Data Bank for Short-Length Red Oak Lumber

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Abstract

This data bank for short-length lumber (less than 8 feet long) contains information on board outlines and defect size and quality for 426 4/4-inch-thick red oak boards. The Selects, 1 Common, 2A Common, and 3A Common grades are represented in the data bank. These boards are too short to be FAS. The data bank provides the kind of detailed lumber description that is required as input by computer programs that analyze rough mill yield. The data bank format provides more information than do other available board data sets. For Selects grade boards, the qualifying back-face rule used to grade the board is noted. For the other board grades, the percentage of the board-surface measure found in the grading cuttings and the number of cuttings used to determine the grade are given. Tables are included that list the boards by grade, width, length, and quality. These can be used to select subsamples when boards of specified sizes or quality levels are needed for a study.

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Introduction

More and more computer software tools are becoming available that are designed for use in analyzing hardwood lumber cut-up operations. For these tools to yield accurate and reliable results, accurate data inputs are required. One of the primary data requirements of these programs is a detailed lumber description.

The data in this publication are for short (less than 8 feet long), 4/4, red oak lumber. These data were collected as part of a larger study of the effects of lumber length on rough-mill productivity and profitability (Wiedenbeck 1992, 1993). At present, most eastern hardwood sawmills produce little lumber less than 8 feet long. Potential short-length lumber generated in the process of sawing longer logs frequently is converted into relatively low-value hardwood chips. The short lumber is chipped due to a lack of demand.

Before secondary hardwood processors will accept short-length lumber, several obstacles must be overcome. These include cutting-yield uncertainties, handling problems and costs, and the furniture industry's lack of experience with short lumber (Wengert et al. 1986). The short-length data bank described here can be used by hardwood lumber processors to predict short-lumber yield and processing costs with greater accuracy than could be obtained by other means.

The short-lumber data bank is a companion to the "1992 Data Bank for Red Oak Lumber" developed by Gatchell et al. (1992b). The reader should refer to this publication for a more complete description of our grading procedures. The boards in both data sets were graded according to National Hardwood Lumber Association's "Rules for the Measurement and Inspection of Hardwood & Cypress" (NHLA 1990). A several-stage process was used to ensure grading accuracy. The data bank format used for these short boards is the same as that used by Gatchell et al. (1992b).

We are making both data sets available from a single source, the USDA Forest Service's Northeastern Forest Experiment Station's Laboratory at Princeton, West Virginia. By pooling these lumber data and making them readily available, we hope that potential users of yield-analysis programs will no longer be discouraged from using these tools due to lumber data availability problems.

Procedure

Sampling

Short-length red oak boards are scarce in most areas due to limited demand for lumber less than 8 feet long. Due to this scarcity we had to make special arrangements with four mills to obtain our short-lumber sample.
Approximately 18 percent of the 426 boards in the sample were obtained from a southwest Virginia hardwood sawmill that commonly cuts short lumber. This short lumber is processed by a dimension plant that is owned by the same company. The lumber is hand stacked at the sawmill then bound with plastic strapping to prevent spillage during shipping and handling. It is dried at another of the

company's sawmills. We obtained dry lumber from this company.

Twenty-eight percent of the boards in the data bank were produced by another southwest Virginia sawmill and a southern West Virginia sawmill. Both of these mills typically limit their production of lumber less than 8 feet long. We shipped this short lumber to a local cabinet manufacturer for drying because, as part of our larger study (Wiedenbeck 1992), we wanted to compare the rough-part yield of this short lumber with that of longer lumber dried by the same mill.

The remaining short boards were obtained from a northern West Virginia dry kiln/concentration yard operation. These dry boards were received in two shipments and represent the short-lumber production of several hardwood sawmills.

Lumber Grading

All of the dried lumber was brought to the Brooks Forest Products Center at Virginia Polytechnic Institute and State University where it was skip-planed and the dimensions and defects of the boards were manually recorded. For grading purposes, the lumber was considered rough lumber. We used the NHLA's (1990) Special Kiln Dried Rule. This rule counts all defects (including defects associated with drying). The use of the Special Kiln Dried Rule is discussed in Gatchell et al. (1992b).

The boards were computer graded using the ReGS program (Gatchell et al. 1992a). The computer-derived grades were checked manually using to-scale plots of the boards. In cases where the two grades were different, the manually derived grade was used. While ReGS provided an excellent base for determining the correct grade, several inherent problems remain in computerized grading (Gatchell et al. 1992a,b).

Lumber Defects

The short-lumber data bank, like the "1992 Data Bank for Red Oak Lumber", emphasizes naturally occurring defects (Table 1). Mechanical or handling-induced defects were not included in the data records for these boards.

Table 1.--Board defects and code numbers

Defect	Defect code
Void[a]	2
Pith	3
Decay	4
Shake	5
Wane/scant wood thickness or both, owing to bark	8
Bark pocket	10
Hole	11
Unsound knot	12
Sound knot	15
Split	24

[a]The space between the edge of the board and the smallest rectangle enclosing the board caused by crook, taper, and differential shrinkage.

Stain is a defect that is recognized and interpreted differently by different people (Huber et al. 1990). According to the NHLA grading rules, "stain" denotes "the initial evidences of decay." Stain that will surface out or that occurs only on the sound face of a cutting is allowed. Stain that will not surface out, is darker in color, and more pervasive can be considered "incipient decay." During defect mapping, very light stain that would surface out was ignored. Heavy stain was considered "incipient decay" but was coded as "decay" since our original codes did not include the "incipient decay" category.

The distinction between checks and splits and the manner in which they were recorded were similar to the treatment used in the "1992 Data Bank for Red Oak Lumber," any check that would not surface out was defined as a split.

When the short-lumber mapping project began, our aim was to map the boards so that simulated yield studies using computerized cut-up routines could be performed and compared with simulated yields from longer length lumber. With this objective in mind, we defined our defect categories. For this reason we tended to lump defects together that were split out by Gatchell et al. (1992b). For example, we had one category called "holes" rather than several size-based hole categories. Also, we did not have a category for "bud trace with bark."

Like the "1992 Data Bank for Red Oak Lumber," this is a straight-board data bank. Boards with taper or crook exceeding one-quarter inch are not included. This is not a serious limitation since it is uncommon for short boards to crook in excess of one-quarter inch during drying. Non-straight boards were excluded because programs for automatically grading hardwood lumber cannot grade these boards accurately.

