

LUMBER - GRADE RECOVERY FROM OREGON COAST-TYPE DOUGLAS-FIR

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During the past few years several studies have been made by the Pacific Northwest Forest and Range Experiment Station to obtain lumber recovery data for various species and age classes of timber grown in Oregon and Washington. The study reported here was a continuation of that project. The primary purpose of this study was to collect accurate data on lumber grade recoveries to be expected from old-growth Douglas-fir timber in the Coos Bay area of Oregon.

Agencies cooperating were the Cape Arago Lumber Company, the Bureau of Land Management, the West Coast Lumbermen's Association, and the Forest Service.

Field data were collected at the Cape Arago Lumber Company sawmill at Empire, Oregon, an old-type cargo mill that does not meet present day standards of mill design and operation. Mill capacity is approximately 160 thousand board feet per 8-hour shift. Approximately one-quarter of the production for a 2-weeks period was included in this study.

The Study Sample

A total of 324 logs, as well distributed as possible, from the available log inventory, by grades and sizes, was studied (table 1). Forest Service net scale for these logs was 260,300 board feet. Gross scale was 332,950 board feet, which gives a defect allowance of 22 percent.

Logs were obtained from a number of sources. Some came from a company logging operation on the Millicoma River, and others were obtained from the Evans Products Company. The Millicoma logs had been felled in the spring of 1949 but were not logged until the next spring. The sapwood of these logs was badly stained. The logs obtained from the Evans Products Company were those left after all "peelable" logs had been removed. The timber in this study is therefore considered to have been of lower quality than freshly cut camp-run logs in the Coos Bay area.

Table 1.--Distribution of logs by diameter class and commercial log grade,
Cape Arago Lumber Company

Diameter class	Peeler logs			Sawmill logs			All log grades
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3	
10-11						29	29
12-13					9	11	20
14-15					16	5	21
16-17					17	6	23
18-19					18	5	23
20-21					20	3	23
22-23					15	4	19
24-25			20		11	3	34
26-27			15		17	1	33
28-29		1	13		12		26
30-31	1	1	4		4	2	12
32-33	1	1	4		7		13
34-35		1	1		8	1	11
36-37	2		4	1	4		11
38-39			3		4		7
40-41		1			2	1	4
42-43	1		3	1	1		6
44-45		2	2		1		5
46-47	1	1					2
48-49							
Above 50				1	1		2
Total	6	8	69	3	167	71	324

Manufacturing Practices

All logs arrive at the mill by water, being either towed directly from the company's logging operation on the Millicoma or obtained from other companies dumping logs in Coos Bay. Extra long timbers for export are an important item in this company's business. Therefore, in their own logging operations they produce as many 60-foot and longer logs as practicable. The mill is equipped to handle material up to 64 feet in length. Logs beyond this length and crooked ones were bucked on the log deck in the mill.

By far the largest percentage of logs cut in this mill fall in the sawmill grade. Some peeler logs were obtained from the company operation on the Millicoma. However, all other logs at the mill had been sorted over and peelable logs were traded to plywood plants for sawmill grade logs. For this reason it was not possible to get enough high grade logs in the study to establish reliable lumber recovery data for the No. 1 and No. 2 Peeler logs.

The mill is equipped with a 10-foot Allis Chalmers band headrig. It has both an 8-inch and a 12-inch edger, two 40-foot automatic trim saws, and a Sumner resaw. It is an all-electric mill. Power for the 500-horsepower headrig motor and for the 300-horsepower edger motor is purchased. Other power is produced at the mill. Lumber from the green chain is moved by means of carriers to the yard or to boats that load on the company dock. A total of 73 men operate the sawmill.

Study Procedure

Approximately every fourth log that came into the mill was designated as a study log. These logs were assigned a number and were scaled and graded by a Forest Service man familiar with the rules of Columbia River and Puget Sound log-scaling bureaus. A sawing time record was obtained for each study log, and every piece of lumber cut from these logs was graded and tallied.

