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Red Alder Log and Lumber Grading

By

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United States Forest Products Laboratory



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OREGON FOREST PRODUCTS LABORATORY

State Board of Forestry and School of Forestry,
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Corvallis

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Red Alder Log and Lumber Grading

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Industry Service Division
Oregon Forest Products Laboratory

and

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Division of Timber Growth and Utilization Relations
United States Forest Products Laboratory

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Cooperators in the study were the U. S. Forest Products Laboratory, Madison, Wisconsin; the Pacific Northwest Forest and Range Experiment Station, Portland, Oregon; and the Oregon Forest Products Laboratory, Corvallis, Oregon.

SUMMARY

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Four hundred seventy two red alder logs, scaling 36,476 board feet, were sawed into 34,137 board feet of lumber at two northwest sawmills. All were eight feet in length, and ranged in diameter from 10 to 27 inches.

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

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Lumber grade yields of standard lumber graded under rules of the National Hardwood Lumber Association, and overrun in sawing the logs were compared by log grades with results from several studies of eastern hardwoods.

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The results led to the conclusions that the log-grading rules proposed by the U. S. Forest Products Laboratory and accepted as Forest Service Standard are suitable to red alder log grading with only minor modifications; the lumber-grading rules used by the National Hardwood Lumber Association are applicable to lumber from this species; and the lumber-grade recovery from red alder logs is comparable to that from many eastern hardwoods.

RED ALDER LOG AND LUMBER GRADING

by

J. R. Pfeiffer and A. C. Wollin

According to the most recent estimate there are approximately 1 1/2 billion board feet of red alder (Alnus rubra, Bong.) in Oregon, almost one-third of the total stand of hardwood sawtimber in the state.(4)* The largest concentrations of this species are in a coastal belt extending inland about 60 miles. The reddish-brown wood from this tree is used extensively in the manufacture of furniture because of its tendency to resist splitting, its easy-working qualities, and the ease with which it may be stained to blend with other woods such as maple or mahogany. It is used also for core stock, woodenware, novelties, millwork, paper roll plugs, and wall paneling. Its use for pulp is expected to become important.

Lack of information concerning Oregon hardwoods has been a major factor in limiting their use. Some of this deficiency has been remedied by a mill study on alder conducted during the summers of 1952 and 1953. This cooperative investigation was undertaken to:

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

* Numbers in parentheses refer to publications 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 rules developed by the U. S. Forest Products Laboratory.(1) Figure 2 summarizes the rules for the three grades of sawlogs. A system of marking the logs was used by which the yield of lumber from an individual log could be identified.

The study was conducted in 1952 at two mills, both equipped with a circular headsaw and an eastern-style edger; one had a 2-saw trimmer. The study in 1953 was conducted at a mill equipped with a 4-foot band headsaw. The study logs were sawed according to established practice at each mill, without regard to the log diagrams. The logs sawed at the plant in Longview came mainly from Lewis County, Washington, while most of the logs sawed in the Albany mill were from Lincoln County, Oregon.

It was noted during the sawing that many knots, both open and overgrown, contained rot, but this rot seldom extended beyond the knot area.

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 face, except as otherwise stated.

ANALYSIS

The original log grade classification of the 8-foot alder logs in this study resulted in a small percentage of grade 2 logs, although the lumber grade recovery indicated that almost one-half of the No. 3 logs should have been classed as grade 2 (the yield of quality lumber was as high as that from the grade 2 logs). It was apparent, therefore, that some modification of the log grading rules should be made to provide realistic log grades for 8-foot alder logs.

To provide for grading red alder logs of 8-foot length only, three important modifications of the log-grading rules were proposed:

- Log grade 1 should admit 3-foot minimum cuttings on the three grading faces.
- Log grade 2 should include logs that have one 2-foot minimum cutting and one 3-foot minimum cutting on the three grading faces, rather than two 3-foot cuttings as was the previous minimum requirement.
- Log grade 3 should include all logs otherwise classified as below grade 3 that have two faces of grade 2 quality.

The suggested log grades for 8-foot red alder logs are outlined in Table 10.

Regrading with these modified rules resulted in almost one half of the logs originally classified as grade 3 being raised to grade 2, while 30 per cent of the below-grade logs were placed in grade 3.

The normal procedure for grading logs is stated in the rules as follows: "The grade of the log is that of the lowest of the three grading faces." (2) The three grading faces are the best three faces from the standpoint of clearcutting requirements. Stated another way, this means that hardwood logs are graded from the second poorest of the four faces.

