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Forest Products Measurements and Values

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Introduction

Success in buying and selling forest products depends on one's knowledge of product measurement and ability to predict the current market value. When trees are harvested, they can be sold as whole trees, factory class sawlogs, construction class sawlogs, veneer logs, pulpwood and/or chipwood. Lumber is sold by its grade, which is determined by the size and location of defects. Each product from the forest has a particular method by which it is measured and its market value estimated. This publication explains common forest products measures used in Tennessee and how to estimate the current market value.

Pulpwood

Pulpwood is usually bought and sold by the volume of the wood measured in ***cords*** or by the weight of the wood in pounds. A ***standard cord*** of wood is a volume of stacked wood including air space occupying 128 cubic feet. A ***cord*** is defined as the volume of a stack of wood 4 feet high by 4 feet wide by 8 feet long. There are variations from this standard, so the buyer and seller should use the same definition. The actual volume of wood in a 4x4x8-foot space can vary greatly depending on how tightly the wood is packed, the diameter of the pieces and the straightness of the pieces. Studies have shown that the volume of wood per standard cord can vary from 58 cubic feet to 94 cubic feet.(1) Due to the variation in the volume of wood in a cord and the development of new methods of transportation and material handling, pulpwood and chipwood are more often bought and sold on a weight basis. In Tennessee, the Department of Agriculture, Division of Forestry defines a cord of pine as weighing 5350 pounds and a cord of hardwood as weighing 5800 pounds.

There is a trend towards selling pulpwood and chipwood as tree-length material. Tree-length loads are usually sold on a weight basis. Log trucks are weighed fully loaded and weighed again when empty to determine the weight of the load. The weight can be converted to an equivalent board foot or cord volume if desired. Some companies use standard weight-scale factors for pricing, and some develop their own factors based on their product mix. Weight-scale factors vary with log size, as larger logs usually produce higher product volumes per unit weight than do small logs. Timber quality, density, moisture content and mill efficiency influence the scale factor and the price paid at the mill for timber. An advantage of buying and selling on a weight basis is that it encourages landowners to deliver the timber to the mill quickly. Quick delivery after harvesting insures that the moisture content of the wood is high. Freshly harvested logs will weigh more than those allowed to dry out. Mills prefer fresh-cut logs because they contain less stain, decay and wood-destroying insects.

The market value of pulpwood is related to the quality of the wood and the local market. For evaluating the market value of forest products, the Tennessee Division of Agriculture, Division of Forestry (TDA-DF) divides the state into three regions based on the local markets. These regions are East, Central and West Tennessee. TDA-DF publishes the market value of pulpwood in Tennessee four times a year for each region in the state.(2) *Timber Mart-South*(3) also publishes pulpwood and chipwood prices in the state, but splits the state into two regions. Examples of delivered prices for pulpwood in relation to other products is given in Table 1. Delivered prices are the prices paid for the material at the gate of the manufacturer and differ from stumpage prices. Stumpage prices are the amount paid for the material standing in the forest and do not account for logging and transportation.

Table 1. Example of delivered prices for pulpwood and logs in Tennessee as reported by the TDA-DF for January-March, 1999.[2]

Product		Specifications	Eastern TN	Central TN	Western TN
Hardwood pulpwood		Variable diameter and length	$47/cord $16 /ton	$58/cord $25/ton	$58/cord $25/ton
Softwood pulpwood		Variable diameter and length	$50/cord $19/ton	$67/cord $25/ton	$67/cord $25/ton
Red oak	log grade 1	*	$750/Mbf*	$737/Mbf*	$757/Mbf*
	log grade 2	*	$475/Mbf*	$537/Mbf*	$475/Mbf*
	log grade 3	*	$250/Mbf*	$206/Mbf*	$277/Mbf*
Yellow-poplar	log grade 1	*	$375/Mbf*	$412/Mbf*	$294/Mbf*
	log grade 2	*	$250/Mbf*	$302/Mbf*	$191/Mbf*
	log grade 3	*	$125/Mbf*	$175/Mbf*	$96/Mbf*
Southern Yellow Pine		*	$200/Mbf*	$200/Mbf*	$360/Mbf* or $45/ton

*Log Specifications: 8'-16' length, minimum diameter inside bark must be 8"at small end, delivered prices are per thousand board feet (MBF) scaled using the Doyle Rule.