Data Bank Format

The format used in the data bank is detailed in Figure 1. The first line of data given for each board contains the NHLA grade as determined by ReGS, the board number, the qualifying rule used in grading a Selects board (1SB=sound back Selects, 1CB=1 Common back Selects; this variable is "0" for all other grades), and the total number of defects on the board.

The second line of data for each board contains the measured board width in quarter inches ("20" = 20/4 or 5 inches wide). This is used to determine the board-surface measure. This width is obtained by measuring board width one-third the length of the piece in from the narrow end of the board (NHLA 1990). This line also contains variables that indicate the percentage of the board-surface measure found in the grading cuttings and the number of cuttings used to determine the grade (these are excluded for the Selects grade).

The third data line for each board (Fig.1) contains the Y-X coordinates in 1/4-inch units of the lower left and upper right corners of the smallest rectangle containing the board. For rectangular boards, the measured width given in the second line and the upper Y value will be the same.

For boards with slight taper or crook, there will be a one-quarter inch difference between these two values (e.g., 20 versus 21 in Figure 1).

Each succeeding line describes a specific defect or defect segment (linearly oriented defects frequently are broken up into multiple-defect segments). These data lines contain the Y-X coordinates of the lower left and upper right corners of the defect, a "1" or "2" which indicates which board face the defect is located on, and a number that indicates the defect type.

Users of the data bank will want to make certain that their data conversion programs properly handle the void and pith defects (defect types "2" and "3", respectively). Void is the area that falls outside the board and inside the enclosing rectangle; it appears on both faces. Pith limitations apply not only to pith that appears on the surface of the wood but also to "boxed" pith. Therefore, like void, pith must be viewed as if it occurs on both faces. However, in the data bank, these defects are indexed on only one face (the coordinates would be the same on the opposing face). This must be accounted for in grading and processing computer programs (Gatchell et al. 1992b).

Data Bank Overview

There are 426 short boards less than 8 feet long in the short-length red oak lumber data bank. These boards are listed in the grade-based Tables 3-6 in the Appendix. Board numbers were assigned sequentially based on board width. The tables contain information on board number, width, length, clear-face cutting area and the number of grading cuttings, grade, and surface measure. All widths and lengths were measured to the nearest one-quarter inch.

For boards with surface measures that are halfway between whole feet (e.g., 2.5) we have used the lower surface measure to determine the grade of the board (e.g., SM=2 rather than SM=3). Using the lower surface measure often results in a higher grade (Gatchell et al. 1992b).

The data bank contains the following short-length boards in the Selects, 1 Common, 2A Common, and 3A Common NHLA grades:

Grade	Number of boards	Board feet
Selects	42	132
1 Common	182	500
2A Common	153	375
3A Common	49	133

When these short boards are added to the "1992 Data Bank for Red Oak Lumber," 251 Selects boards, 773 No. 1 Common boards, 733 2A Common boards, and 49 3A Common boards are now available to users through the Northeastern Forest Experiment Station's Laboratory at Princeton, West Virginia.

GRADE OSL[a]		BOARD NUMBER 8 1SB[b]	TOTAL NUMBER OF DEFECTS 11
MEASURED BOARD WIDTH 20[c]		GRADING: 0-0[d]	
0-0	21-295[e]		
0-216	1-295[f]	1[g]	2[h]
1-290	2-295	1	12
20-287	21-295	1	24
8-293	9-295	1	24
20-62	21-216	2	2
5-0	6-14	2	24
15-0	16-14	2	24
7-285	20-295	2	24
2-293	6-295	2	24
16-165	18-166	2	15
0-0	1-62	2	2

[a] NHLA grade - Grades are represented as follows:

        OFS = FAS
        OSL = Selects
        1C =   No. 1 Common
        2C =   No. 2A Common
        3C =   No. 3A Common

[b] For Selects grade lumber this indicates the type of back on the board: 1SB indicates a sound back Selects, 1CB indicates a 1 Common back Selects.

[c] All measurements are in 1/4-inch units.

[d] Percent of board surface measure and number of grading cuttings (0-0 for Selects).

[e] Lower left (left column) and upper right corner (right column) coordinates of rectangle enclosing the board (1/4-inch units); Y coordinate is first in each column set.

[f] Defect lower left and upper right corner coordinates; Y coordinate is first.

[g] Board face: 1 or 2.

[h] Defect code (see Table 1).

Figure 1.--Format for short-lumber data bank.

Width

Mean, median, and mode widths for the short boards in this data bank are given as follows:

Central tendency	Selects (42 boards)	1 Common (182 boards)	2A Common (150 boards)	3A Common (49 boards)
Mean	6.25	7.00	6.25	6.75
Median	6.25	6.75	6.00	6.50

Since board and defect dimensions were measured in quarter-inch increments, the mean width figures are rounded to the nearest quarter inch.

Figures 2 through 5 are histograms that depict the number of boards in each NHLA lumber width class for each of the four NHLA lumber grades contained in this data bank. Note that these width classes have, as a minimum, the width indicated on the X-axis of the histogram. Thus, the 4-inch-width class includes all boards with measured widths of 4, 4-1/4, 4-1/2, and 4-3/4 inches.

We sorted our widths this way to conform with the NHLA's classification system that specifies minimum widths (with exceptions) for each grade. Our grade-based groupings do not contain undersize (scant width) boards. The minimum-width board in our Selects data is 4 inches and the minimum-width boards in our 1 Common, 2 Common, and 3A Common data are 3 inches. NHLA grading rules allow up to 10 percent of the boards in a load of lumber to be one-quarter inch scant of the stated minimum width for the grade. For a discussion on how to include scant-width boards in a study sample, see Gatchell et al. (1992b).

Board Lengths

Since lumber shorter than 8 feet long cannot qualify for the FAS and FAS-1-Face grades, these grades are not included in the data bank. The size distribution for Selects, 1 Common, 2A Common, and 3A Common short lumber is given in Table 2. Standard lengths are obtained by truncating the board's length to the whole foot.

However, boards that are only one-quarter inch shy of the next whole foot are rounded to the higher standard length.