A modification of lumber grades also concerned the 8-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 that allow only limited percentages of 8-foot lengths.

Lumber-grade recovery and overrun from logs in grades 1, 2, and 3 are summarized in Tables 1, 2, and 3, respectively. These three tables are arranged similarly, with one exception: Tables 2 and 3 show, in column 12, values for overrun read from the curves in Figure 3 for log grades 2 and 3. Curves were not drawn for overrun in grade 1 because of the small number of logs in this grade.

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 percentage of any lumber grade sawed from a given log diameter class may be found from these curves.

For instance, the average yield of No. 1C sawed from 20-inch diameter logs is found by subtracting the value on the lower line, which shows a cumulative total of 17 per cent Firsts and Seconds (FAS) and Selects, from the upper line which shows a total of 57 per cent recovery of No. 1C and Better. The difference of 40 per cent is the average percentage of No. 1C obtained from this size log.

Referring again to Tables 1, 2, and 3, the total lumber recovery by log diameter in column 9 may be compared with the net log scale (using Scribner Decimal C log scale) in column 10. The differences between the values, when converted into per cent, show overrun as percentages of the net log scale. These values for overrun are recorded in column 11.

The overrun for grades 1, 2, and 3 combined is presented in Table 5.

COMPARISON WITH OTHER SPECIES

The overrun for red alder 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 alder logs were 8 feet in length, while logs of the eastern species were up to 16 feet long. In addition, no alder logs were cut under 10 inches in diameter, while logs of the other trees were cut down to 8 inches in diameter. Overrun is usually greater in logs of smaller diameters or greater lengths.

Lumber-grade recovery from red alder according to log grade is compared with that from several eastern species in Table 7.(1) Here also it should be noted that all red alder 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 red alder logs, which were placed in log grades 2 and 3 after modifying the rules, would have been classified as grade 3, or below grade, respectively, according to the standard rules.(1)

Lumber-grade recovery from red alder is compared in Table 8 with that from hardwoods in the Tennessee Valley.(3) The lumber yield from red alder is shown to be similar to the grade recovery from these eastern species.

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 red alder logs, with only three modifications.
2. National Hardwood Lumber Association grading rules for hardwood lumber are well suited for use with red alder lumber.
3. Percentage yields of No. 1 Common and Better lumber grades are comparable to those from eastern species.

REMARKS

Average lumber-grade yield percentages computed in the study were based on short logs, 8 feet in length. Current practice in eastern mills producing hardwood lumber is to saw logs up to 16 feet in length. It is likely that percentage yields of No. 1 Common and Better lumber grades from red alder could be increased by sawing longer logs with practices which lead to maximum recovery of high-quality lumber.

Net overrun percentages from red alder likely can be increased also by such practices as restricting the amount and width of edgings, sawing longer logs, and reducing the width of saw kerf.

It should be noted that the three log-grade modifications were designed to be applied to 8-foot red alder logs. These modifications might be undesirable for use with longer logs up to 16 feet in length.

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Table 1. Lumber-grade Recovery and Overrun in Red Alder
Log Grade 1; by Diameters.

Diameter	Logs	Lumber-grade recovery						Lumber recovery, all grades	Net log scale*	Overrun
		FAS	Sel	No.1C	No.2C	No.3A	No.3B			
1	2	3	4	5	6	7	8	9	10	11
<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>
16	7	10.6	9.3	34.8	30.4	11.8	3.9	536	560	- 4.3
17	3	11.6	14.7	36.6	31.5	0	5.6	232	270	-14.1
18	6	18.9	10.8	42.1	18.9	5.1	4.2	566	660	-14.2
19	4	15.2	3.7	47.6	18.9	4.0	10.6	376	442	-14.9
20	1	34.0	4.7	39.6	9.4	0	12.3	106	140	-24.3
21	4	16.9	9.8	50.0	15.6	5.3	2.4	450	570	-21.1
22	2	0	13.7	47.8	32.5	4.0	2.0	249	340	-26.8
23	2	22.0	19.5	43.3	6.7	0	8.5	282	365	-22.7
All diameters	29	15.1	10.6	42.6	21.2	5.1	5.4	2,797	3,347	-16.4

* Scribner Decimal C log scale.

Table 2. Lumber-grade Recovery and Overrun in Red Alder Log Grade 2; by Diameters.