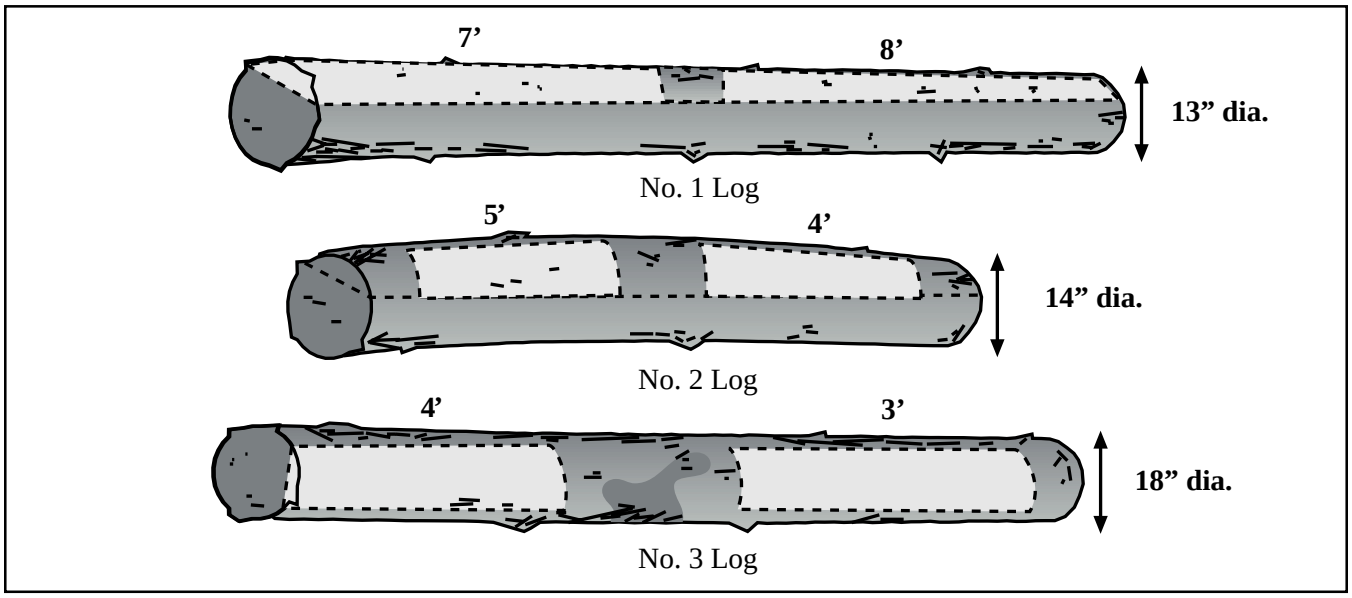

Figure 1. Examples of Number 1, 2 and 3 grade logs by the U.S. Forest Service log rule.

Saw-Logs

Most hardwood sawmills purchase logs based on a log grade and log scale. Grades are assigned to a log based on the number of visible defects on the surface such as knots and rot. These defects affect the quality and quantity of lumber that can be produced from the log. The most common log grade rules were developed by the U.S. Forest Service.[4] The expected volume of grade lumber for each U.S. Forest Service log grade is listed in Table 2. Figure 1 displays examples of each U.S. Forest Service log rule. The lumber grades listed

in the expected lumber yield column are the National Hardwood Lumber Association (NHLA) lumber grades for higher-valued material. This higher-valued material allows sawmills to be profitable. The higher the log grade, the more high-grade lumber can be expected from a log; therefore, a high-grade log is worth more than a low-grade log of the same volume. Logs that are of very large diameter and clear of defects are often sold as veneer logs and receive a higher price than if they were sold as sawlogs. Very-low quality logs are often sold as construction-grade logs from which railroad ties and mine timbers can be sawn. Some sawmills develop and use their own log grades rather than using the Forest Service grade rules.

Table 2. Estimated high value lumber yield for each log grade using the U.S. Forest Service Log Grade Rules.

