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Oregon Maple Log and Lumber Grading

by

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Oregon Forest Products Laboratory



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OREGON FOREST PRODUCTS LABORATORY

State Board of Forestry and School of Forestry,
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Division of Industrial Investigations
United States Forest Products Laboratory

and

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Industry Service Section
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OREGON FOREST PRODUCTS LABORATORY
the
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SUMMARY

Three hundred and sixty-seven Oregon maple logs, scaling 41,690 board feet, were sawed into 36,580 fbm of lumber at the L. R. Smith Hardwood Company. All logs were eight feet in length, and ranged in diameter from 10 to 32 inches.

Each log was graded according to the rules developed for hardwood sawlogs by the U. S. Forest Products Laboratory.

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Grades of mill-run logs, yields of standard lumber graded according to the rules established by the National Hardwood Lumber Association, and overrun in sawing the logs were compared with results from several studies of eastern hardwoods.

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The results led to the conclusion that the standard log-grading rules of the U. S. Forest Products Laboratory were suitable to Oregon maple with only minor modifications; the lumber-grading rules used by the National Hardwood Lumber Association were applicable to lumber from this species, and the lumber-grade recovery from Oregon maple was comparable to that from eastern hardwoods.

OREGON MAPLE LOG AND LUMBER GRADING

by

A. C. Wollin and J. R. Pfeiffer

The best estimate available for the present volume of Oregon, or bigleaf, maple (Acer macrophyllum, Pursh.) saw timber in Oregon is approximately 3/4 billion board feet (4,6)*. The largest concentrations of the species are located in a coastal belt extending inland about 50 or 60 miles and along the western slopes of the Cascade Mountains. The wood is pinkish to light brown in color and is usually fine- and straight-grained; frequently found with quilted, curly or birds-eye figures. Because of its fine grain, excellent machinability and pleasing appearance when finished it is used extensively in the manufacture of furniture in the Pacific Northwest and to a limited extent for flooring and similar products. Present uses for Oregon maple are limited, but the excellent properties of this species should lead to its increased utilization.

As in other western hardwoods, lack of information concerning the many excellent properties of the wood, resultant lack of confidence in its ability to do a given job, and the erroneous belief that only low-grade lumber can be recovered from this tree, have been some of the major factors in limiting use of Oregon maple. Some needed information was supplied by a cooperative mill study during the summer of 1953. The investigation was undertaken to:

- Determine the applicability of the hardwood log grading rules developed by the U. S. Forest Products Laboratory to Oregon maple.
- Ascertain the applicability of the National Hardwood Lumber Association grading rules to this species.
- Compare the grades of Oregon maple logs and lumber with those of commonly used eastern species.

* Numbers in parentheses refer to references in the bibliography.

PROCEDURE

Each log was scaled, then the surface was divided into four quarters, or faces, by chalk lines. In laying out the quarters an effort was made to place the maximum possible number of defects in one face so that the remaining faces might yield lumber as clear as possible. All visible defects or blemishes on the log were measured for diameter, height above the bark surface, and distance from one end (usually the small end) of the log. These defects were then plotted on individual log-diagram sheets, as illustrated in Figure 1. Blemishes, such as sound and unsound knots (both open and overgrown), rot, flutes, checks and bumps, were recorded. On the basis of the presence and arrangement of such characteristics, each log was given a tentative grade according to the standard rules of the U. S. Forest Service (Figure 2) (1). All logs were numbered in order to permit classification of the lumber from each log.

The logs were sawed in a mill equipped with a circular head saw and an eastern-type three-saw edger.

The lumber was graded by a qualified hardwood lumber inspector with many years of experience in grading eastern hardwood lumber. The grading was based on rules developed for the national hardwood industry, and published by the National Hardwood Lumber Association, 59 East Van Buren Street, Chicago 5, Illinois. Table 9 shows in a general way the requirements of the various grades and the manner in which hardwood lumber is usually graded--mainly according to the percentage of clear-face cuttings. All lumber graded according to these rules is graded from the poorer side, except as otherwise stated.

ANALYSIS

The original log grade classification of the eight-foot Oregon maple logs in this study resulted in a number of logs being placed in the No. 2 log-grade that apparently did not belong there, since the lumber-grade recovery indicated that these logs should have been classed as No. 1. Similar results were indicated in the original classification of log grades two and three, in that the lumber-grade recovery indicated certain logs should have been placed in log grade two that were included in grade 3. It was apparent, therefore, that some modification of the log grading rules should be made to provide realistic log grades for eight-foot Oregon maple logs. As a result, several modifications of the standard log grading rules were proposed and used in this study (Table 10).

Because of the presence and effect of adventitious bud clusters in logs of this species, and the resulting difficulty in achieving close correlation between log grades and lumber grade recovery, it was necessary to consider this defect in modifying the standard log grading rules. Modifications adopted were that, for all diameter logs, three clusters one inch in diameter or two clusters two inches in diameter will be admitted in the cuttings on the grading faces, and for logs 15 inches and larger, one cluster three inches in diameter also will be admitted in all grades. Except for the combination of one 1-inch and one 2-inch cluster, the specified number and size are the maximum permitted.