Diameter	Logs	Lumber-grade recovery						Lumber recovery, all grades	Net log scale*	Overrun	Overrun from curve**
		FAS	Sel	No.1C	No.2C	No.3A	No.3B				
1	2	3	4	5	6	7	8	9	10	11	12
Inches	Basis	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Fbm	Fbm	Per cent	Per cent
11	6	0	2.3	25.3	28.1	22.6	21.7	217	189	+14.8	+18.5
12	21	1.1	2.8	23.2	42.2	19.9	10.8	957	834	+14.7	+10.0
13	51	1.8	2.8	21.1	45.4	22.1	6.8	2,631	2,523	+ 4.3	+ 4.5
14	37	4.7	3.3	25.8	44.3	16.6	5.3	2,200	2,209	- 0.4	+ 0.0
15	43	4.4	5.0	28.4	43.4	15.2	3.6	2,917	2,992	- 2.5	- 3.4
16	33	4.5	3.5	34.0	40.0	14.7	3.3	2,432	2,616	- 7.0	- 6.3
17	28	12.4	3.1	35.4	36.1	8.9	4.1	2,503	2,495	+ 0.3	- 8.8
18	25	5.1	3.1	37.4	37.8	11.8	4.8	2,390	2,717	-12.0	-11.4
19	13	12.4	11.4	33.2	26.0	10.4	6.6	1,336	1,534	-12.9	-13.2
20	12	5.4	2.4	38.0	38.7	12.2	3.3	1,325	1,614	-17.9	-14.5
21	5	8.6	8.3	40.8	35.0	4.2	3.1	569	735	-22.6	-15.6
22	2	2.0	0	34.4	35.5	21.4	6.7	299	330	- 9.4	-16.5
23	3	4.4	2.8	54.7	29.0	9.1	0	503	550	- 8.5	-17.1
24	1	4.6	0	46.8	26.0	16.8	5.8	173	210	-17.6	-17.6
25	-										-18.0
26	1	7.1	0	40.7	33.6	0	18.6	113	163	-30.7	-18.4
27	1	6.1	0	43.7	27.7	13.6	8.9	213	250	-14.8	-18.7
All diameters	282	5.7	3.9	31.8	39.1	14.4	5.1	20,778	21,961	- 5.4	

* Scribner Decimal C log scale.

** Values read from curve in Figure 3.

Table 3. Lumber-grade Recovery and Overrun in Red Alder Log Grade 3; by Diameters.

Diameter	Logs	Lumber-grade recovery						Lumber recovery, all grades	Net log scale*	Overrun	Overrun from curve**
		FAS	Sel	No.1C	No.2C	No.3A	No.3B				
1	2	3	4	5	6	7	8	9	10	11	12
<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>	<u>Per cent</u>
10	7	9.0	2.2	21.3	15.5	39.7	12.3	277	210	+31.9	+40.0
11	13	0	0	10.5	43.6	24.6	21.3	493	385	+28.1	+20.2
12	19	0.5	1.9	13.2	43.8	25.1	15.5	827	760	+ 8.8	+ 8.8
13	22	0	1.6	16.7	44.1	24.2	13.4	1,093	1,091	+ 0.2	+ 2.3
14	25	3.7	5.7	21.7	43.5	20.2	5.2	1,499	1,487	+ 0.8	- 2.5
15	24	1.5	1.4	24.2	41.9	22.1	8.9	1,498	1,659	- 9.7	- 6.5
16	17	2.8	5.2	24.3	41.6	14.2	11.9	1,336	1,356	- 1.5	- 9.7
17	8	3.4	1.2	28.2	43.0	17.2	7.0	668	720	- 7.2	-12.3
18	10	1.3	5.1	33.6	37.0	15.1	7.9	901	1,100	-17.3	-14.7
19	6	3.5	2.9	43.4	29.8	13.3	7.1	663	720	- 7.9	-16.7
20	3	4.4	22.1	28.7	29.3	10.9	4.6	321	405	-20.7	-18.3
21	2	6.4	0	41.3	31.8	18.2	2.3	220	285	-22.8	-20.8
22	1	20.3	15.8	29.3	15.1	6.0	13.5	133	170	-21.8	-21.0
23	1	0	0	15.3	50.0	13.3	21.4	150	190	-21.1	-22.1
24	3	1.2	0	29.6	64.6	4.6	0	483	630	-23.3	-23.0
All diameters	161	2.5	3.6	24.4	41.0	18.9	9.6	10,562	11,168	- 5.4	

* Scribner Decimal C log scale.

** Values read from curve in Figure 3.

Table 4. Lumber Recovery from Red Alder by Log Diameters.