Log Grade	Expected lumber yield
No. 1	60+ % #1 common, selects and FAS
No. 2	40-60% #1 common, selects and FAS
No. 3	20-40% #1 common, selects and FAS

The grade of a log indicates the percent of lumber volume by grade that can be cut from the log. To estimate the volume of lumber in a log, it is ***scaled***. The ***log scale*** estimates the amount of lumber that can be expected from a log given its diameter and length. Log scale *does not* estimate the grade of the lumber produced. It only estimates the *volume* of lumber produced. Many factors affect how much lumber is actually produced when a log is sawn. Some of these include: ***saw kerf***, log diameter, log taper, log sweep and crook, sawing method and the saw operator. ***Saw kerf*** is the amount of material removed as sawdust due to the width of the sawblade.

The three most common log rules are Doyle, Scribner and International 1/4 inch. The rule used will vary with the buyer. Sawmills within a certain locality commonly adopt a specific method for scaling logs, while mills in another areas may use a different log rule. When scaling logs, be consistent in the rule you chose and the methods you use. Each log rule estimates the amount of board feet in a log using a different method; therefore, converting between scales is not accurate. There is no best rule. The Doyle rule is most common in Tennessee for scaling hardwood logs. The Doyle rule is more accurate with large-diameter logs and greatly underestimates the volume of lumber that can be obtained from small-diameter logs. The Scribner rule was developed based on the diameter of the small end of a log and perfectly round logs. This rule tends to overscale large logs and underscale small logs. If the estimated volumes are rounded to the nearest 10 board feet, then this rule is known as the Scribner Decimal C rule. The International 1/4" rule provides the most accurate lumber volume estimation and is the only rule that includes taper and sawkerf. The difference in percent of actual lumber tally by log rule is displayed in Figure 2.

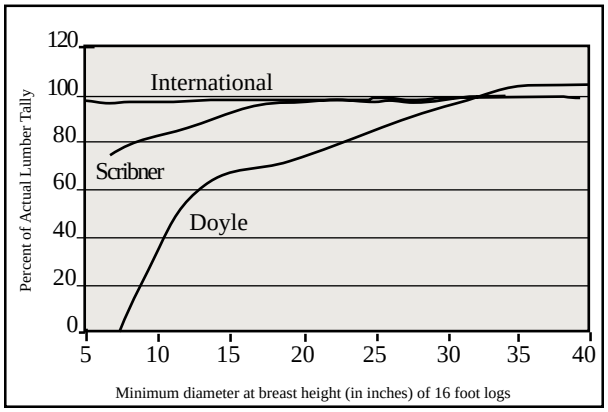

Figure 2. Difference in estimated and actual lumber volume for each log scale.

A good estimate for the value of sawlogs, veneer and crossties for each region in Tennessee is published by the TDA-DF. Timber Mart-South also publishes this information for Tennessee and the region. Examples of red oak and yellow-poplar log prices obtained by TDA-DF using Doyle scale for 1998 are given in Table 1.

Lumber

After lumber has been sawn, edged and trimmed, it is graded. Lumber is sold based on its grade, which differs for hardwoods and softwoods. Softwood lumber grades in Tennessee are usually based on rules assigned by the Southern Pine Inspection Bureau (SPIB). [5] Hardwood lumber

grades are based on the number and sizes of clear cuttings that can be cut from the board and are determined using the rules assigned by the National Hardwood Lumber Association (NHLA).[6] The hardwood lumber grades determined by the NHLA and the amount of clear material contained in each grade are presented in Table 3. The area of a board required in clear face cuttings for NHLA lumber grading rules is presented in Figure 3. The value of lumber decreases as the number of defects increases.