Other modifications to the standard rule for Oregon maple were used as follows:

- Log lengths--8 feet and longer.
- Minimum diameter of 14 inches for No. 1 log grade and no butt log requirement.
- Minimum diameter of 10 inches for No. 2 log grade if the grading face of the log has $\frac{5}{6}$ of the area in one clear cutting.

Regrading with these modified rules resulted in a satisfactory distribution of the logs into the various grade classifications, based on the yield of No. 1 Common and better lumber.

The normal procedure for grading logs is stated in the rules as follows: The grade of the log is that of the poorest of the best three faces from the standpoint of clear-cutting requirements (2). Stated another way, this means that the grade of a given hardwood log corresponds to the grade of the next to the poorest face.

A modification of lumber grades also concerned the eight-foot length of logs that were sawed. Because this was the only length cut during the study, it seemed advisable to ignore the restrictions in the lumber grades which allow only limited percentages of eight-foot lengths.

Lumber-grade recovery and overrun from logs in grades 1, 2, and 3 are summarized in Tables 1, 2, and 3, respectively. Figure 3 shows the overrun by diameters in the three log grades.

Lumber-grade recovery from all log grades combined was tabulated by log diameters, as shown in Table 4. Volumes in board feet of lumber sawed from each log diameter are shown also in this table.

A graphic summation of lumber recovery by log diameters, from values in Table 4, is presented in Figure 4.

The overrun for all grades combined is presented in Table 5.

COMPARISON WITH OTHER SPECIES

The overrun for Oregon maple obtained in this study is compared in Table 6 with overrun from three eastern species (1). It should be noted when making this comparison that all Oregon maple logs were eight feet in length, while logs of the eastern species were up to 16 feet long. In addition, no Oregon maple or alder logs were cut under ten inches in diameter, while logs of the other trees were cut down to eight inches in diameter. Overrun is usually greater in logs of smaller diameters or greater lengths.

Lumber-grade recovery from Oregon maple according to log grade is compared with that from several eastern species and red alder in Table 7 (1,5). Here also, it should be noted that all Oregon maple logs cut were eight feet long, while logs of the other species were up to 16 feet in length. Hardwood lumber grading rules are such that trees bucked into short logs are likely to yield smaller percentages of high-grade lumber than would have resulted from sawing longer logs. In addition, many Oregon maple and red alder logs which were placed in log grade No. 1 after modifying the rules, would have been classified as grade No. 2 or No. 3, according to the standard rules of the U. S. Forest Service for grading hardwood logs (Figure 2).

Lumber-grade recovery from Oregon maple and red alder is compared in Table 8 with that from hardwoods in the Tennessee Valley (3). The lumber yield from the two western species is shown to be similar to the grade recovery from these eastern species when graded by rules of the National Hardwood Lumber Association.

CONCLUSIONS

Analysis of the data accumulated and observations made during the study led to the following conclusions:

1. The log-grading system developed by the U. S. Forest Products Laboratory is adaptable to 8-foot Oregon maple logs, with minor modifications.
2. National Hardwood Lumber Association grading rules for hardwood lumber are well suited for use with Oregon maple lumber.
3. Percentage yields of No. 1 Common and Better lumber grades were comparable to those from eastern species.

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Table 1. Lumber-grade Recovery and Overrun in Oregon Maple
Log Grade 1, by Diameters.

Diameters	Logs	Lumber-grade recovery						Lumber recovery, all grades	Net log scale*	Overrun
		Firsts and Seconds	Selects	No. 1C	No. 2C	No. 3A	No. 3B			
<u>Inches</u>	<u>Basis</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Fbm</u>	<u>Fbm</u>	<u>Per cent</u>
14	10	28.6	9.2	33.7	21.2	4.0	3.3	632	600	+ 5.3
15	14	26.5	11.0	36.8	15.8	8.0	1.9	950	985	- 3.6
16	19	20.4	12.6	38.3	17.2	8.7	2.8	1,384	1,508	- 8.2
17	18	31.7	16.8	39.0	9.5	0.9	2.1	1,491	1,587	- 6.0
18	23	31.7	8.7	38.6	14.0	5.1	1.9	2,253	2,481	- 9.2
19	18	31.0	11.8	37.7	13.5	3.5	2.5	1,994	2,094	- 4.8
20	21	27.7	13.3	38.9	11.8	5.5	2.8	2,453	2,823	-13.1
21	13	27.2	8.8	46.4	12.7	3.9	1.0	1,650	1,919	-14.0
22	16	35.3	9.1	37.3	14.5	2.7	1.1	2,289	2,568	-10.9
23	10	29.7	11.5	37.4	16.2	3.1	2.1	1,567	1,833	-14.5
24	7	43.7	9.2	35.4	8.7	2.4	0.6	1,135	1,375	-17.5
25	1	6.2	4.0	61.4	23.9	4.5	---	176	230	-23.5
26	5	22.7	5.5	52.8	12.3	4.2	2.5	947	1,126	-15.9
27	4	26.9	9.9	42.5	18.0	1.3	1.4	778	989	-21.3
28	1	54.4	11.7	23.4	9.2	---	1.3	239	290	-17.6
29	1	40.9	13.0	28.0	15.0	3.1	---	254	279	- 9.0
30	-									
31	1	13.0	3.5	57.4	22.2	3.9	---	230	252	- 8.7
32	1	33.6	9.4	41.0	7.4	6.1	2.5	244	333	-26.7
All diameters	183	30.0	10.7	39.5	13.8	4.1	1.9	20,666	23,272	-11.2

* Scribner decimal C log scale.

