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Green Lumber Grade Yields for Subfactory Class Hardwood Logs

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ABSTRACT

Data on lumber grade yields for subfactory class logs are presented for ten species of hardwoods. Logs of this type are expected to assume greater importance in the market. The yields, when coupled with lumber prices, will be useful to sawmill operators for developing log prices in terms of standard factory lumber.

Introduction

LUMBER GRADE yield tables for subfactory class red oak sawlogs were reported previously by Schroeder in 1968.[1] Since then, there have been requests for tables of subfactory class lumber yields of additional species. We have developed such tables for nine more hardwood species: beech, hickory, red maple, yellow-poplar, yellow and paper birch, and white, chestnut, and overcup oak. These are presented in this report together with yields for red oak, thus bringing all available subfactory class yields under one cover.

Procedure

During the past 12 years, the Forest Service has collected lumber grade yield data from approximately 12,000 hardwood logs. Although most of these qualified as factory grade 3 or better, over 600 subfactory class logs were sawed. Subfactory logs include construction and local-use classes. Specifications for these classes appear in tables 1 and 2, respectively. All lumber was graded by a National Hardwood Lumber Association inspector at the time of sawing, and the necessary information was recorded so that the board grades and volumes for each log were known.

In preparation for this report, we tabulated actual green lumber grade yields by log diameter for each species. These yields formed the basis for the analysis. Several species were eliminated from the study at this stage because the sample size or range of diameters was too small to be useful in yield table development. Multiple regression equations were derived for each lumber grade within a species. The equations were of the form:

$$\% \text{ yield} = a + b\ (\text{scaling diameter}) + c\ (\text{scaling diameter})^2$$

Results

Tables 3 through 12 show the green lumber grade yields for subfactory class logs. Most major hardwood species have been considered, with the notable exception of sugar maple. Of the 613 sugar maple logs available, only three were classed as subfactory. If a subfactory yield table for sugar maple is required, the table for red maple is suggested as a substitute.

[1]Schroeder, James G. 1968. LUMBER GRADE YIELDS FOR SUBFACTORY CLASS RED OAK LOGS. USDA Forest Serv. Res. Paper NE-114, 15 p., NE. Forest Exp. Sta., Upper Darby, Pa.

It should be noted that the yields in table 3 were developed from the same logs used for Schroeder's earlier publication. A comparison will show differences. An obvious reason is that yields presented here are green yields while the earlier report presented dry yields. Most mills that saw subfactory class logs are producing lumber for the pallet industry, and the biggest share of pallet lumber is traded green. A possible reason for the differences between our yields and Schroeder's is that we used regression analysis instead of a hand fitting procedure. As a check, we compared the dry yields reported in NE-114, which were developed using hand fitted curves, with dry yields computed from our equations and found close agreement. Only 6 of the 66 figures differed by more than one percent. This finding justifies use of the much faster equation solving method.

Discussion

Requests for data on subfactory class lumber yields have come from several sources. These logs are being converted into lumber, so buyers and sellers need to know the log values in terms of lumber. By applying prices to the yields, these log values can be determined.

As we approach utilization of the whole tree, more low quality logs will be marketed. The most profitable use of these logs must be determined, and yield data for subfactory class logs will be useful.

Table 1.—*Forest Service standard specifications for hardwood construction logs.*[a]

Position in tree		Butt & upper
Min. diameter, small end		8 inches +
Min. length, without trim		8 feet
Clear cuttings		No requirements.
Sweep allowance, absolute		¼ diameter small end for each 8 feet of length.
Sound surface defects	Single knots	Any number, if no one knot has an average diameter above the callus in excess of ⅓ of log diameter at point of occurrence.
	Whorled knots	Any number if sum of knot diameters above the callus does not exceed ⅓ of log diameter at point of occurrence.
	Holes	Any number provided none has a diameter over ⅓ of log diameter at point of occurrence, and none extends over 3 inches into included timber.[b]
Unsound surface defects		Same requirements as for sound defects if they extend into included timber.[b] No limit if they do not.
End defects	Sound	No requirements.
	Unsound	None allowed; log must be sound internally, but will admit 1 shake not to exceed ¼ the scaling diameter and a longitudinal split not extending over 5 inches into the contained timber.