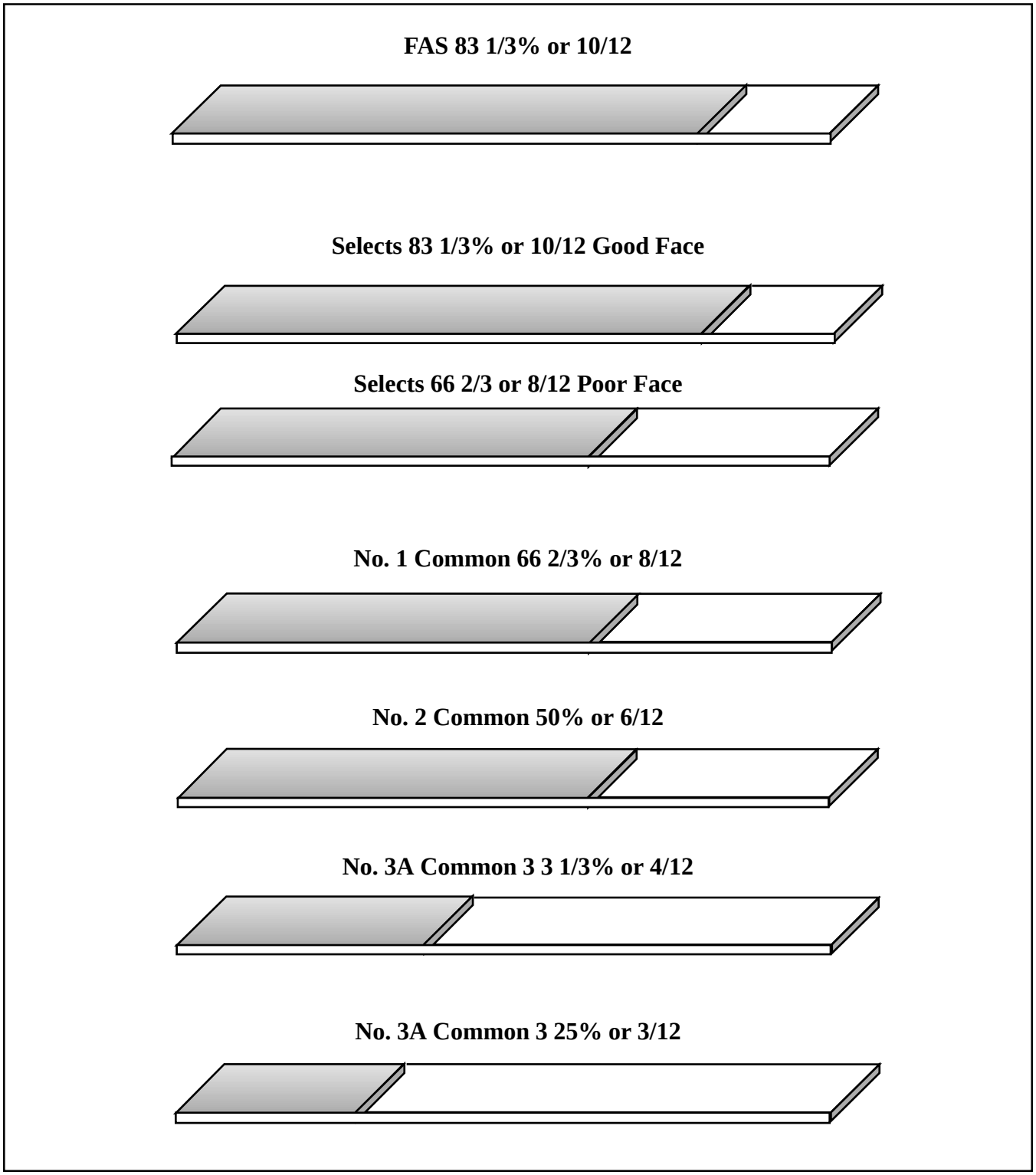

Figure 3. Area of a board required in clear face cuttings for NHLA lumber grading rules.

Table 3. Standard hardwood lumber grades and their minimum requirements. [6]

Lumber Grade	FAS	Selects	#1 Common	#2A	#3A	#3B
Min. Width	6"+	4"+	3"+	3"+	3"+	3"+
Min. Length	8'-16'	6'-16'	4'-16'	4'-16'	4'-16'	4'-16'
No. of cuttings allowed	SM*/4 Not over 4	SM*/4 FAS Side (SM* + 1)/3 #1 Com. Side	(SM* + 1)/3 Not over 5	SM*/2 Not over 7	No Limit	No Limit
Minimum size of cuttings	4"x5' 3"x7'	4"x5' or 3"x7' FAS Side 4"x2' or 3"x3' #1 C Side	4"x2'	3"x2'	3"x2'	1 1/2"
Yield amount req. in clear face cuttings	10/12	10/12 FAS Side 8/12 #1 Com.	8/12	6/12	4/12	3/12

*SM is the surface measure of the board, which is defined as the width of the board in inches and fractions of inches times length in feet divided by 12. The surface measure is rounded to the nearest whole number.

