	150	0	0	79	--	21.12	2.37	2.43	6.76	9.56
22	1	170	0	0	69	--	25.40	2.08	.12	16.71	6.49
Total or average	4	460	0	0	226	--	75.14	6.84	2.55	29.61	36.14

Appendix 4b.--Veneer recovery and cubic volumes, by block grade and diameter, 3/8-inch basis, 1/6-inch veneer

Block diameter (inches)	Number of blocks	Scribner scale		Percent sound	Veneer, 3/8-inch basis	Recovery ratio	Block	Veneer	Reject	Core	Residual
		Gross	Net								
		----Board feet----			*Square feet*		*----------Cubic feet----------*				
					NO. 3 PEELER						
24	1	210	210	100	621	2.96	27.67	18.52	.76	2.02	6.37
25	1	230	230	100	611	2.66	35.56	18.17	1.67	3.45	12.27
26	0	--	--	--	--	--	--	--	--	--	--
27	1	270	270	100	352	1.30	40.96	10.49	6.75	3.05	20.67
28	0	--	--	--	--	--	--	--	--	--	--
29	2	620	620	100	1,971	3.18	88.47	58.76	1.25	4.48	23.98
Total or average	5	1,330	1,330	100	3,555	2.67	192.66	105.94	10.43	13.00	63.29
					SPECIAL PEELER						
19	1	120	120	100	425	3.54	17.52	12.68	0	2.00	2.84
20	1	140	140	100	390	2.79	19.50	11.61	0	2.02	5.87
21	1	150	120	80	492	4.10	24.36	14.66	.44	2.00	7.26
22	0	--	--	--	--	--	--	--	--	--	--
23	1	190	190	100	535	2.82	25.56	15.92	1.77	2.10	5.77
Total or average	4	600	570	95	1,842	3.23	86.94	54.87	2.21	8.12	21.74
					NO. 2 SAWMILL						
12	56	2,240	2,180	97	5,254	2.41	412.87	156.77	17.57	111.52	127.01
13	51	2,550	2,490	98	6,022	2.42	435.51	179.66	16.76	105.82	133.27
14	43	2,580	2,490	97	6,418	2.58	427.27	191.57	13.29	88.59	133.82
15	41	2,870	2,840	99	7,363	2.59	459.83	219.76	14.45	80.85	144.77
16	37	2,960	2,930	99	8,723	2.98	479.34	260.04	11.06	74.06	134.18
17	31	2,790	2,740	98	8,572	3.13	457.31	255.91	12.67	65.99	122.74
18	27	2,970	2,910	98	8,732	3.00	438.25	260.63	10.11	53.48	114.03
19	21	2,520	2,450	97	6,983	2.85	379.88	208.34	15.03	55.51	101.00
20	21	2,940	2,920	99	8,347	2.86	429.01	248.94	21.52	41.49	117.06
21	9	1,350	1,320	98	3,943	2.99	205.23	117.40	4.36	18.77	64.70
22	10	1,700	1,700	100	4,241	2.49	238.16	126.56	16.91	20.38	74.31
23	6	1,140	1,140	100	3,431	3.01	155.73	102.18	3.23	13.18	37.14
24	8	1,680	1,680	100	4,457	2.65	235.38	132.89	11.36	16.99	74.14
25	6	1,380	1,320	96	3,995	3.03	194.70	119.10	4.65	14.86	56.09
26	4	1,000	1,000	100	2,577	2.58	146.12	76.82	13.79	9.44	46.07
27	2	540	540	100	1,247	2.31	71.46	37.22	8.12	4.67	21.45
28	3	870	870	100	2,405	2.76	111.07	71.74	8.34	6.16	24.83
Total or average	376	34,080	33,520	98	92,710	2.77	5,277.12	2,765.53	203.22	781.76	1,526.61
					NO. 3 SAWMILL						
9	1	20	20	100	42	2.10	5.07	1.26	.04	2.02	1.75
10	15	440	440	100	1,047	2.38	88.51	31.31	3.10	28.86	25.24
11	50	1,510	1,480	98	3,908	2.64	320.23	116.88	14.24	98.77	90.34
12	0	--	--	--	--	--	--	--	--	--	--
13	0	--	--	--	--	--	--	--	--	--	--
14	0	--	--	--	--	--	--	--	--	--	--
15	0	--	--	--	--	--	--	--	--	--	--
16	1	80	80	100	91	1.14	14.38	2.74	1.72	2.90	7.02
17	1	90	90	100	332	3.69	15.26	9.92	.19	2.02	3.13
18	1	110	110	100	222	2.02	17.02	6.61	.98	1.98	7.45
19	1	120	60	50	97	1.62	18.39	2.88	2.55	8.49	4.47
20	2	280	280	100	700	2.50	41.02	20.89	1.85	3.74	14.54
21	0	--	--	--	--	--	--	--	--	--	--
22	1	170	170	100	378	2.22	24.47	11.30	2.53	2.21	8.43
23	1	190	190	100	517	2.72	26.45	15.41	.93	2.00	8.11
24	1	210	210	100	573	2.73	28.35	17.11	.80	2.08	8.36
25	1	230	230	100	592	2.57	31.65	17.68	1.44	2.19	10.34
26	3	750	750	100	1,399	1.87	101.72	41.71	15.80	6.84	37.37
27	2	540	540	100	827	1.53	71.32	24.67	18.69	5.63	22.33
28	3	870	790	91	2,285	2.89	131.39	68.16	6.40	8.20	48.63
Total or average	84	5,610	5,440	97	13,010	2.39	935.23	388.53	71.26	177.93	297.51
					CULL						
13	1	50	0	0	110	--	8.74	3.30	.34	1.94	3.16
14	0	--	--	--	--	--	--	--	--	--	--
15	1	70	0	0	231	--	11.15	6.90	0	1.82	2.43
Total or average	2	120	0	0	341	--	19.89	10.20	.34	3.76	5.59

Appendix 5.--Veneer recovery by grade, item, and log grade

(Square feet)

Veneer item	Veneer grade						Total	Reject
	A	A Patch	B	B Patch	C	D		
				SPECIAL PEELER				
Full sheets	78	39	0	282	1,877	721	2,997	78
Half sheets	0	0	0	114	1,555	228	1,897	121
Random width, 8 feet	8	0	238	7	519	188	960	124
Random width, 4 feet	0	0	0	0	145	56	201	0
Total	86	39	238	403	4,096	1,193	6,055	323
				NO. 2 SAWMILL				
Full sheets	10	78	20	1,128	13,720	10,465	25,421	641
Half sheets	0	0	68	5,364	34,222	36,368	76,022	2,979
Random width, 8 feet	33	4	1,133	4	15,162	12,633	28,969	6,000
Random width, 4 feet	0	0	0	0	3,476	2,447	5,923	14
Total	43	82	1,221	6,496	66,580	61,913	136,335	9,634
				NO. 3 SAWMILL				
Full sheets	0	0	0	68	2,807	2,611	5,486	537
Half sheets	0	0	0	216	7,924	9,469	17,609	1,631
Random width, 8 feet	2	7	95	0	6,353	5,835	12,292	3,139
Random width, 4 feet	0	0	0	0	1,456	1,080	2,536	52
Total	2	7	95	284	18,540	18,995	37,923	5,359

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1974. Veneer recovery from second-growth Douglas-fir. USDA For. Serv. Res. Pap. PNW-173, 22 p., illus. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

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Keywords: Veneers (recovery), stand age, Douglas-fir.

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