As was the case for the "1992 Data Bank for Red Oak Lumber," few odd-length boards were found. This is largely a function of the fact that most sawmill trim saws are set to trim even lengths only. The majority of the 5-foot-long boards in the 1 Common and 2A Common data sets were mismanufactured 6-foot-long boards (no more than 2 inches shy of 6 feet).

Why We Used the Special Kiln Dried Rule

The Special Kiln Dried Rule used to grade these data bank boards is a better predictor of a board's utility since it does not ignore defects imposed during drying. The effects of drying on defect evaluation as well as differences between the Standard and Special Kiln Dried Rules (NHLA 1990) are detailed in Gatchell et al. (1992b).

Effects of Stain on Grade

Short-length lumber is frequently mishandled because it tends to be one of the lowest priority items in a mill's inventory. It is not uncommon for short lumber to sit, deadpiled, on the yard for more than a week before it is sticker-stacked for drying. Many species of lumber will stain badly when stickering is delayed, and red oak is one of the most stain-prone species.

Thirty-eight percent of the boards in our short-lumber sample contained stain when we received them. Forty-one percent of the boards with stain were downgraded because of the stain (16 percent of all boards). Nine percent of the stained boards lost two or three grades due to stain.

Two of our short-lumber sources badly mishandled the lumber; more than half of the lumber from these sources was stained. Stain affected 25 to 30 percent of the boards from our other two sources. This sample was collected during the early summer when lumber is most prone to staining. However, even these lower stain rates are unacceptably high.

Short boards are easily ignored on the yard because they are in low demand. When such boards are ignored for several days, their quality begins to deteriorate. When the lumber is subsequently received by a customer (e.g., a rough-mill operation), the deterioration is noted and the customer is even less likely to accept short lumber in the future. Rather than expanding the market for short lumber, this kind of mishandling likely will have the opposite effect.

Because stain can be avoided with proper handling and our goal is to provide data on well-manufactured, well-dried lumber for users, we dropped the stain defect from the data bank.

Effectiveness of NHLA Grade Rules in Assigning Relative Values to Short Boards

Our work with short lumber leads us to question the value of the NHLA grading rules as predictors of the potential yield of short lumber. There are many instances where the NHLA grades do not accurately reflect the potential utility of a given short board. While the relative value of a board is not solely a function of yield, the relationship between board value and yield is indisputable.

There are several striking grade-yield inconsistencies that seem to favor the consumer of short lumber. The most
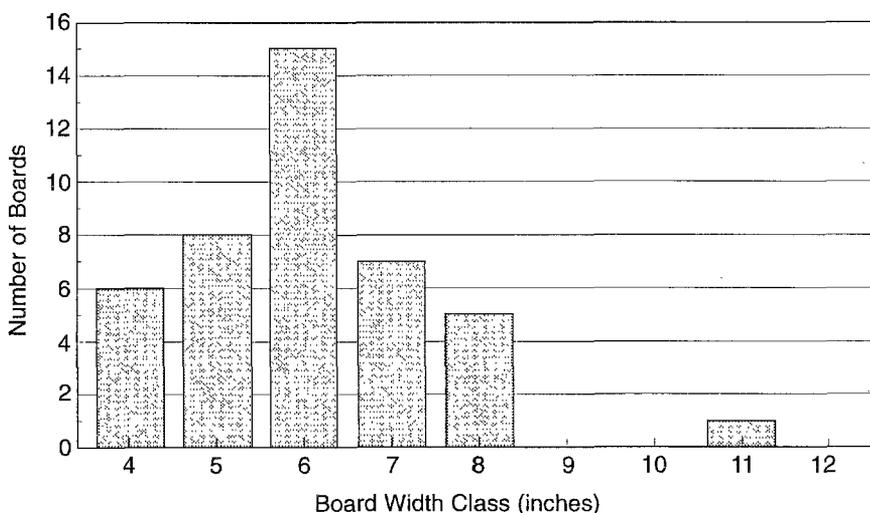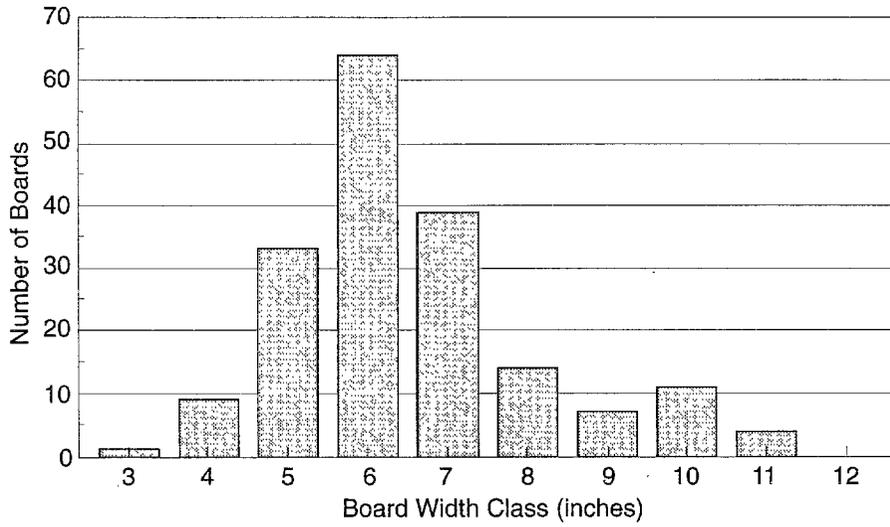

Figure 2.--Selects width distribution.