Table 2. Lumber-grade Recovery and Overrun in Oregon Maple Log Grade 2, by Diameters.

Diameters	Logs	Lumber-grade Recovery						Lumber recovery, all grades	Net log scale*	Overrun
		Firsts and Seconds	Selects	No. 1C	No. 2C	No. 3A	No. 3B			
<u>Inches</u>	<u>Basis</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Fbm</u>	<u>Fbm</u>	<u>Per cent</u>
11	4	—	6.0	66.2	19.5	5.3	3.0	133	120	+10.8
12	4	7.1	7.8	41.1	29.8	9.9	4.3	141	158	-10.8
13	11	6.8	1.3	24.7	40.9	16.9	9.4	469	528	-10.2
14	11	8.1	—	42.8	29.0	15.8	4.3	603	645	- 6.5
15	13	5.6	9.9	42.8	31.2	5.4	5.1	876	915	- 4.3
16	9	10.6	7.6	41.5	28.8	8.9	2.6	621	716	-13.3
17	12	8.8	11.7	34.5	27.5	12.4	5.1	924	1,045	-11.6
18	8	7.2	12.5	42.2	28.8	8.2	1.1	711	880	-19.2
19	12	3.7	8.2	48.8	24.6	11.7	3.0	1,175	1,380	-14.9
20	14	11.4	7.6	42.0	31.8	5.7	1.5	1,457	1,731	-15.8
21	8	6.0	2.7	44.0	36.0	10.3	1.0	1,044	1,117	- 6.5
22	4	10.2	10.8	44.7	23.6	10.7	—	590	656	-10.1
23	3	6.2	2.4	53.1	34.7	3.6	—	420	455	- 7.7
24	4	5.0	11.7	36.7	35.8	8.7	2.1	575	714	-19.5
25	2	—	9.4	44.0	44.2	2.4	—	339	403	-15.9
26	1	9.0	14.5	35.9	36.5	—	4.1	145	188	-22.9
27	-									
28	-									
29	2	11.6	9.0	41.0	30.9	5.5	2.0	456	604	-24.5
All diameters	122	7.4	7.7	42.2	31.0	9.0	2.7	10,679	12,255	-12.9

* Scribner Decimal C log scale.

Table 3. Lumber-grade Recovery and Overrun in Oregon Maple Log Grade 3, by Diameters.

Diameter	Logs	Lumber-grade Recovery						Lumber recovery, all grades	Net log scale*	Overrun
		Firsts and Seconds	Selects	No. 1C	No. 2C	No. 3A	No. 3B			
<u>Inches</u>	<u>Basis</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Fbm</u>	<u>Fbm</u>	<u>Per cent</u>
10	2	---	---	47.4	44.7	---	7.9	76	60	+26.7
11	-									
12	2	---	---	24.5	60.0	11.1	4.4	90	78	+15.4
13	4	---	4.0	30.2	34.6	22.8	8.4	202	198	+ 2.0
14	8	---	8.0	20.4	55.3	7.3	9.0	412	474	-13.1
15	5	1.6	2.3	12.8	55.4	24.0	3.9	258	342	-24.6
16	6	---	---	25.1	32.8	32.6	9.5	402	460	-12.6
17	8	---	---	16.7	32.0	41.5	9.8	672	712	- 5.6
18	3	---	3.8	40.3	34.4	13.9	7.6	238	324	-26.5
19	5	2.3	5.2	29.2	42.5	11.0	9.8	438	558	-21.5
20	4	6.1	2.0	18.9	49.3	10.4	13.3	460	560	-17.9
21	8	5.6	5.0	29.5	39.7	16.7	3.5	936	1,110	-15.7
22	2	---	---	31.6	49.6	16.5	2.3	266	323	-17.6
23	1	22.2	---	18.5	14.1	43.0	2.2	135	190	-28.9
24	3	---	---	20.3	36.2	30.3	13.2	439	526	-16.5
25	-									
26	-									
27	-									
28	-									
29	1	---	---	55.0	39.8	5.2	---	211	248	-14.9
All diameters	62	2.4	2.6	25.8	40.8	20.8	7.6	5,235	6,163	-15.1

* Scribner Decimal C log scale.

Table 4. Lumber Recovery from Oregon Maple by Log Diameters.