The lumber from the study logs had to be carefully marked because it became intermixed at the resaw with lumber from other logs. Four colors of lumber crayon were used to mark the lumber. All lumber from the first study log was marked red, the next with another color, and so on until all four colors had been used. By this time the lumber from the first log had at least passed the grader at the green chain and the color series could be started over. The lumber marking was done by one man ahead of and one in back of the edger and three men at the resaw. Every piece of lumber had to be well marked so that it could be quickly identified by the lumber grader. As this marked lumber came to the green chain, it was graded by a lumber grader from the West Coast Bureau of Lumber Grades and Inspection, in accordance with the rules of that bureau. One man tallied the marked lumber by size and grade, keeping a separate record for each log.

Sawing Time

By means of a stop watch, the headrig sawing time was obtained on 304 logs well distributed by diameters and lengths. The longer logs required much more sawing time per log in the larger diameter classes (table 2 and figure 1). To cut a thousand feet of lumber required approximately $5\frac{1}{2}$ minutes for 10-inch logs, 32-feet long. As log size increased, sawing time per thousand board feet of lumber decreased. A thousand board feet of lumber was cut in $2\frac{1}{2}$ minutes from logs over 30-inches in diameter.

Defect of Log Sizes

The percent of defect increased steadily as log diameters increased (figure 2). The 10-inch logs had only 4 percent defect; the 40-inch logs, 30 percent. Average defect for all the logs was 22 percent and consisted mostly of rot, shake, and pitch.

Overrun

Overrun (figure 3) for all the logs averaged 33 percent based on No. 3 Common and Better lumber. When No. 4 Common lumber is included, the overrun is increased to 37 percent. This amount of overrun is considerably higher than the average for the Douglas-fir region, and the excess is probably due to conservative scaling, the cutting of long logs, the high production of timbers, and the close utilization of the entire log.

Lumber Grade Recovery

Lumber grade recoveries obtained for the No. 3 Peelers and for No. 2 and No. 3 Sawmill logs are shown by log diameter in tabular and graphic form in tables 3, 4, and 5 and figures 4, 5, and 6. Similar computations were not made for the other grades of logs because they were too few in number to give reliable data. However, lumber recovery for all the logs has been summarized in table 6.

Average lumber recoveries for the sawmill logs were poorer in this study than in previous similar studies. This is partially due to the timber being lower in quality and partially to the fact that the better No. 2 Sawmill logs, which were considered "peelable", had been sorted out for plywood use. Also, large-size export timbers were being cut, making it impossible to obtain the highest grade recovery. There should be no relationship between grade recovery and overrun, however, in this study the high percentage of overrun offsets somewhat the poor grade recovery obtained in the study. In using this data for determining timber values in the Coos Bay area both figures should be considered.