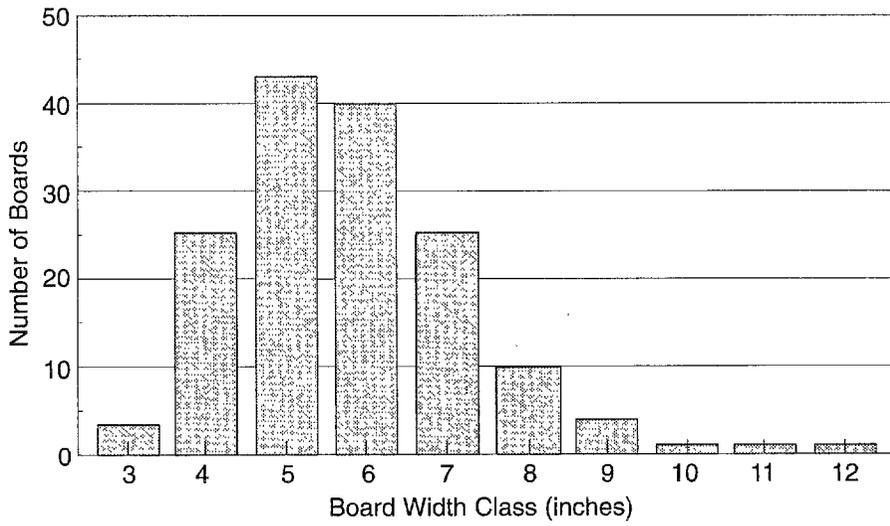Figure 3.--No. 1 Common width distribution.
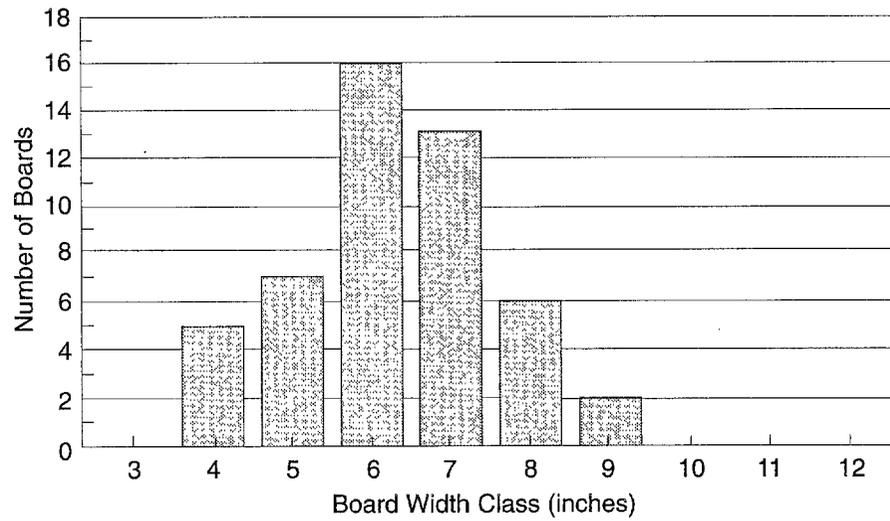

Figure 4.--No. 2A Common width distribution.

Figure 5.--No. 3A Common width distribution.

Table 2.--Size distribution of short, Selects, 1 Common, 2A Common, and 3A Common boards

Standard length (feet)	Width (inches)										Total	Number of board feet
	3	4	5	6	7	8	9	10	11	12		
	- - - - - - - - Number of boards - - - - - - - -											
Selects												
6	-	6	8	15	4	5	-	-	1	-	39	119
7	-	-	-	-	3	-	-	-	-	-	3	13
Total	-	6	8	15	7	5	-	-	1	-	42	132
1 Common												
4	-	-	13	30	21	8	5	6	3	-	86	200
5	-	1	4	4	13	1	-	2	-	-	25	73
6	1	8	16	29	5	5	1	3	1	-	69	217
7	-	-	-	1	-	-	1	-	-	-	2	10
Total	1	9	33	64	39	14	7	11	4	-	182	500
No. 2A Common												
4	1	21	28	26	11	3	-	-	1	-	91	175
5	-	2	4	5	2	1	1	-	-	-	15	38
6	2	2	11	9	11	6	3	1	-	1	46	157
7	-	-	-	-	1	-	-	-	-	-	1	5
Total	3	25	43	40	25	10	4	1	1	1	153	375
No. 3A Common												
4	-	4	4	12	9	3	-	-	-	-	32	74
5	-	1	-	1	-	1	-	-	-	-	3	8
6	-	-	3	3	4	2	2	-	-	-	14	51
7	-	-	-	-	-	-	-	-	-	-	0	0
Total	-	5	7	16	13	6	2	-	-	-	49	133

obvious of these is the length limitation in the upper grades. A totally clear, 7-foot-long board can never be graded as an FAS. However, an 8-foot-long board with a defect at the 7-foot mark that runs from one edge to the other (across the width) will make the FAS grade so long as the first-foot rule is met. This is true despite the fact the defect will render the last foot of the board unusable. Similarly, boards under 6 feet in length, no matter how clear, can be graded no higher than 1 Common.

Other inconsistencies that we have observed relate to surface measure-based constraints in the NHLA grade rules. For instance, any board with less than 18 cutting units (surface measure = 1) that contains any type and size of defect on either face can be graded no higher than a 2A Common. That same board must have at least 66.7 percent in clear-face cuttings to be graded other than a 3A Common. For larger boards, 66.7 is a sufficient clear-face cutting percentage to qualify for 1 Common (NHLA 1990). In fact, it is possible for a board to have 120 percent of its surface measure in clear-face cuttings and be graded 2A Common owing to a small defect on either face.

Summary

This publication provides details on 426 short-length (less than 8 feet long) red oak boards. In combination, this short-lumber data bank and the "1992 Data Bank for Red Oak Lumber" (Gatchell et al. 1992b) contain 251 Selects boards, 773 No. 1 Common boards, 733 2A Common boards, and 49 3A Common boards. We are making both data sets available from the USDA Forest Service's Northeastern Forest Experiment Station's Laboratory in Princeton, West Virginia.

Three Appalachian region sawmills and an Appalachian region concentration yard operation provided us with the short lumber detailed in this publication. We used the NHLA's Special Kiln Dried Rule (1990) to grade the boards. Board grades were determined both manually and with the ReGS computer program (Gatchell et al. 1992a). All of the boards in this data bank are straight (less than one-half inch of crook), well-manufactured boards.

Short-length lumber is frequently mishandled; it is not uncommon for short lumber to sit deadpiled on the yard for

more than a week before it is sticker-stacked for drying. This type of treatment causes boards to stain. Thirty-eight percent of the boards in our short-board sample originally contained stain. Since stain can be avoided with proper handling and our goal is to provide data on well-manufactured lumber, we dropped the stain defect from these boards.

The data bank format provides more information than other available board data sets. For Selects grade boards, the qualifying back-face rule used in grading the board is noted. For the other board grades, the percentage of the board-surface measure found in the grading cuttings and the number of cuttings used to determine the grade are given. Two width measurements are given for each board: the width of the rectangle that encloses the board and the grading width. The Appendix includes look-up tables that list the boards by grade, width, length, and quality. These tables can be used to select subsamples when boards of specified sizes or quality levels are needed for a study.