Diameter	Logs by grade			Lumber volume	Lumber grade recovery					
	1	2	3		FAS	Sel	No. 1C	No. 2C	No. 3A	No. 3B
<u>Inches</u>				<u>Fbm</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>
10	-	-	2	76	---	---	47.4	44.7	---	7.9
11	-	4	-	133	---	6.0	66.2	19.5	5.3	3.0
12	-	4	2	231	4.3	4.8	34.6	41.6	10.4	4.3
13	-	11	4	671	4.8	2.1	26.4	39.0	18.6	9.1
14	10	11	8	1,647	14.0	5.5	33.7	32.6	9.1	5.1
15	14	13	5	2,084	14.6	9.5	36.4	27.2	8.8	3.5
16	19	9	6	2,407	14.5	9.2	36.9	22.8	12.7	3.9
17	18	12	8	3,087	17.9	11.6	32.8	19.8	13.2	4.7
18	23	8	3	3,202	23.9	9.2	39.5	18.8	6.4	2.2
19	18	12	5	3,607	18.6	9.8	40.3	20.7	7.1	3.5
20	21	14	4	4,370	20.0	10.2	37.8	22.4	6.1	3.5
21	13	8	8	3,630	15.5	6.1	41.3	26.4	9.1	1.6
22	16	4	2	3,145	27.6	8.6	38.2	19.2	5.4	1.0
23	10	3	1	2,122	24.6	9.0	39.3	19.7	5.7	1.7
24	7	4	3	2,149	24.4	7.9	32.7	21.6	9.8	3.6
25	1	2	-	515	2.1	7.6	49.9	37.3	3.1	---
26	5	1	-	1,092	20.9	6.7	50.5	15.5	3.7	2.7
27	4	1	-	778	26.9	9.9	42.5	18.0	1.3	1.4
28	1	-	-	239	54.4	11.7	23.4	9.2	---	1.3
29	1	2	1	921	17.0	8.0	40.6	28.6	4.8	1.0
30	-	-	-							
31	1	-	-	230	13.0	3.5	57.4	22.2	3.9	---
32	1	-	-	244	33.6	9.4	41.0	7.4	6.1	2.5
All diameters	183	122	62	36,580	19.4	8.7	38.3	22.7	7.9	3.0

Table 5. Overrun in Oregon Maple, All Grades Combined; in Per Cent by Diameters (Based on Net Log Scale, Scribner, Decimal C).

Diameter	Logs	Net log scale*	Lumber recovery	Overrun
<u>Inches</u>	<u>Basis</u>	<u>Fbm</u>	<u>Fbm</u>	<u>Per cent</u>
10	2	60	76	+ 26.7
11	4	120	133	+ 10.8
12	6	236	231	- 2.1
13	15	726	671	- 5.6
14	29	1,719	1,647	- 4.2
15	32	2,242	2,084	- 7.0
16	34	2,684	2,407	- 10.3
17	38	3,344	3,087	- 7.7
18	34	3,685	3,202	- 13.1
19	35	4,032	3,607	- 10.5
20	39	5,114	4,370	- 14.5
21	29	4,146	3,630	- 12.4
22	22	3,547	3,145	- 11.3
23	14	2,478	2,122	- 14.4
24	14	2,615	2,149	- 17.8
25	3	633	515	- 18.6
26	6	1,314	1,092	- 16.9
27	4	989	778	- 21.3
28	1	290	239	- 17.6
29	4	1,131	921	- 18.6
30	-	-	-	-
31	1	252	230	- 8.7
32	1	333	244	- 26.7
All diameters	367	41,690	36,580	- 12.3

* Scribner Decimal C log scale.

Table 6. Overrun in Oregon Maple Compared with Eastern Hardwoods; by Diameters and Log Grades, in Per Cent. (1)

Log diameter	Oregon maple log grades			Yellow birch log grades			Hard maple log grades			Red oak* log grades		
	1	2	3	1	2	3	1	2	3	1	2	3
Inches	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
8						41.5			40.0			33.5
9						33.0			33.5			29.0
10			+26.7		28.0	25.0		26.0	26.5		30.5	24.5
11		+10.8			20.5	17.0		19.5	20.0		26.0	20.5
12		-10.8	+15.4		15.0	10.0		13.5	13.5		22.0	17.0
13		-10.2	+ 2.0	13.5	10.5	3.5	16.5	8.0	7.0	23.0	18.5	14.0
14	+ 5.3	- 6.5	-13.1	9.5	7.0	- 3.0	9.5	4.0	1.5	20.5	15.5	11.0
15	- 3.6	- 4.3	-24.6	6.0	3.5	- 8.5	4.0	1.0	- 4.0	18.0	13.0	8.0
16	- 8.2	-13.3	-12.6	3.5	0.5	-12.5	0.0	- 1.0	- 9.0	16.0	10.5	5.5
17	- 6.0	-11.6	- 5.6	1.0	- 1.5	-16.5	- 2.5	- 3.0	-13.0	14.0	8.0	3.0
18	- 9.0	-19.2	-26.5	- 1.0	- 3.5	-19.5	- 5.0	- 4.0	-16.5	12.0	6.5	0.5
19	- 4.8	-14.9	-21.5	- 3.0	- 5.5		- 6.5	- 5.0	-19.0	10.0	4.5	- 2.0
20	-13.1	-15.8	-17.9	- 5.0	- 7.0		- 8.0	- 5.5		8.0	2.5	- 4.0
21	-14.0	- 6.5	-15.7	- 7.0	- 9.0		- 9.0	- 6.0		6.0	1.0	- 6.0
22	-10.9	-10.1	-17.6	- 9.0	-11.0		-10.0	- 6.5		4.5	- 1.0	- 8.0
23	-14.5	- 7.7	-28.9	-11.0	-12.5		-10.5			3.0	- 2.5	
24	-17.5	-19.5	-16.5	-13.0						1.5	- 4.0	
25	-23.5	-15.9	-							0.0		
26	-15.9	-22.9	-							- 1.5		
27	-21.3	-	-							- 2.5		
28	-17.6	-	-									
29	- 9.0	-24.5	-14.9									
30	-											
31	- 8.7											
32	-26.7											
All diameters	-11.2	-12.9	-15.1	+ 1.0	+ 7.5	+ 9.9	- 1.0	+ 5.8	+11.0	+10.6	+11.6	+ 8.9

* Lowland red oak.