Further requirements are found in the Measurement and Inspection of Hardwood and Cypress. 1994. National Hardwood Lumber Association, Box 34518, Memphis, TN 38148-0518.

Softwood lumber is primarily used in construction and is sold in standard sizes. These sizes allow for shrinkage and machining; therefore, the actual dimensions of a 2 x 4 will be 1 ½ inches x 3 ½ inches. In hardwood, most lumber is cut for manufacture into other products such as furniture and flooring; therefore, it is sold in random lengths and widths. Hardwood lumber is sold on the ***board foot*** basis rather than the lineal foot basis. A ***board foot*** is 1 inch thick by 1 foot long by 1 foot wide, as seen in Figure 4.

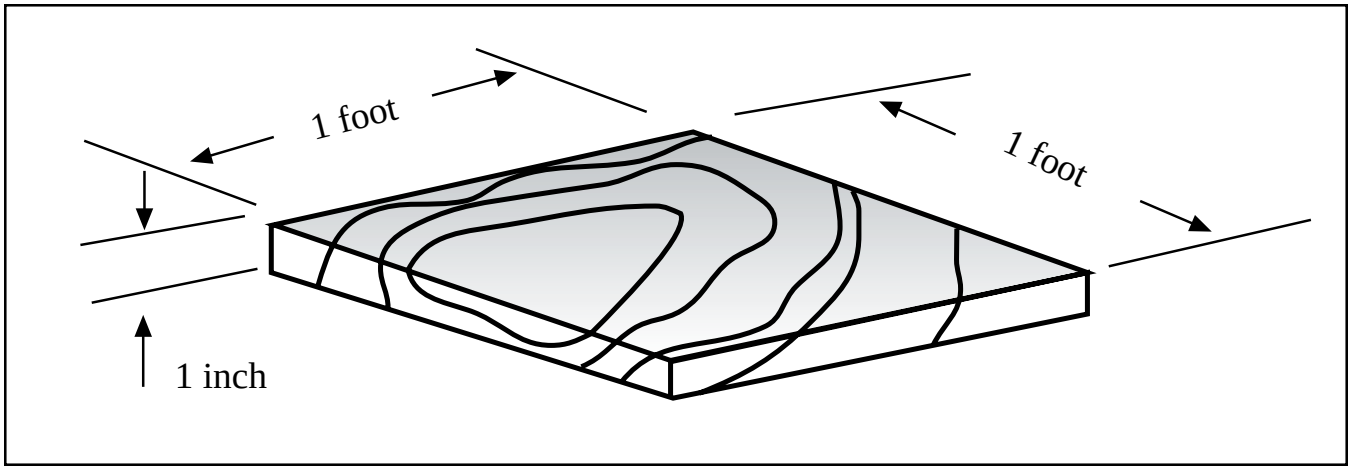

Figure 4. Diagram of a board foot.

The value of hardwood lumber is usually based on prices reported in trade publications such as the *Weekly Hardwood Review*[7] or the *Hardwood Market Report*[8]. Examples of the estimated market values for 4/4-inch thick lumber based on NHLA hardwood lumber grades are given in Table 4. The thickness of hardwood lumber is usually described in 1/2 -inch increments. For example, a 1-inch board would be described as a 4/4" board.

The actual price paid for lumber is usually higher or lower than the published price based on local availability, buyer and seller relationships, price trends, weather conditions and other factors. Softwood prices are determined in a similar manner using *Random Lengths*[9] *or Crow's Market Report*[10]. Grading hardwood lumber is a complex process, and, in order to sell graded lumber, one must become a certified grader through one of the grading agencies.

Species	NHLA Lumber Grade			
	FAS	**1 Common**	**2 Common**	**2A& 3A**
Red oak	1140	790	495	485
Yellow-poplar	655	350	265	200
Hard maple	1130	855	460	345

Table 4. Examples of 4/4 lumber grade values in dollars per MBF for March 12, 1999.[7]

When buying or selling pulpwood, chipwood or logs one should select the measurement method that best suits the situation. There are many different ways to measure the same product, so make sure that both the buyer and seller understand the measurement method used. When buying and selling lumber, remember that hardwoods and softwoods are graded using different rules and that the value of the material varies with the grade. To estimate the value of forest products for sale or purchase, check one of the market price publications mentioned in this article. If you have further questions regarding these measures and values please contact:

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