Acknowledgment

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Appendix

Table 3.--Board information report for short, Selects lumber

Board number	Measured width (inches)	Length (inches)	Grade	Type of back face	Surface measure (feet)	Larger SM grade (a)
210	4.00	72.75	Selects	1C back	2	
211	4.00	72.75	Selects	1C back	2	
212	4.50	72.75	Selects	1C back	2	
213	4.50	74.75	Selects	1C back	2	
214	4.50	76.50	Selects	1C back	2	
215	4.75	72.75	Selects	1C back	2	
216	5.00	72.75	Selects	1C back	2 or 3	2A
217	5.00	73.75	Selects	1C back	2 or 3	2A
218	5.00	75.00	Selects	1C back	2 or 3	2A
219	5.75	72.50	Selects	1C back	3	
220	5.75	72.75	Selects	1C back	3	
221	5.75	72.75	Selects	1C back	3	
222	5.75	72.75	Selects	1C back	3	
223	5.75	73.25	Selects	1C back	3	
224	6.00	72.50	Selects	1C back	3	
225	6.00	72.75	Selects	1C back	3	
226	6.00	72.75	Selects	1C back	3	
227	6.00	72.75	Selects	1C back	3	
228	6.00	72.75	Selects	1C back	3	
229	6.00	72.75	Selects	1C back	3	
230	6.00	79.00	Selects	1C back	3	
231	6.25	72.75	Selects	1C back	3	
232	6.25	83.25	Selects	1C back	3	
233	6.50	72.75	Selects	1C back	3	
234	6.50	72.75	Selects	1C back	3	
235	6.50	72.75	Selects	1C back	3	
236	6.50	74.25	Selects	1C back	3	
237	6.75	74.25	Selects	1C back	3	
238	6.75	74.50	Selects	1C back	3	
239	7.00	72.75	Selects	1C back	3 or 4	Selects
240	7.00	87.25	Selects	1C back	4	
241	7.25	84.50	Selects	1C back	4	
242	7.50	72.75	Selects	1C back	4	
243	7.75	72.75	Selects	1C back	4	
244	7.75	81.00	Selects	1C back	4	
245	7.75	85.00	Selects	1C back	5	
246	8.00	72.50	Selects	1C back	4	
247	8.00	72.75	Selects	1C back	4	
248	8.00	74.25	Selects	1C back	4	
249	8.00	76.25	Selects	1C back	4	
250	8.25	72.75	Selects	1C back	4	
251	11.25	72.75	Selects	1C back	6	

(a) When board surface measure is halfway between two whole feet, the grade is determined with the smaller surface measure. Grades in this column are determined with the larger surface measure.

Table 4.--Board information report for short, No. 1 Common lumber

Board number	Measured width (inches)	Length (inches)	Percent surface measure & number of cuttings	Grade	Surface measure (a)	Larger SM grade (feet) (b)
592	3.25	73.25	76-1	1C	2	
593	4.00	72.75	76-1	1C .	2	
594	4.25	63.00	81-1	1C	2	
595	4.25	72.50	92-1	1C	2	
596	4.50	72.75	84-1	1C	2	
597	4.50	72.75	95-1	1C	2	
598	4.50	74.25	97-1	1C	2	
599	4.50	74.75	91-1	1C	2	
600	4.75	74.75	93-1	1C	2	
601	4.75	75.00	95-1	1C	2	
602	5.00	53.00	77-1	1C	2	
603	5.25	51.25	87-1	1C	2	
604	5.25	72.75	78-2	1C	3	
605	5.25	73.25	72-1	1C	3	
606	5.25	78.00	75-2	1C	3	
607	5.50	48.25	89-1	1C	2	
608	5.50	48.50	88-1	1C	2	
609	5.50	48.50	77-1	1C	2	
610	5.50	49.75	86-1	1C	2	
611	5.50	51.00	83-1	1C	2	
612	5.50	51.50	80-1	1C	. 2	
613	5.50	63.25	88-1	1C	2	
614	5.50	71.75	94-1	1C	2	
615	5.50	72.75	81-2	1C	3	
616	5.50	72.75	86-1	1C	3	
617	5.50	72.75	75-1	1C	3	
618	5.50	72.75	87-1	1C	3	
619	5.50	73.75	68-1	1C	3	
620	5.50	74.00	80-1	1C	3	
621	5.50	74.50	76-1	1C	3	
622	5.75	48.00	83-1	1C	2	
623	5.75	48.50	87-1	1C	2	
624	5.75	49.00	98-1	1C	2	
625	5.75	49.25	79-1	1C	2	
626	5.75	49.75	94-1	1C	2	
627	5.75	62.75	84-1	1C	2	
628	5.75	67.75	116-1	1C	2	
629	5.75	70.25	133-1	1C	2	
630	5.75	72.75	70-1	1C	3	
631	5.75	72.75	87-2	1C	3	
632	5.75	73.00	69-1	1C	3	
633	5.75	74.50	75-1	1C	3	
634	5.75	74.75	76-1	1C	3	
635	6.00	49.25	77-1	1C	2	
636	6.00	49-25	94-1	1C	2	