Table 7. Lumber-grade Yields for Oregon Maple Compared with Yields from Several Eastern Hardwoods and Red Alder; by Log Grades, in Per Cent. (1)

Log grade	Lumber grade						Timber & SSE*
	FAS	Sel	1C	2C	3A	3B	
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
<u>Oregon maple</u>							
1	30.0	10.7	39.5	13.8	4.1	1.9	-
2	7.4	7.7	42.2	31.0	9.0	2.7	-
3	2.4	2.6	25.8	40.8	20.8	7.6	-
<u>Red alder</u>							
1	15.1	10.6	42.6	21.2	5.1	5.4	-
2	5.7	3.9	31.8	39.1	14.4	5.1	-
3	2.5	3.6	24.4	41.0	18.9	9.6	-
<u>Yellow Birch</u>							
1	36.3	7.5	26.5	10.6	3.8	14.7	0.6
2	8.3	4.6	29.6	20.8	6.6	29.8	0.3
3	0.7	0.9	11.6	19.3	7.6	59.9	-
<u>Hard maple</u>							
1	24.7	12.9	30.6	12.3	4.5	14.0	1.0
2	5.6	5.9	29.4	21.3	8.2	27.6	2.0
3	0.4	1.0	13.8	23.9	12.7	47.3	0.9
<u>Red oak (Lowland)</u>							
1	27.8	8.6	30.8	12.8	6.2	6.8	7.0
2	6.5	4.6	32.8	21.3	12.7	14.8	7.3
3	0.8	1.2	21.3	26.5	18.5	25.2	6.5
<u>Red oak (Upland)</u>							
1	34.7	8.5	29.0	10.9	4.8	10.9	1.2
2	7.9	4.4	32.2	19.7	8.7	24.9	2.2
3	0.8	0.6	16.8	23.8	12.2	43.5	2.3
<u>Beech</u>							
1	24.9	5.4	37.0	12.5	5.1	13.2	1.9
2	7.5	4.2	35.1	20.2	6.8	19.0	7.1
3	0.6	0.7	17.4	26.4	11.6	31.4	11.9
<u>Soft maple</u>							
1	30.6	6.6	35.5	20.8	6.5	-	-
2	15.3	4.7	43.6	19.2	17.2	-	-
3	3.2	1.4	20.6	52.5	22.3	-	-

* Sound Square Edge.

Table 8. Lumber-grade Recovery from Oregon Maple and Red Alder Compared with Recovery from Hardwoods in the Tennessee Valley. (3)

Species	Lumber grade							
	FAS	Sel	No.1 Com	No.2 Com	Sound Wormy	No.3A Com	No.3B Com	Ties & timbers
- - - - - 100 Per Cent - - - - -								
Ash	13.4	12.7	28.8	29.1	0.5	10.3	4.9	0.3
Basswood	17.0	5.8	30.1	37.3	-	6.9	2.9	-
Beech	2.8	3.2	24.4	34.3	0.1	16.3	7.1	11.8
Birch	5.8	2.3	31.0	38.1	-	13.5	9.3	-
Buckeye	8.4	3.3	23.1	43.6	-	12.6	8.7	0.3
Chestnut	0.6	1.7	13.5	34.9	10.9	17.0	20.7	0.7
Gum, black	4.9	1.8	18.9	39.9	0.7	14.8	7.0	12.0
Gum, sweet	2.2	0.8	18.5	31.3	-	7.4	2.0	37.8
Hickory	2.8	0.5	19.2	28.7	0.6	21.6	11.9	14.7
Maple, hard	7.1	7.1	27.0	35.2	1.3	15.6	6.4	0.3
Maple, soft	5.8	4.7	24.0	44.6	1.3	10.9	4.4	4.3
Oak, black	4.7	3.9	14.7	20.5	1.4	20.7	14.9	19.2
Oak, blackjack	-	-	-	-	-	17.2	27.6	55.2
Oak, chestnut	2.1	3.0	12.8	19.1	22.4	14.4	16.2	10.0
Oak, chinquapin	1.5	2.8	8.5	6.7	-	-	0.9	79.6
Oak, post	1.0	1.1	5.9	15.0	3.8	18.7	18.1	36.4
Oak, red, Northern	17.4	10.3	25.7	18.7	1.2	10.5	6.0	10.2
Oak, red, Southern	4.8	3.1	16.5	21.2	0.8	12.8	10.5	30.3
Oak, scarlet	1.9	2.3	11.8	20.2	0.9	22.3	19.3	21.3
Oak, water	4.3	-	7.3	3.1	-	-	8.0	77.3
Oak, white	3.9	3.6	14.0	21.0	3.6	18.2	12.6	23.1
Oak, willow	-	-	36.7	18.3	-	20.0	25.0	-
Yellow poplar*	0.7	7.6	29.0	36.9	21.2	2.9	1.5	0.2
Miscellaneous**	4.1	1.5	18.6	39.6	10.3	11.2	3.5	11.1
ABOVE SPECIES	5.0	4.6	19.1	26.0	6.4	14.6	10.7	13.6
Red Oaks	7.0	4.9	16.8	20.0	1.1	17.9	13.5	18.8
White Oaks	3.0	3.1	12.8	19.7	11.1	16.7	14.4	19.2
Oaks	5.5	4.3	15.4	19.9	4.6	17.5	13.8	19.0
Alder, red	5.5	4.3	30.4	38.2	-	15.0	6.6	-
Maple, Oregon	19.4	8.7	38.3	22.7	-	7.9	3.0	-

* Saps included in Select Grade; 2A included in No. 2 Com; 2B included in Sound Wormy.