Log diameter	Logs, by grade				Lumber volume	Lumber-grade recovery					
	1	2	3	all		FAS	Sel	1	2	3A	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			7	7	277	9.0	2.2	21.3	15.5	39.7	12.3
11		6	13	19	710	0	0.7	15.1	38.9	23.9	21.4
12		21	19	40	1,784	0.9	2.4	18.6	42.9	22.3	12.9
13		51	22	73	3,724	1.3	2.4	19.8	45.1	22.7	8.7
14		37	25	62	3,699	4.3	4.3	24.1	44.0	18.1	5.2
15		43	24	67	4,415	3.4	3.8	27.0	42.8	17.6	5.4
16	7	33	17	57	4,304	4.7	4.8	31.0	39.3	14.2	6.0
17	3	28	8	39	3,403	10.6	3.5	34.1	37.1	9.9	4.8
18	6	25	10	41	3,857	6.3	4.7	37.2	34.8	11.6	5.4
19	4	13	6	23	2,375	10.4	7.8	38.3	25.9	10.2	7.4
20	1	12	3	16	1,752	7.0	6.2	36.3	35.2	11.2	4.1
21	4	5	2	11	1,239	11.2	7.4	44.2	27.4	7.1	2.7
22	2	2	1	5	681	4.8	8.1	38.3	30.4	12.1	6.3
23	2	3	1	6	935	9.0	7.4	44.9	25.7	7.0	6.0
24		1	3	4	656	2.1	0	34.2	54.4	7.8	1.5
25		0									
26		1		1	113	7.1	0	40.7	33.6	0	18.6
27		1		1	213	6.1	0	43.7	27.7	13.6	8.9
Totals	29	282	161	472	34,137						
Weighted averages						5.5	4.3	30.4	38.2	15.0	6.6

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

Diameter	Logs	Net log scale*	Lumber recovery	Over- run
<u>Inches</u>	<u>Basis</u>	<u>Fbm</u>	<u>Fbm</u>	<u>Per cent</u>
10	7	210	277	+31.9
11	19	574	710	+23.7
12	40	1,594	1,784	+11.9
13	73	3,614	3,724	+ 3.0
14	62	3,696	3,699	+ 0.1
15	67	4,651	4,415	- 5.1
16	57	4,532	4,304	- 5.0
17	39	3,485	3,403	- 2.4
18	41	4,477	3,857	-13.8
19	23	2,696	2,375	-11.1
20	16	2,159	1,752	-18.9
21	11	1,590	1,239	-22.1
22	5	840	681	-18.9
23	6	1,105	935	-15.4
24	4	840	656	-21.8
25	--	---	---	---
26	1	163	113	-30.7
27	1	250	213	-14.8
All diameters	472	36,476	34,137	- 6.4

* Scribner Decimal C Log Scale.

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

Log diameter	Red alder 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	<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>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>	<u>Per cent</u>
8						41.5			40.0			33.5
9						33.0			33.5			29.0
10			+31.9		28.0	25.0		26.0	26.5		30.5	24.5
11		+14.8	+28.1		20.5	17.0		19.5	20.0		26.0	20.5
12		+14.7	+ 8.8			15.0	10.0		13.5	13.5		22.0
13		+ 4.3	+ 0.2	13.5	10.5	3.5	16.5	8.0	7.0	23.0	18.5	14.0
14		- 0.4	+ 0.8	9.5	7.0	- 3.0	9.5	4.0	1.5	20.5	15.5	11.0
15		- 2.5	- 9.7	6.0	3.5	- 8.5	4.0	1.0	- 4.0	18.0	13.0	8.0
16	- 4.3	- 7.0	- 1.5	3.5	0.5	-12.5	0.0	- 1.0	- 9.0	16.0	10.5	5.5
17	-14.1	+ 0.3	- 7.2	1.0	- 1.5	-16.5	- 2.5	- 3.0	-13.0	14.0	8.0	3.0
18	-14.2	-12.0	-17.3	- 1.0	- 3.5	-19.5	- 5.0	- 4.0	-16.5	12.0	6.5	0.5
19	-14.9	-12.9	- 7.9	- 3.0	- 5.5		- 6.5	- 5.0	-19.0	10.0	4.5	- 2.0
20	-24.3	-17.9	-20.7	- 5.0	- 7.0		- 8.0	- 5.5		8.0	2.5	- 4.0
21	-21.1	-22.6	-22.8	- 7.0	- 9.0		- 9.0	- 6.0		6.0	1.0	- 6.0
22	-26.8	- 9.4	-21.8	- 9.0	-11.0		-10.0	- 6.5		4.5	- 1.0	- 8.0
23	-22.7	- 8.5	-21.1	-11.0	-12.5		-10.5			3.0	- 2.5	
24		-17.6	-23.3	-13.0						1.5	- 4.0	
25										0.0		
26		-30.7								- 1.5		
27		-14.8								- 2.5		
All diameters	-16.4	- 5.4	- 5.4	+ 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 Red Alder Compared with Yields from Several Eastern Hardwoods; by Log Grades, in Per Cent.(1)