Continued

Table 4.--Continued

Board number	Measured width (inches)	Length (inches)	Percent surface measure & number of cuttings	Grade	Surface measure (a)	Larger SM grade (feet) (b)
637	6.00	49.50	86-1	1C	2	
638	6.00	49.50	81-1	1C	2	
639	6.00	49.50	76-1	1C	2	
640	6.00	51.50	85-1	1C	2	
641	6.00	56.00	93-1	1C	2	
642	6.00	58.25	77-1	1C	2	
643	6.00	72.25	78-1	1C	3	
644	6.00	72.50	75-1	1C	3	
645	6.00	72.50	83-1	1C	3	
646	6.00	72.75	86-2	1C	3	
647	6.00	72.75	86-2	1C	3	
648	6.00	72.75	69-1	1C	3	
649	6.00	72.75	88-2	1C	3	
650	6.00	72.75	74-1	1C	3	
651	6.00	72.75	92-2	1C	3	
652	6.00	73.00	67-1	1C	3	
653	6.25	49.25	79-1	1C	2	
654	6.25	49.50	92-1	1C	2	
655	6.25	49.50	88-1	1C	2	
656	6.25	49.75	86-1	1C	2	
657	6.25	50.50	75-1	1C	2	
658	6.25	50.75	76-1	1C	2	
659	6.25	52.75	79-1	1C	2	
660	6.25	56.50	103-1	1C	2	
661	6.25	61.75	68-1	1C	3	
662	6.25	72.50	68-1	1C	3	
663	6.25	72.50	70-1	1C	3	
664	6.25	72.50	88-2	1C	3	
665	6.25	72.75	79-1	1C	3	
666	6.25	72.75	100-1	1C	3	
667	6.25	72.75	71-1	1C	3	
668	6.25	73.25	80-2	1C	3	
669	6.50	48.50	85-1	1C	2	
670	6.50	49.75	77-1	1C	2	
671	6.50	51.00	79-1	1C	2	
672	6.50	51.75	77-1	1C	2	
673	6.50	65.00	79-1	1C	3	
674	6.50	72.75	90-1	1C	3	
675	6.50	72.75	91-1	1C	3	
676	6.50	72.75	73-1	1C	3	
677	6.50	72.75	86-2	1C	3	
678	6.50	73.50	89-2	1C	3	
679	6.50	74.00	67-1	1C	3	
680	6.50	74.00	69-1	1C	3	
681	6.50	86.50	79-2	1C	4	

Table 4.--Continued

Board number	Measured width (inches)	Length (inches)	Percent surface measure & number of cuttings	Grade	Surface measure (a)	Larger SM grade (feet) (b)
682	6.75	48.25	103-2	1C	2	
683	6.75	49.25	76-1	1C	2	
684	6.75	49.50	92-1	1C	2	
685	6.75	49.50	104-1	1C	2	
686	6.75	49.50	91-1	1C	2	
687	6.75	49.50	84-1	1C	2	
688	6.75	49.75	101-1	1C	*2*	
689	6.75	51.25	82-1	1C	2	
690	6.75	53.50	88-1	1C	2	
691	6.75	56.00	85-1	1C	2	
693	6.75	70.50	85-2	1C	3	
694	6.75	72.75	98-2	1C	3	
695	6.75	72.75	83-1	1C	3	
696	6.75	73.25	79-2	1C	3	
697	6.75	74.25	86-1	1C	3	
698	6.75	74.25	74-1	1C	3	
699	7.00	48-25	90-1	1C	2	
700	7.00	48.50	103-1	1C	2	
701	7.00	48.75	82-1	1C	2	
702	7.00	49.25	98-1	1C	2	
703	7.00	49.25	87-1	1C	2	
704	7.00	49.50	92-1	1C	2	
705	7.00	49.50	87-1	1C	2	
706	7.00	49.50	86-1	1C	2	
707	7.00	52.00	93-1	1C	2	
708	7.00	64.75	76-1	1C	3	
709	7.00	66.25	76-1	1C	3	
710	7.00	70.50	77-2	1C	3	
711	7.00	71.50	75-1	1C	3	
712	7.00	71.50	87-2	1C	3	
713	7.00	72.75	73-1	1C	3 or 4	2A
714	7.25	48.50	97-1	1C	2	
715	7.25	49.00	77-1	1C	2	
716	7.25	56.00	130-1	1C	2	
717	7.25	70.75	88-2	1C	3	
718	7.25	72.50	68-1	1C	4	
719	7.25	72.75	72-1	1C	4	
720	7.50	49.00	90-1	1C	2 or 3	2A
721	7.50	50.25	80-1	1C	2 or 3	1C
722	7.50	52.75	105-2	1C	2 or 3	1C
723	7.50	55.00	94-1	1C	2 or 3	2A
724	7.50	55.50	100-1	1C	2 or 3	1C
725	7.50	55.75	128-1	1C	2 or 3	1C
726	7.50	58.75	91-1	1C	2 or 3	2A
727	7.50	62.25	71-1	1C	3	

Continued

Table 4.--Continued

Board number	Measured width (inches)	Length (inches)	Percent surface measure & number of cuttings	Grade	Surface measure (a)	Larger SM grade (feet) (b)
728	7.50	70.00	87-1	1C	3	
729	7.50	71.50	110-2	1C	3	
730	7.50	72.00	70-1	1C	4	
731	7.75	53.75	88-1	1C	3	
732	7.75	56.75	82-1	1C	3	
733	7.75	60.25	77-1	1C	3	
734	7.75	61.75	99-2	1C	3	
735	7.75	69.25	96-1	1C	3	
736	7.75	71.00	96-2	1C	3	
737	7.75	72.25	83-2	1C	4	
738	8.00	48.25	71-1	1C	3	
739	8.00	49.75	78-1	1C	3	
740	8.00	51.00	87-1	1C	3	
741	8.00	72.75	72-1	1C	4	
742	8.00	72.75	84-2	1C	4	
743	8.25	48.50	84-1	1C	3	
744	8.25	49.00	91-1	1C	3	
745	8.25	49.50	76-1	1C	3	
746	8.50	48.50	82-2	1C	3	
747	8.50	49.75	72-1	1C	3	
748	8.50	72.75	79-2	1C	4	
749	8.75	71.00	79-1	1C	4	
750	8.75	72.50	78-1	1C	4	
751	8.75	74.25	75-2	1C	4	
752	9.00	50.00	96-1	1C	3	
753	9.00	53.25	81-2	1C	3	
754	9.25	50.50	77-2	1C	3	
755	9.50	49.50	93-1	1C	3	
756	9.50	75.25	72-1	1C	5	
757	9.50	84.50	76-3	1C	6	
758	9.75	49.25	102-1	1C	3	
759	10.00	49.50	70-1	1C	3	
760	10.00	50.00	99-1	1C	3	
761	10.00	51.50	97-2	1C	3	
762	10.00	55.00	92-1	1C	3	
763	10.00	70.25	94-2	1C	4	
764	10.00	71.25	81-2	1C	4	
765	10.25	72.50	79-2	1C	5	
766	10.50	49.50	77-2	1C	3 or 4	2A
767	10.50	74.25	69-2	1C	5	
768	10.50	74.50	71-2	1C	5	
769	10.75	50.50	87-2	1C	4	
770	11.00	49.50	80-2	1C	4	
771	11.25	50.00	83-2	1C	4	
772	11.25	50.00	84-1	1C	4	
773	11.25	73.00	82-2	1C	6	

(a) Graded with program REGS. Contains all cuttings up to the maximum allowed for the grade.
(b) When board surface measure is halfway between consecutive standard feet, the minimum and maximum grades are determined with the smaller surface measure. Grades in this column are determined with the larger surface measure.