** Includes butternut, black cherry, cottonwood, cucumbertree, elm, hackberry, black locust, mulberry, sassafras, sourwood, sycamore, black walnut.

TABLE 9. SUMMARY OF CUTTING REQUIREMENTS FOR GRADES OF STANDARD HARDWOOD LUMBER.
(From 1954 rulebook of the National Hardwood Lumber Association)

FIRSTS	SECONDS	SELECTS	NO. 1 COMMON	NO. 2 COMMON	NO. 3A COMMON	NO. 3B COMMON
Widths: 6" and wider Lengths: 8 to 16 ft.	Widths: 6" and wider Lengths: 8 to 16 ft.	Widths: 4" and wider Lengths: 6 to 16 ft.	Widths: 3" and wider Lengths: 4 to 16 ft.	Width: 3" and wider Lengths: 4 to 16 ft.	Width: 3" and wider Lengths: 4 to 16 ft.	Width: 3" and wider Lengths: 4 to 16 ft.
*S.M. %Cl. Face Cuts	*S.M. %Cl. Face Cuts	*S.M. %Cl. Face Cuts	*S.M. %Cl. Face Cuts	*S.M. %Cl. Face Cuts	*S.M. %Cl. Face Cuts	
4' to 9' 91 $\frac{3}{4}$ 1	4' & 5' 83 $\frac{3}{4}$ 1	2' & 3' 91 $\frac{3}{4}$ 1	1' Clear ..	1' 66 $\frac{3}{4}$ 1	Yield: 33 $\frac{1}{2}$ % Clear Face cuttings	Yield: 25% sound cuttings No. cuttings: No limit
10' to 14' " 2	6' & 7' " 1	Reverse side cutting	2' 75 1	2' & 3' 50 1	No. cuttings: No limit	
15' & up " 3	8' to 11' " 2	4' and over shall grade on one face as required in Seconds with reverse side of board not below No. 1 Common or reverse side of cuttings sound. See Rule (Par. 69) defining edges of boards 4" and 5" wide.	3' & 4' 66 $\frac{3}{4}$ 1	4' & 5' " 2		
	12' to 15' " 3	**	5' & 7' " 2	6' & 7' " 3		
	16' & up " 4	6' to 15' S.M. will admit 1 additional cut to yield 91 $\frac{3}{4}$ % Clear Face.	8' to 10' " 3	8' & 9' " 4		
			11' to 13' " 4	10' & 11' " 5		
			14' & up " 5	12' & 13' " 6		
			3' to 7' S.M. will admit 1 additional cut to yield 75% Clear Face.	14' & up " 7		
				2' to 7' S.M. will admit 1 additional cut to yield 66 $\frac{3}{4}$ % Clear Face.		
			Minimum cutting 4" x 2' or 3" x 3'	Minimum cutting 3" x 2'	Minimum cutting 3" x 2'	Minimum cutting not less than 1 $\frac{1}{2}$ " wide and containing not less than 36 sq. in.

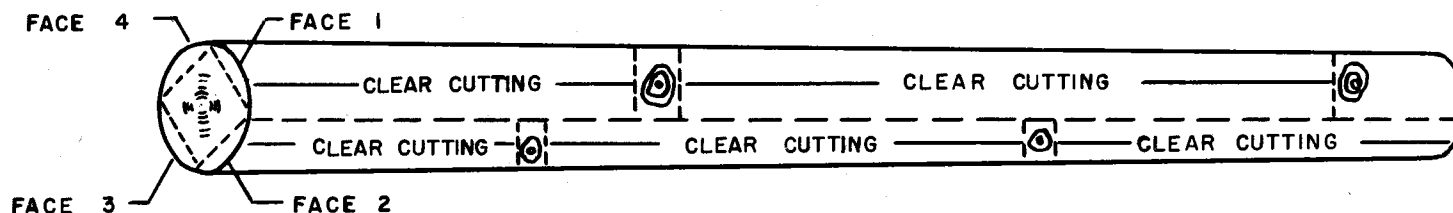
* Surface Measure.

** Admits also, pieces 6" to 7" wide of 6' to 10' surface measure and pieces 8" to 9" wide of 8' to 12' surface measure that will yield 97% in two clear-face cuttings of any length, full width of the board.

Table 10. Log Grades for 8-foot Oregon Maple Logs.