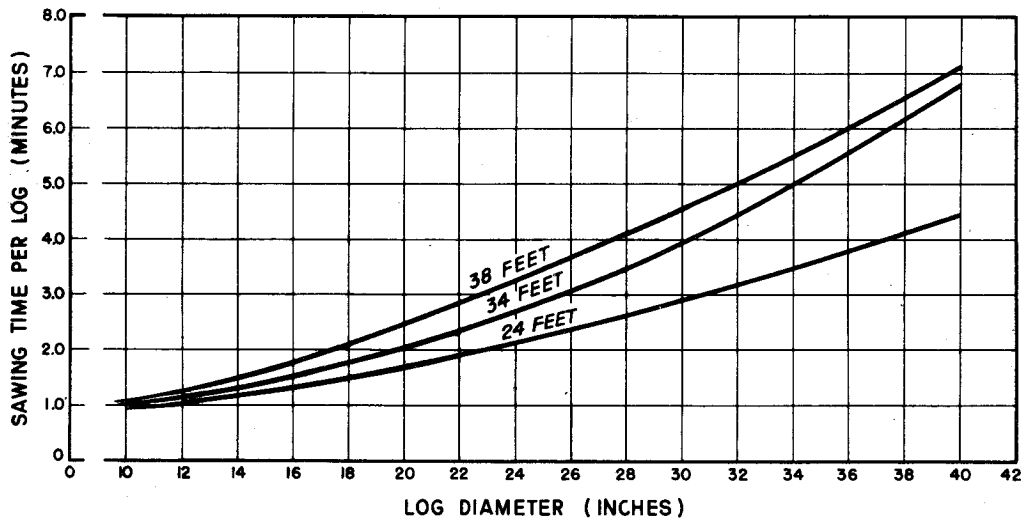


Figure No.1 -- Sawing time

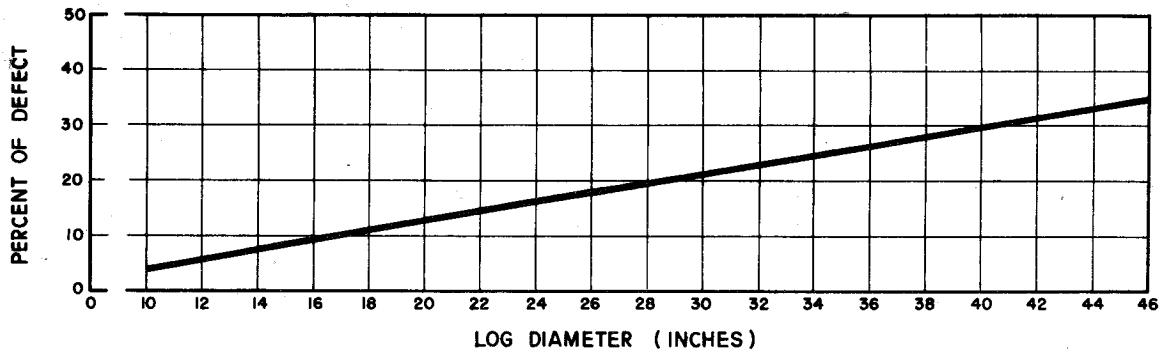


Figure No.2 -- Defect by log size

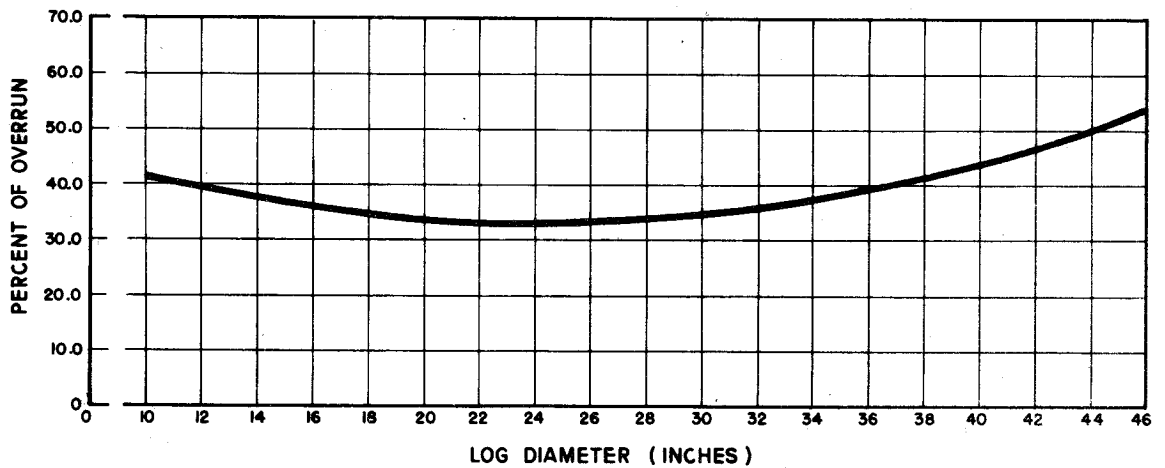


Figure No.3 -- Overrun by log size

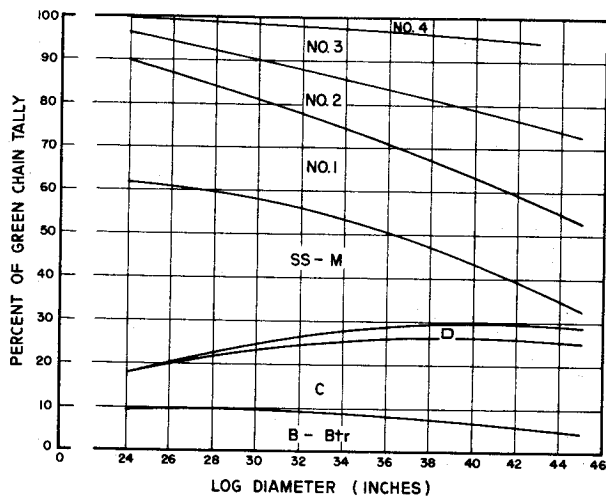


Figure No. 4-- Cumulative grade recoveries on No. 3 Douglas-fir peeler logs