Table 5.--Board information report for short, No. 2A Common lumber

Board number	Measured width (inches)	Length (inches)	Percent surface measure & number of cuttings	Grade	Surface measure (a)	Larger SM grade (feet) (b)
581	3.00	72.75	136-1	2A	1 or 2	2A
582	3.50	72.75	64-1	2A	2	
583	3.75	49.25	86-1	2A	1	
584	4.00	51.75	93-1	2A	1	
585	4.00	72.50	74-1	2A	2	
586	4.00	72.75	69-1	2A	2	
587	4.25	49.25	138-1	2A	1	
588	4.25	49.50	118-1	2A	1	
589	4.25	49.50	112-1	2A	1	
590	4.25	49.50	88-1	2A	1	
591	4.25	49.50	72-1	2A	1	
592	4.25	49.50	109-1	2A	1	
593	4.25	50.00	101-1	2A	1	
594	4.25	53.75	116-1	2A	1	
595	4.50	48.25	124-1	2A	1 or 2	2A
596	4.50	49.00	130-1	2A	1 or 2	2A
597	4.50	49.00	128-1	2A	1 or 2	2A
598	4.50	49.50	98-1	2A	1 or 2	3A
599	4.50	49.50	82-1	2A	1 or 2	3A
600	4.50	50.50	115-1	2A	1 or 2	2A
601	4.50	53.25	115-1	2A	1 or 2	2A
602	4.50	60.50	69-1	2A	2	
603	4.75	48.75	62-1	2A	2	
604	4.75	49.50	52-1	2A	2	
605	4.75	49.50	68-1	2A	2	
606	4.75	49.50	52-1	2A	2	
607	4.75	49.75	68-1	2A	2	
608	4.75	61.00	74-1	2A	2	
609	5.00	48.25	75-2	2A	2	
610	5.00	49.00	56-1	2A	2	
611	5.00	49.00	62-1	2A	2	
612	5.00	49.00	54-1	2A	2	
613	5.00	49.00	72-1	2A	2	
614	5.00	49.50	53-1	2A	2	
615	5.00	49.50	54-1	2A	2	
616	5.00	49.75	54-1	2A	2	
617	5.00	50.00	65-1	2A	2	
618	5.00	50.50	53-1	2A	2	
619	5.00	62.50	60-1	2A	2	
620	5.00	63.00	51-1	2A	2	
621	5.00	74.75	54-1	2A	2 or 3	3A
622	5.00	75.00	53-1	2A	2 or 3	3A
623	5.25	49.50	52-1	2A	2	
624	5.25	54.50	54-1	2A	2	
625	5.25	70.50	63-1	2A	2	
626	5.25	72.75	60-1	2A	3	
627	5.25	73.25	51-1	2A	3	
628	5.25	74.25	64-1	2A	3	
629	5.25	74.25	59-1	2A	3	
630	5.25	75.00	79-2	2A	3	
631	5.50	48.25	56-1	2A	2	
632	5.50	49.50	70-1	2A	2	
633	5.50	49.50	67-1	2A	2	
634	5.50	52.00	74-1	2A	2	
635	5.50	72.75	54-1	2A	3	
636	5.50	74.25	57-1	2A	3	

Continued

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Table 5.--Continued

Board number	Measured width (inches)	Length (inches)	Percent surface measure & number of cuttings	Grade	Surface measure (a)	Larger SM grade (feet) (b)
637	5.75	48.50	74-1	2A	2	
638	5.75	49.00	72-1	2A	2	
639	5.75	49.25	68-1	2A	2	
640	5.75	49.25	61-1	2A	2	
641	5.75	49.50	56-1	2A	2	
642	5.75	49.50	60-1	2A	2	
643	5.75	49.50	67-1	2A	2	
644	5.75	49.50	67-1	2A	2	
645	5.75	49.50	65-1	2A	2	
646	5.75	49.75	62-1	2A	2	
647	5.75	50.00	65-1	2A	2	
648	5.75	50.50	64-1	2A	2	
649	5.75	62.00	78-2	2A	2	
650	5.75	72.50	52-1	2A	3	
651	5.75	73.25	75-2	2A	3	
652	6.00	49.00	57-1	2A	2	
653	6.00	49.25	66-1	2A	2	
654	6.00	49.50	84-2	2A	2	
655	6.00	49.50	52-1	2A	2	
656	6.00	49.50	54-1	2A	2	
657	6.00	49.50	50-1	2A	2	
658	6.00	49.50	58-1	2A	2	
659	6.00	49.50	58-1	2A	2	
660	6.00	49.50	56-1	2A	2	
661	6.00	49.50	74-1	2A	2	
662	6.00	59.25	66-1	2A	2	
663	6.00	60.00	68-1	2A	2 or 3	3A
664	6.00	60.25	90-2	2A	2 or 3	3A
665	6.00	63.75	107-2	2A	2 or 3	2A
666	6.00	72.75	69-2	2A	3	
667	6.00	74.25	60-1	2A	3	
668	6.00	74.50	75-2	2A	3	
669	6.00	75.75	66-1	2A	3	
670	6.25	49.50	58-1	2A	2	
671	6.25	49.50	64-1	2A	2	
672	6.25	49.50	52-1	2A	2	
673	6.25	49.50	58-1	2A	2	
674	6.25	49.50	79-2	2A	2	
675	6.25	49.50	61-1	2A	2	
676	6.25	71.25	57-1	2A	3	
677	6.25	74.50	62-1	2A	3	
678	6.50	49.25	52-1	2A	2	
679	6.50	49.50	58-1	2A	2	
680	6.50	52.25	63-1	2A	2	
681	6.50	56.00	59-1	2A	2	
682	6.50	64.00	54-1	2A	3	
683	6.50	74.75	53-1	2A	3	
684	6.50	74.75	59-1	2A	3	
685	6.75	49.25	71-1	2A	2	
686	6.75	49.50	56-1	2A	2	
687	6.75	49.50	61-1	2A	2	
688	6.75	49.50	61-1	2A	2	
689	6.75	49.50	54-1	2A	2	
690	6.75	72.50	71-2	2A	3	
691	6.75	74.50	55-1	2A	3	
692	7.00	49.50	54-1	2A	2	