Grade factors	Log grade		
	1	2	3
DIAMETER (minimum)	14" : 20"	10" : 11"	8"
LENGTH (minumum)	8'	8'	8'
CLEAR CUTTINGS (on the 3 best faces) Lengths (minimum)	6 2/3' : 3'+3 2/3'	6 2/3' : 3'	2'
Yield in face length (minimum)	5/6	5/6 : 4/6	3/6
Number on face (maximum)	1 : 2	1 : 2	Unlimited
ADVENTITIOUS BUD CLUSTERS (maximum)	Three 1" in diameter or two 2" except for combination of one 1" and one 2". Logs 15"+, 1 cluster 3" in diameter also. Same as log Grade 1 Same as log Grade 1		
SWEEP AND CROCK DEDUCTION (maximum)	15%	30%	50%
CULL DEDUCTION, including sweep (maximum)	40%	50%	50%

Grade factors	Log grade 1		Log grade 2	Log grade 3
	Butts only	Butts and uppers	Butts and uppers	Butts and uppers
DIAMETER (minimum).....	13"-15"	16"-19"	20"+	11" : 8"+
LENGTH (minimum).....	10'+	10'+	8'-11' : 12'+	8'+
CLEAR CUTTINGS (on the 3 best faces)				
Length (minimum).....	7'	5' : 3'	3'	2'
Number on face (maximum).....	2	2	2 : 3	Unlimited
Yield in face length (minimum).....	5/6	5/6	4/6	3/6
SWEEP AND CROOK DEDUCTION (maximum).....	15%	15%	30%	50%
CULL DEDUCTION, including sweep (maximum).....	40%	40%	50%	50%
SOUND END DEFECTS, area (maximum).....		--- See instruction* ---		



Exceptions. --In ash and basswood 12" d.i.b. for grade 1 butts.

Grade 2 10" d.i.b. must be grade 1 surface quality.

Grade 2 11" d.i.b. limited to two cuttings.

Grade 2 8' and 9' lengths limited to 12" d.i.b.; 3/4 yield in not more than two 3'+ cuttings.

Sweep and crook allowance reduced 1/3 in logs with more than 1/4 diameter in sound end defects.

Sixty per cent cull deduction permitted in grade 2 if otherwise of grade 1 quality.

Sixty per cent cull deduction permitted in grade 3 if otherwise of grade 2 quality.

* Hardwood Log Grades for Standard Lumber. Report No. D1737, Forest Products Laboratory, United States Department of Agriculture, Madison, Wisconsin. 1949.

**FIGURE 2. BASIC HARDWOOD LOG GRADES FOR STANDARD LUMBER.
(FOR EXCEPTIONS TO BASIC LOG RULE FOR
OREGON MAPLE SEE TABLE 10)**