Log grade	Lumber grade						Timber & SSE*
	FAS	Sel	No.1C	No.2C	No.3A	No.3B	
	<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>Per cent</u>
<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>Sap gum</u>							
1	35.6	8.3	27.7	19.6		8.8	----
2	10.4	5.6	33.4	33.6		17.0	----
3	1.6	1.6	20.7	47.5		28.6	----
<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 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	11.3	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	---

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

** Includes butternut, black cherry, cottonwood, cucumber tree, 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 4' to 9' 91 $\frac{3}{8}$ 1 10' to 14' " 2 15' & up " 3	*S.M. %Cl. Face Cuts 4' & 5' 83 $\frac{3}{8}$ 1 6' & 7' " 1 8' to 11' " 2 12' to 15' " 3 16' & up " 4 ** 6' to 15' S.M. will admit 1 additional cut to yield 91 $\frac{3}{8}$ % Clear Face.	*S.M. %Cl. Face Cuts 2' & 3' 91 $\frac{3}{8}$ 1 Reverse side cutting sound. 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.	*S.M. %Cl. Face Cuts 1' Clear .. 2' 75 1 3' & 4' 66 $\frac{3}{8}$ 1 5' & 7' " 2 8' to 10' " 3 11' to 13' " 4 14' & up " 5 3' to 7' S.M. will admit 1 additional cut to yield 75% Clear Face.	*S.M. %Cl. Face Cuts 1' 66 $\frac{3}{8}$ 1 2' & 3' 50 1 4' & 5' " 2 6' & 7' " 3 8' & 9' " 4 10' & 11' " 5 12' & 13' " 6 14' & up " 7 2' to 7' S.M. will admit 1 additional cut to yield 66 $\frac{3}{8}$ % Clear Face.	Yield: 33 $\frac{3}{8}$ % Clear Face cuttings No. cuttings: No limit	Yield: 25% sound cuttings No. cuttings: No limit Minimum cutting not less than 1 $\frac{1}{2}$ " wide and containing not less than 36 sq. in.
	Minimum cutting 4" x 5' or 3" x 7'		Minimum cutting 4" x 2' or 3" x 3'	Minimum cutting 3" x 2'	Minimum cutting 3" x 2'	

* 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 Red Alder Logs.

Grade factors	Log grade		
	1	2	3
DIAMETER (minimum)	16"	10"	8"
LENGTH	8'	8'	8'
CLEAR CUTTINGS (on the 3 best faces)			
Length (minimum)	3'	2' - 3'	2'
Number on face (maximum)	2	1 - 1	Unlimited
Yield in face length (minimum)	5/6	4/6	3/6
SWEEP AND CROOK DEDUCTION (maximum)	15%	30%	50%
CULL DEDUCTION, including sweep (maximum)	40%	50%	50%

Exceptions: Logs classified as below the No. 3 grade when graded from the second from the poorest face will be admitted in the No. 3 log grade when two sides are of No. 2 log grade quality.

Grade 2, 10-inch diameter inside bark, must be of grade 1 surface quality.