Continued

Table 5.--Continued

Board number	Measured width (inches)	Length (inches)	Percent surface measure & number of cuttings	Grade	Surface measure (a)	Larger SM grade (feet) (b)
693	7.00	57.25	72-1	2A	2	
694	7.00	58.50	55-1	2A	2	
695	7.00	60.25	61-1	2A	3	
696	7.00	74.50	74-2	2A	3 or 4	2A
697	7.25	71.25	69-2	2A	3	
698	7.25	73.00	65-2	2A	4	
699	7.25	73.25	56-1	2A	4	
700	7.25	73.25	56-2	2A	4	
701	7.50	49.50	54-1	2A	2 or 3	3A
702	7.50	49.50	56-1	2A	2 or 3	3A
703	7.50	49.50	68-1	2A	2 or 3	3A
704	7.50	72.50	66-1	2A	4	
705	7.50	76.00	59-1	2A	4	
706	7.75	48.25	59-1	2A	3	
707	7.75	48.25	66-1	2A	3	
708	7.75	49.50	65-1	2A	3	
709	7.75	49.50	56-1	2A	3	
710	7.75	49.50	69-2	2A	3	
711	7.75	71.75	74-2	2A	3	
712	7.75	72.75	57-1	2A	4	
713	7.75	72.75	71-2	2A	4	
714	7.75	73.25	79-2	2A	4	
715	7.75	74.50	62-2	2A	4	
716	7.75	84.50	55-2	2A	5	
717	8.00	49.25	51-1	2A	3	
718	8.00	59.00	70-2	2A	3	
719	8.00	73.00	54-2	2A	4	
720	8.00	73.25	68-2	2A	4	
721	8.00	74.25	62-2	2A	4	
722	8.25	73.25	63-2	2A	4	
723	8.25	74.25	74-2	2C	4	
724	8.50	73.00	58-2	2A	4	
725	8.75	49.25	54-1	2A	3	
726	8.75	70.50	67-2	2A	4	
727	9.25	72.75	61-1	2A	5	
728	9.25	72.75	54-2	2A	5	
729	9.25	72.75	54-2	2A	5	
730	9.75	70.75	77-3	2A	4	
731	10.50	75.00	61-1	2A	5	
732	11.25	52.00	58-1	2A	4	
733	12.25	74.75	60-2	2A	6	

(a) Graded with program REGS. Contains all cuttings up to the maximum allowed for the grade.
(b) When board surface measure is halfway between consecutive standard feet, the minimum and maximum grades are determined with the smaller surface measure. Grades in this column are determined with the larger surface measure.

Table 6.--Board information report for short, No. 3A Common lumber

Board number	Measured width (inches)	Length (inches)	Percent surface measure & number of cuttings	Grade	Surface measure (a)	Larger SM grade (feet) (b)
1	4.50	49.75	57-1	3A	1 or 2	Below grade
2	4.50	60.00	34-1	3A	2	
3	4.75	49.50	40-1	3A	2	
4	4.75	49.50	46-1	3A	2	
5	4.75	49.50	47-1	3A	2	
6	5.00	50.00	46-1	3A	2	
7	5.00	50.75	41-1	3A	2	
8	5.25	74.25	37-1	3A	3	
9	5.50	49.50	46-1	3A	2	
10	5.50	74.25	37-2	3A	3	
11	5.75	49.50	49-1	3A	2	
12	5.75	74.75	37-2	3A	3	
13	6.00	48.50	46-1	3A	2	
14	6.00	49.50	45-1	3A	2	
15	6.00	49.50	37-1	3A	2	
16	6.00	49.50	41-1	3A	2	
17	6.00	49.75	33-1	3A	2	
18	6.00	49.75	46-1	3A	2	
19	6.00	49.75	48-1	3A	2	
20	6.00	74.25	45-1	3A	3	
21	6.25	48.50	44-1	3A	2	
22	6.25	49.50	42-1	3A	2	
23	6.25	73.25	40-1	3A	3	
24	6.50	49.50	0-0	3A	2	
25	6.50	61.75	42-1	3A	3	
26	6.50	73.50	38-1	3A	3	
27	6.75	49.25	0-0	3A	2	
28	6.75	49.50	47-1	3A	2	
29	7.00	49.50	41-1	3A	2	
30	7.00	73.25	45-1	3A	3 or 4	3A
31	7.50	74.25	40-1	3A	4	
32	7.50	74.25	40-1	3A	4	
33	7.75	48.00	49-2	3A	3	
34	7.75	49.50	45-2	3A	3	
35	7.75	49.50	44-1	3A	3	
36	7.75	49.50	38-1	3A	3	
37	7.75	49.50	40-1	3A	3	
38	7.75	49.50	39-1	3A	3	
39	7.75	49.75	48-1	3A	3	
40	7.75	55.00	41-1	3A	3	
41	7.75	73.00	48-1	3A	4	
42	8.00	58.00	34-1	3A	3	
43	8.00	61.75	38-1	3A	3	
44	8.25	49.00	45-1	3A	3	
45	8.25	73.25	46-2	3A	4	
46	8.50	48.50	47-1	3A	3	
47	8.75	72.00	35-2	3A	4	
48	9.25	73.00	48-2	3A	5	
49	9.25	74.25	36-1	3A	5	

(a) Graded with program REGS. Contains all cuttings up to the maximum allowed for the grade.
(b) When board surface measure is halfway between consecutive standard feet, the minimum and maximum grades are determined with the smaller surface measure. Grades in this column are determined with the larger surface measure.

This data bank for short-length lumber (less than 8 feet long) contains information
on board outlines and defect size and quality for 426 4/4-inch-thick red oak
boards. The Selects, 1 Common, 2A Common, and 3A Common grades are
represented in the data bank. The data bank provides the kind of detailed lumber
description that is required as input by computer programs that analyze rough mill
yield.

Keywords: Lumber defects, computer-yield simulation programs, lumber grades,
lumber size

Headquarters of the Northeastern Forest Experiment station is in Radnor, Pennsylvania. Field laboratories are maintained at:

Amherst, Massachusetts, in cooperation with the University of Massachusetts

Burlington, Vermont, in cooperation with the University of Vermont

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