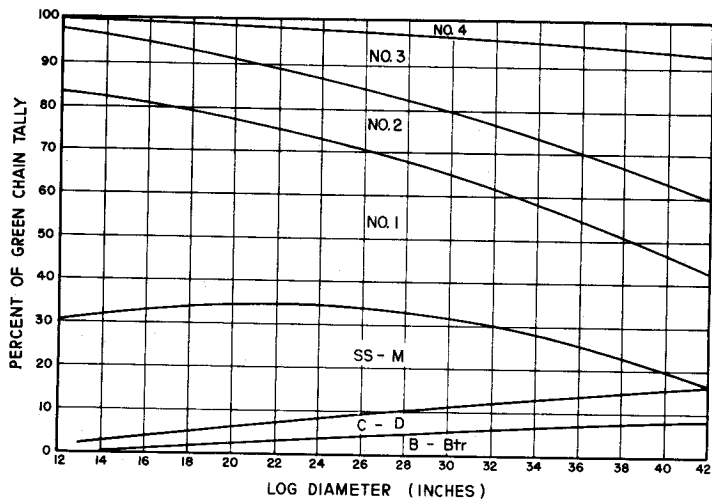


Figure No. 5-- Cumulative grade recoveries on No. 2 sawmill logs (Douglas-fir)

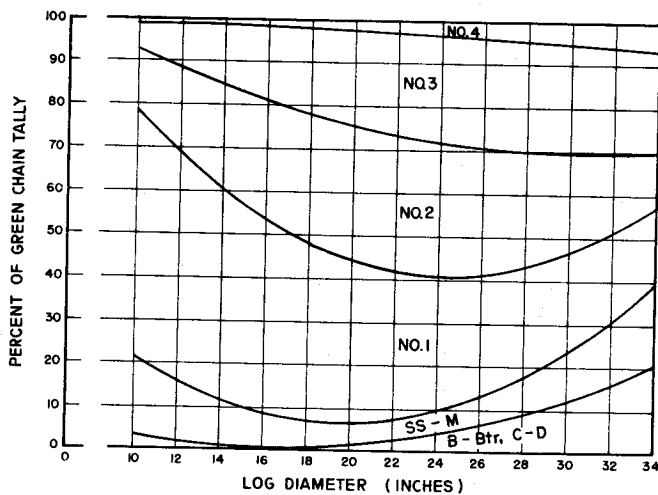


Figure No. 6-- Cumulative grade recoveries on No. 3 sawmill logs (Douglas-fir)

Table 2.--Sawing time per thousand board feet of lumber tally
by log diameter and length