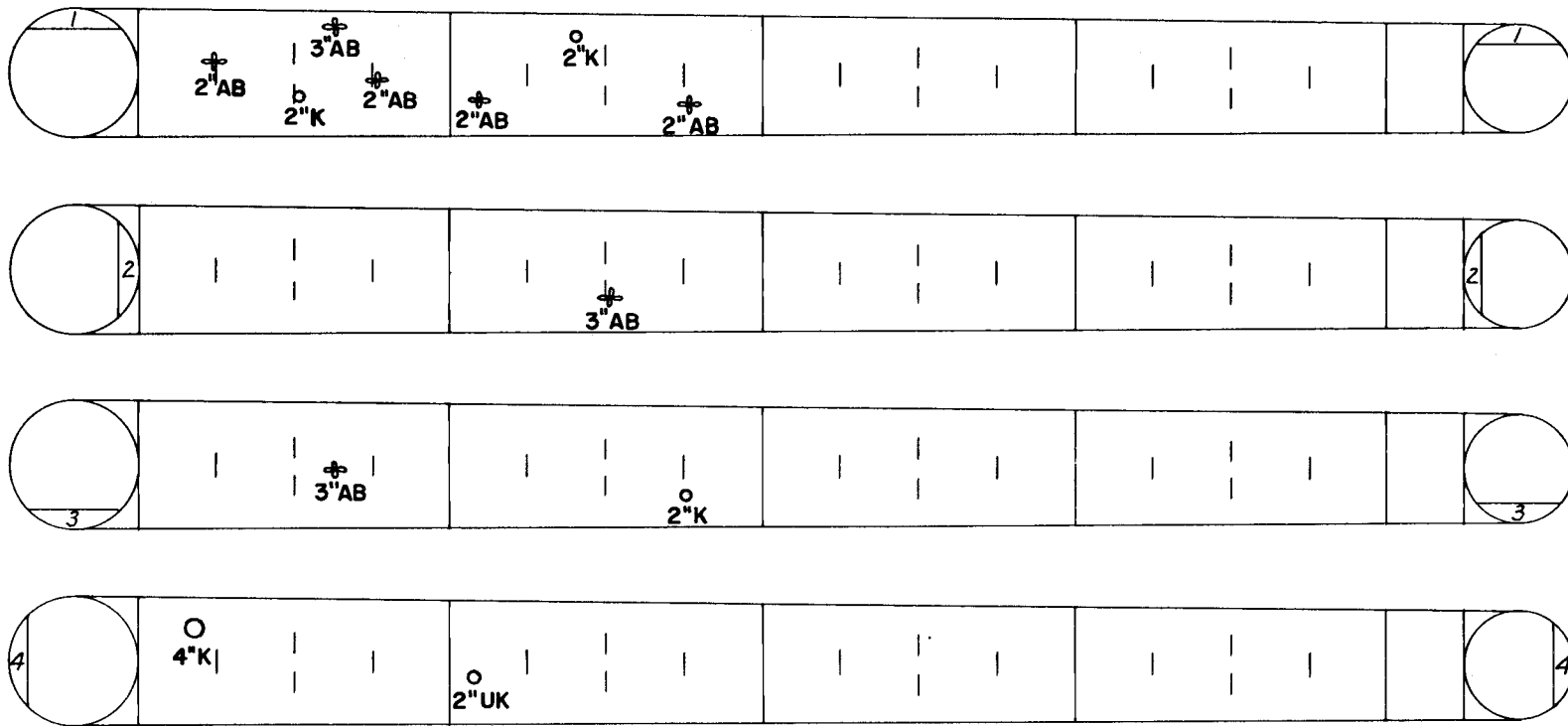
Note: Sound end defect (blue stain) in excess of 50 per cent of the area on either end of the log will cause a one step degrade.

Date 7-24-52 Species RED ALDER Log No. 7707 Lg. Dia. 19 Sm. Dia. 17 Length 8'-1" Wth. Sap — Age 35 Butt _____

Mill No. 1 Gross Scale 90 Defect 0 Ded. 0 Net Scale 90 Lbr. 100 Overrun, gross + 10 Net + 10 Slight dot — Mineral — Gum spots — Streak _____

FAS 4 % Sel. 11 % No. 1C. 24 % No. 1 & Btr. 39 % No. 2C. 41 % No. 3A 20 % No. 3B — % T & T — % Value \$ — Log Grade 220

0 2 4 6 8 10 12 14 16



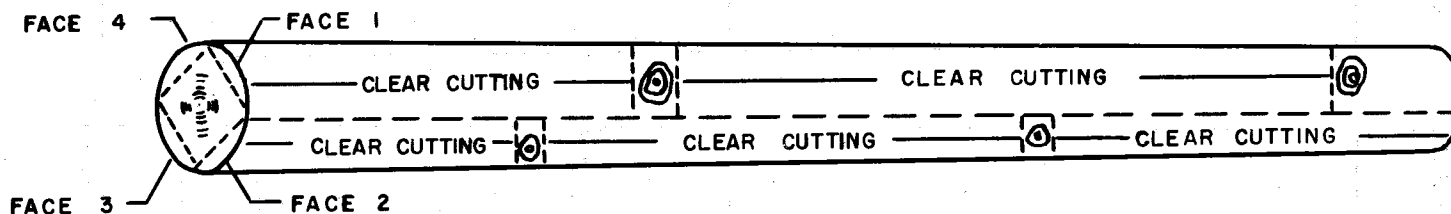
Deductable defects: 1. Sweep or crook. 2. Rot, advanced dot. 3. Shake, heart checks.
4. Fire. 5. Flutes. 6. Operating defects; splits, splinters, breaks. 7. Grubholes. 8. Tapholes.