[a] These specifications are minimum for the class. If, from a group of logs, factory logs are selected first, thus leaving only non-factory logs from which to select construction logs, then the quality range of the construction logs so selected is limited, and the class may be considered a grade. If selection for construction logs is given first priority, then it may be necessary to subdivide the class into grades.

[b] Included timber is always square, and dimension is judged from small end.

From: Rast, Everette D., David L. Sonderman, and Glenn L. Gammon. 1973. A GUIDE TO HARDWOOD LOG GRADING (Revised). USDA Forest Serv. Gen. Tech. Rep. NE-1. 32 p., illus. NE. Forest Exp. Sta., Upper Darby, Pa.

Table 2.—*Suggested specifications for hardwood local-use logs.*

Position in tree	Butt and upper
Min. diameter, small end	8 inches +
Min. length, without trim	8 feet +
Sweep allowance, absolute	½ diameter of small end
Max. scale deduction allowed	⅔
Clear cuttings	No requirements
Sound or unsound surface defect limitations	Only requirement is that diameter of knots, holes, rot, etc. shall not exceed ½ diameter of log at point of occurrence.
Sound end defects	No requirements

From: Rast, Everette D., David L. Sonderman, and Glenn L. Gammon. 1973. A GUIDE TO HARDWOOD LOG GRADING (Revised). USDA Forest Serv. Gen. Tech. Rep. NE-1. 32 p., illus. NE. Forest Exp. Sta., Upper Darby, Pa.

Table 3.—*Green lumber yields by grade for construction and local-use class red oak sawlogs*[a]

Diameter	Lumber grade					
	FAS	SEL	1C	2C	3A	3B
Inches	*Percent*					
9	0	0	0	2	21	77
10	0	0	2	6	22	70
11	0	0	3	10	23	64
12	0	0	5	14	24	57
13	0	1	7	17	25	50
14	0	1	10	20	25	44
15	0	1	12	23	25	39
16	1	1	15	25	25	33
17	1	1	18	27	25	28
18	1	2	21	29	24	23
19	1	2	24	30	24	19

[a]Includes black, northern red, and scarlet oaks.

Table 4.—*Green lumber yields by grade for construction and local-use class white oak sawlogs*

Diameter	Lumber grade							
	FAS	FASIF	SEL	1C	2C	SW	3A	3B
Inches				*Percent*				
8	0	0	0	0	6	16	38	40
9	0	0	0	0	9	18	37	36
10	0	0	0	2	11	20	35	32
11	0	0	0	5	13	21	33	28
12	0	0	1	7	14	23	31	24
13	0	0	1	9	16	24	29	21
14	0	0	1	11	17	25	28	18
15	0	0	0	13	18	27	26	16
16	0	0	0	15	19	28	24	14
17	0	1	0	16	19	29	22	13
18	0	1	0	18	19	30	21	11
19	0	1	0	19	20	31	19	10
20	0	1	0	20	20	32	18	9
21	0	1	0	21	19	33	16	10
22	0	1	0	22	18	34	15	10
23	0	1	0	22	18	34	14	11
24	0	1	0	23	17	35	12	12

Table 5.—*Green lumber yields by grade for construction and local-use class chestnut oak sawlogs*

Diameter	Lumber grade							
	FAS	FASIF	SEL	1C	2C	SW	3A	3B
Inches				*Percent*				
8	0	0	0	0	3	22	22	53
9	0	0	0	1	5	24	22	48
10	0	0	0	1	7	26	23	43
11	0	0	0	1	9	28	23	39
12	0	0	0	2	11	30	22	35
13	0	0	0	2	12	32	22	32
14	0	0	0	3	13	34	21	29
15	0	0	0	4	13	35	21	27
16	0	0	0	5	14	37	19	25
17	0	0	0	6	14	38	18	24
18	0	0	0	7	13	40	16	24
19	0	0	0	9	12	41	14	24
20	0	0	0	10	11	42	12	25
21	0	0	0	12	10	43	9	26
22	0	0	0	14	8	44	7	27
23	0	0	0	15	6	45	4	30

Table 6.—*Green lumber yields by grade for construction and local-use class overcup oak sawlogs*