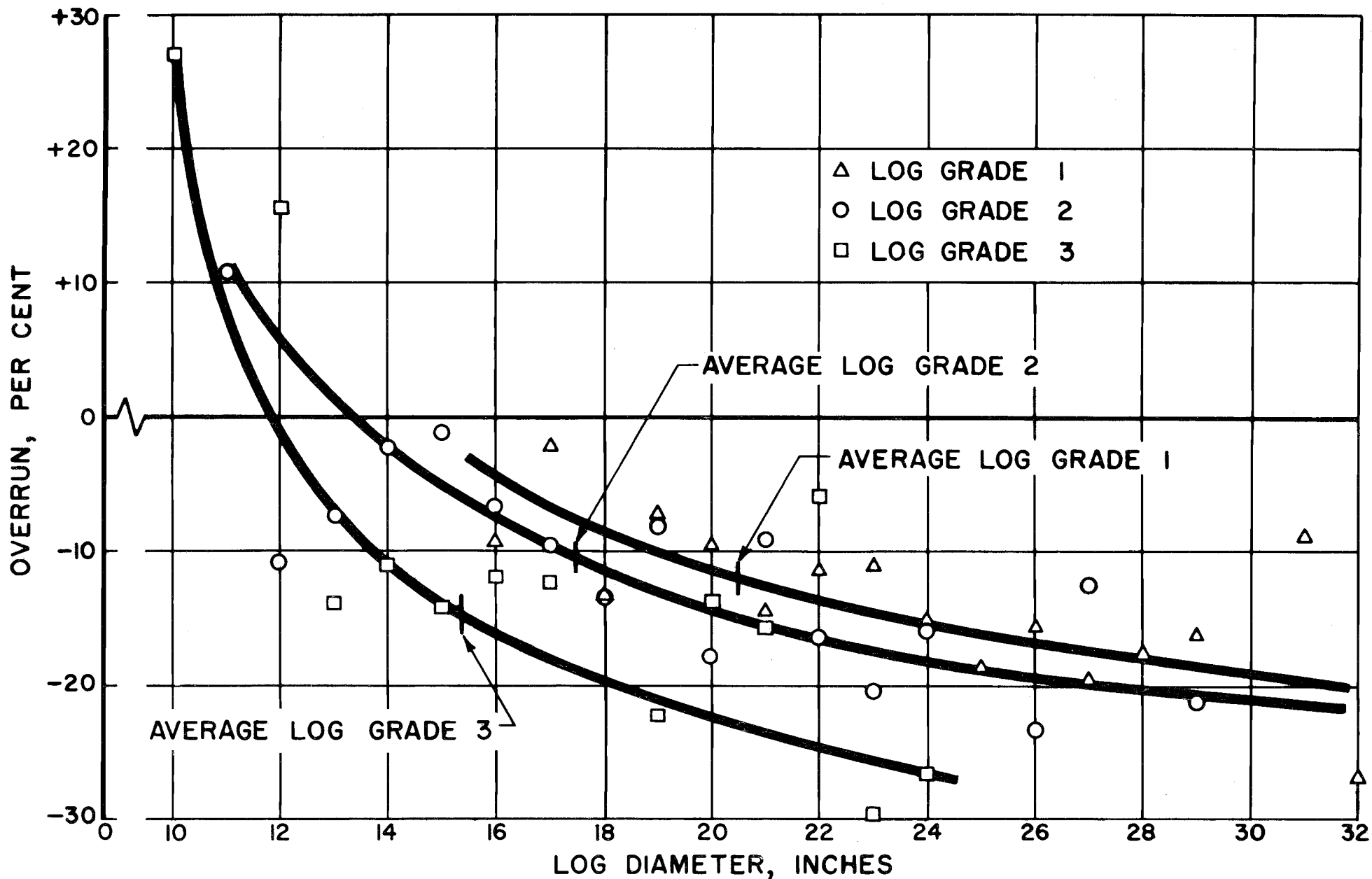


FIGURE 3. OVERRUN IN OREGON MAPLE BY LOG DIAMETERS.
(BASED ON VALUES IN TABLE 6)

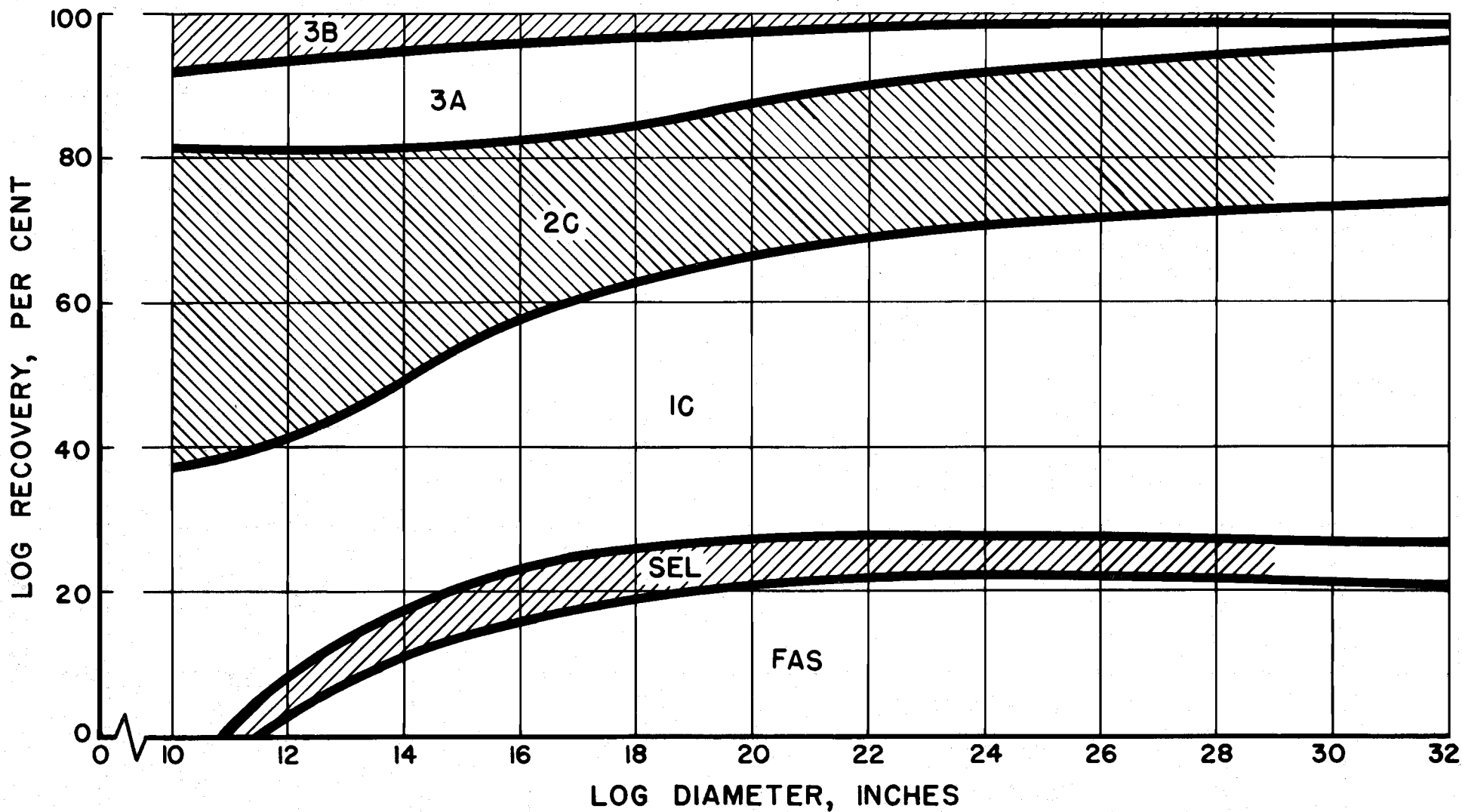


FIGURE 4. LUMBER GRADE RECOVERY FROM OREGON MAPLE LOGS; IN CUMULATIVE PERCENTAGES, BY LOG DIAMETERS, FROM 1953 MILL STUDY.