Code: K-Sound knot or limb. U-Unsound knot. B-Bump. UB-Unsound Bump. F-Frost cracks. R-Ridges
L-FLuter. AB-Adventitious buds. W-Swell. D-Distortion.

Forest Products Laboratory, Madison, Wisconsin, July, 1938

Figure 1. Typical log description form used in red alder grading study.

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
RED ALDER SEE TABLE 10)**

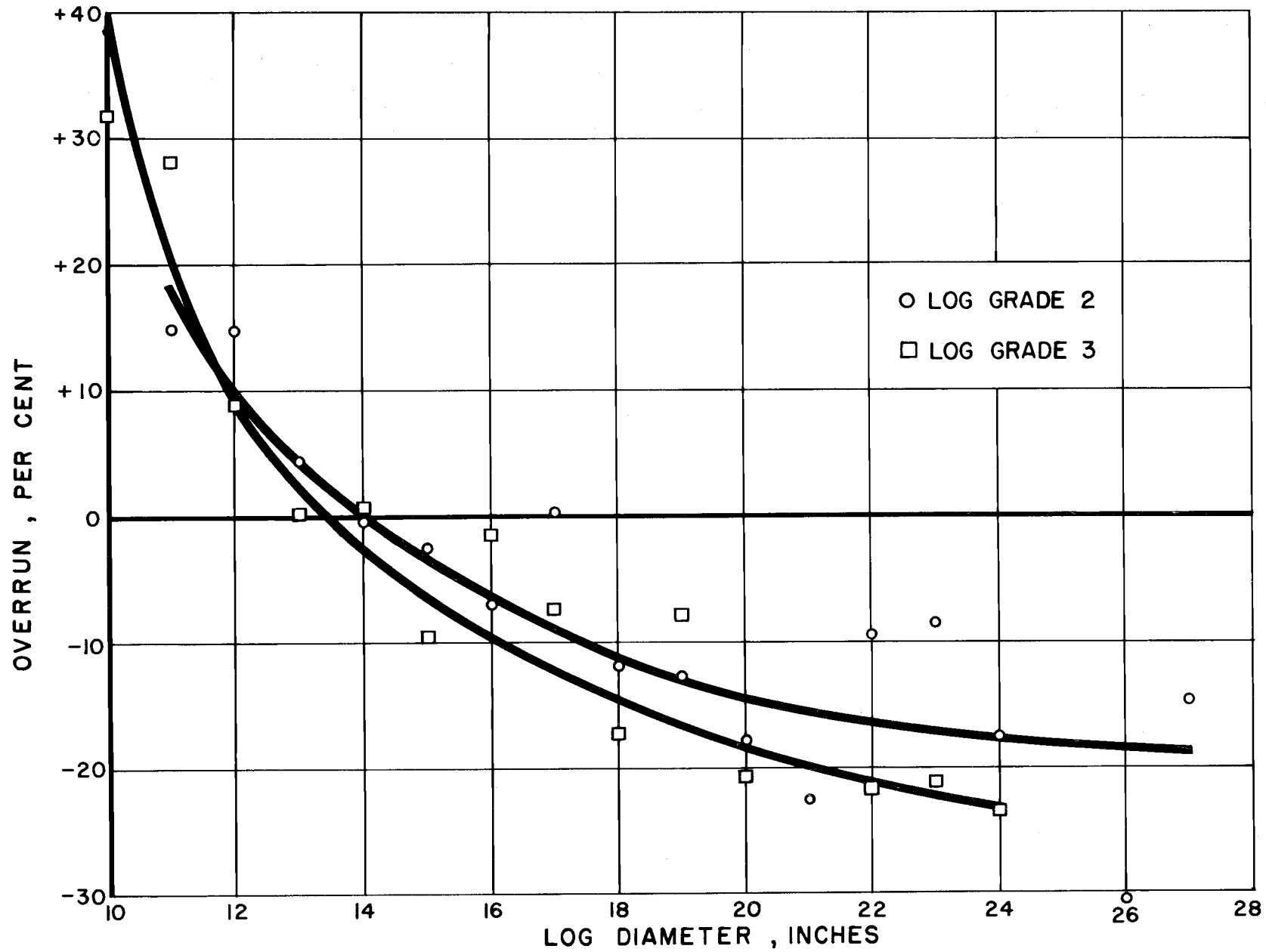


FIGURE 3. OVERRUN IN RED ALDER BY LOG DIAMETERS.
 (BASED ON VALUES IN TABLE 6)