Diameter	Lumber grade						
	FAS	FASIF	SEL	1C	2C	3A	3B
Inches				*Percent*			
10	0	0	0	0	9	16	75
11	0	0	0	2	13	18	67
12	0	0	0	3	17	19	61
13	0	0	0	5	20	21	54
14	0	0	0	7	23	22	48
15	0	0	0	8	26	22	44
16	0	0	0	10	28	23	39
17	0	0	0	12	29	23	36
18	0	0	0	14	30	23	33
19	0	0	0	16	31	23	30
20	0	0	0	18	32	22	28
21	0	0	0	20	31	22	27
22	0	0	0	22	31	21	26
23	0	0	0	25	30	19	26
24	0	0	0	27	29	18	26

Table 7.—*Green lumber yields by grade for construction and local-use class yellow-poplar sawlogs*

Diameter	Lumber grade						
	FAS	SEL	SAPS	1C	2A	2B	3C
Inches				*Percent*			
8	0	0	0	2	7	89	2
9	0	0	0	3	14	81	2
10	0	0	0	5	21	72	2
11	0	0	0	7	27	64	2
12	0	0	0	9	32	57	2
13	0	0	1	12	35	50	2
14	0	0	1	15	38	44	2
15	0	0	2	18	39	39	2
16	0	0	2	22	39	35	2
17	0	0	2	26	39	31	2
18	0	0	3	30	37	28	2
19	0	0	4	35	34	25	2
20	0	0	5	40	30	23	2

Table 8.—*Green lumber yields by grade for construction and local-use class red maple sawlogs*

Diameter	Lumber grade							
	FAS	FASIF	SEL	1C	2A	2B	3A	3B
Inches				*Percent*				
8	0	0	0	1	1	56	0	42
9	0	0	0	2	5	69	5	19
10	0	0	0	2	8	75	11	4
11	0	0	0	4	11	72	13	0
12	0	0	0	6	13	65	15	1
13	0	0	0	9	14	50	14	13
14	0	0	0	12	14	28	11	35
15	0	0	0	16	14	0	5	65

Table 9.—*Green lumber yields by grade for construction and local-use class yellow birch sawlogs*

Diameter	Lumber grade						
	FAS	FASIF	SEL	1C	2C	3A	3B
Inches				*Percent*			
8	0	1	0	0	5	34	60
9	1	1	0	2	11	31	54
10	1	1	0	5	16	28	49
11	1	1	0	8	21	26	43
12	1	1	0	10	26	24	38
13	2	1	0	12	29	22	34
14	2	1	0	14	33	20	30
15	2	1	0	16	36	19	26
16	2	2	0	18	38	18	22
17	2	2	0	19	40	18	19
18	2	2	0	21	42	17	16
19	2	3	0	22	42	17	14
20	2	3	0	23	43	17	12
21	2	3	0	25	42	18	10
22	2	5	0	26	41	18	8
23	2	5	0	26	40	20	7
24	2	6	0	27	38	21	6

Table 10.—*Green lumber yields by grade for construction and local-use class paper birch sawlogs*

Diameter	Lumber grade					
	FAS	SEL	1C	2C	3A	3B
Inches			*Percent*			
8	0	0	3	9	37	51
9	0	1	3	13	38	45
10	0	1	3	17	38	41
11	0	1	4	20	37	38
12	0	1	6	22	35	36
13	0	1	9	24	31	35
14	0	1	12	25	27	35
15	0	1	16	25	21	37
16	0	1	21	25	14	39

Table 11.—*Green lumber yields by grade for construction and local-use class hickory sawlogs*

Diameter	Lumber grade			
	FAS	1C	2C	3C
Inches		*Percent*		
8	0	0	26	74
9	0	0	38	62
10	0	0	47	53
11	0	1	52	47
12	0	3	55	42
13	0	6	53	41
14	0	10	49	41
15	0	16	40	44
16	0	22	29	49

Table 12.—*Green lumber yields by grade for construction and local-use class beech sawlogs*

Diameter	Lumber grade						
	FAS	FASIF	SEL	1C	2C	3A	3B
Inches				*Percent*			
9	0	0	0	0	0	20	80
10	0	0	0	0	4	25	71
11	0	1	0	5	11	27	56
12	0	3	0	9	17	28	43
13	0	4	0	13	22	28	33
14	0	5	1	16	26	28	24
15	0	5	1	19	29	28	18
16	0	6	1	21	31	28	13
17	0	6	2	22	32	27	11
18	0	5	2	23	32	27	11
19	0	5	3	23	31	25	13
20	0	4	4	23	29	24	16
21	0	3	5	22	25	22	23

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