Diameter	32-foot logs	34-foot logs	38-foot logs
	(minutes)	(minutes)	(minutes)
10	5.4	5.1	4.6
11	5.1	4.9	4.5
12	4.8	4.6	4.1
13	4.6	4.5	4.0
14	4.4	4.3	3.8
15	4.1	4.1	3.7
16	3.9	4.0	3.6
17	3.7	3.8	3.5
18	3.6	3.7	3.3
19	3.4	3.5	3.2
20	3.2	3.4	3.1
21	3.1	3.3	3.0
22	3.0	3.2	2.9
23	2.9	3.1	2.8
24	2.8	3.0	2.8
25	2.7	2.9	2.7
26	2.6	2.9	2.6
27	2.6	2.8	2.6
28	2.5	2.8	2.6
29	2.5	2.7	2.6
30	2.5	2.7	2.6
31	2.4	2.6	2.6
32	2.4	2.6	2.6
33	2.4	2.6	2.6
34	2.4	2.6	2.6
35	2.4	2.6	2.6
36	2.4	2.6	2.6

Table 3.--Grade recoveries in percent of lumber green chain tally, No. 3 Douglas-fir peeler logs

Cape Arago Lumber Company

Grade	Diameter class (inches)																	
	24	25	26	27	28	29	30	31	32	33	34	36	37	38	39	42	44	45
B. & Btr.	9.6	9.7	9.7	9.7	9.7	9.6	9.5	9.4	9.3	9.1	8.9	8.4	8.1	7.8	7.4	6.2	5.2	4.7
C.	8.2	9.2	10.2	11.2	12.0	12.9	13.7	14.5	15.2	15.9	16.5	17.6	18.1	18.6	19.0	20.0	20.4	20.6
D.	.2	.5	.8	1.1	1.3	1.6	1.8	2.0	2.2	2.4	2.8	2.9	3.1	3.2	3.5	3.6	3.6	3.7
Sel. Struc. & Sel Merch.	44.0	42.2	40.5	38.7	36.9	35.1	33.3	31.4	29.5	27.6	25.7	21.9	19.9	17.9	15.9	9.7	5.6	3.4
No. 1	28.0	27.1	26.2	25.3	24.5	23.8	23.1	22.5	22.0	21.5	21.1	20.4	20.2	20.0	19.9	19.9	20.2	20.4
No. 2	6.4	6.8	7.0	7.4	7.8	8.2	8.6	9.1	9.6	10.2	10.9	12.1	12.8	13.5	14.3	16.8	18.7	19.7
No. 3	3.5	4.3	5.2	6.0	6.9	7.7	8.6	9.5	10.3	11.2	12.1	13.8	14.7	15.6	16.5	19.3	21.1	22.1
No. 4	.3	.5	.7	.9	1.1	1.4	1.6	1.8	2.1	2.3	2.5	3.0	3.3	3.5	3.8	4.6	5.2	5.4
No. of logs	12	8	7	8	8	5	1	3	2	2	1	2	2	1	2	3	1	1

Table 4.--Grade recoveries in percent of lumber green chain tally, No. 2 Douglas-fir sawmill logs,

Cape Arago Lumber Company

Grade	Diameter class (inches)															
	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
B. & Btr.	.4	1.1	1.8	2.4	3.1	3.6	4.2	4.8	5.4	6.0	6.5	7.0	7.5	8.0	8.5	
C.	1.9	2.5	3.0	3.5	3.9	4.4	4.7	5.1	5.5	5.7	6.0	6.3	6.5	6.7	6.9	7.0
D.	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.2	.3	.4	.5	.6	.7
Sel. Struc. & Sel. Merch.	28.4	28.9	29.0	28.7	28.2	27.3	26.1	24.5	22.6	20.4	17.8	14.9	11.7	8.2	4.3	.1
No. 1	52.8	50.1	47.3	44.8	42.4	40.2	38.1	36.2	34.4	32.8	31.4	30.0	28.9	27.9	27.0	26.3
No. 2	14.7	14.5	14.2	14.1	14.0	14.0	14.0	14.1	14.3	14.5	14.8	15.2	15.6	16.1	16.7	17.3
No. 3	1.8	3.1	4.6	6.2	7.9	9.4	11.5	13.4	15.5	17.6	19.8	22.2	24.6	27.1	29.7	32.5
No. 4	.3	.5	.7	.9	1.2	1.5	1.9	2.4	2.8	3.4	4.0	4.6	5.3	6.0	6.8	7.6
No. of logs	9	16	17	18	20	15	11	17	12	4	7	8	4	4	2	1