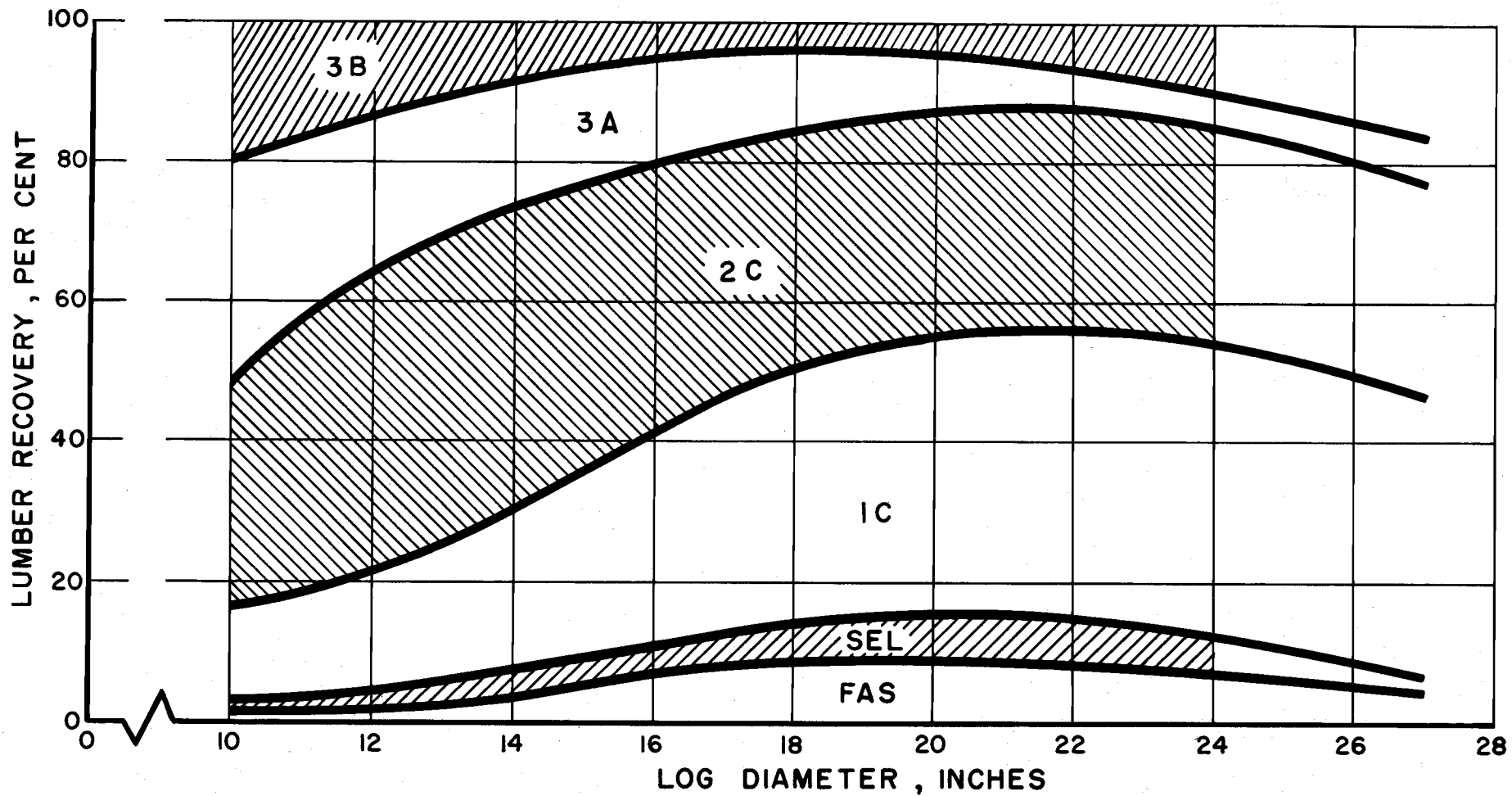


FIGURE 4. LUMBER GRADE RECOVERY FROM RED ALDER LOGS; IN CUMULATIVE PERCENTAGES, BY LOG DIAMETERS, FROM 1952 AND 1953 MILL STUDY.