Table 5.--Grade recoveries in percent of lumber green chain tally, No. 3 Douglas-fir sawmill logs,

Cape Arago Lumber Company

Grade	Diameter class (inches)												Percent						
	10	11	12	13	14	15	16	18	19	20	21	22		23	24	25	27	30	31
B.&Btr., C.&D.	3.3	2.6	2.0	1.5	1.1	.9	.8	1.0	1.2	1.7	2.2	2.8	3.7	4.6	5.6	8.1	12.8	14.6	20.7
Selects	18.0	15.9	13.9	12.2	10.7	9.2	8.0	6.2	5.6	5.1	4.9	4.8	4.9	5.2	5.7	7.3	11.0	12.6	18.6
No. 1	56.8	54.6	52.6	50.5	48.5	46.6	44.7	41.0	39.2	37.5	35.8	34.2	32.5	31.0	29.5	26.6	22.5	21.3	17.8
No. 2	14.5	17.3	19.8	22.1	24.2	26.0	27.5	29.9	30.7	31.2	31.5	31.6	31.4	30.9	30.3	28.1	23.0	20.8	12.8
No. 3	5.9	8.1	10.2	12.2	14.0	15.7	17.3	20.0	21.2	22.2	23.2	23.9	24.6	25.1	25.5	25.9	25.6	25.2	23.3
No. 4	1.5	1.5	1.5	1.5	1.6	1.7	1.9	2.1	2.3	2.4	2.7	2.9	3.2	3.4	4.0	5.1	5.5	6.8	
No. of logs	5	24	4	7	3	2	6	3	2	2	1	1	3	2	1	1	1	1	1

Table 6.--Summary of log volume in board feet and lumber grade recovery in percent for all

study logs (green chain tally). Cape Arago Lumber Company

Log grade	Number logs	Log volume		Lumber tally		Grade recovery by log grade in percent							
		gross	net	including No. 4	excluding No. 4	B. & Btr.	C	D	SS & SM	No. 1	No. 2	No. 3	No. 4
No. 1 peeler	6	14,780	10,830	16,300	16,120	38.7	12.1	1.1	20.3	15.9	6.8	4.0	1.1
No. 2 peeler	8	21,060	14,720	21,770	21,090	28.8	16.3	2.6	19.3	14.8	4.4	10.7	3.1
No. 3 peeler	69	102,450	80,440	109,980	107,960	8.7	13.0	1.4	32.0	24.1	9.7	9.2	1.9
No. 1 sawmill	3	7,760	4,850	7,610	7,300	20.0	16.1	2.2	9.8	19.0	8.6	20.2	4.1
No. 2 sawmill	167	159,430	129,990	169,470	163,920	4.7	5.2	.2	21.0	35.6	14.4	15.6	3.3
No. 3 sawmill	71	27,470	19,970	32,110	30,910	2.3	2.1	.1	9.6	36.8	24.8	20.5	3.8
Total.....	324	332,950	260,800	357,240	347,300								
Overrun, percent.....				37.0	33.2								
Average grade recovery, all logs.....						9.0	8.6	.8	23.0	29.6	12.8	13.4	2.8

It is particularly difficult to grade the No. 2 Sawmill logs uniformly. Such logs must, in the judgment of the grader, be capable of producing at least 24 percent B. & Better or 65 percent No. 1 Common & Better lumber. Because No. 2 Sawmill logs vary widely in defects and quality, it is difficult to judge accurately what quality of lumber they will produce. A log rule based on outward indicators rather than on quality of lumber the log should produce would probably result in more uniformity in grading.