Pine Timber Volume-to-Weight Conversions

Can you answer the following questions? How many tons does one MBF pine sawtimber weigh? One cord of chip-n-saw? One cord of pine pulpwood? How can a bid per ton be compared to a bid per MBF? Per ton versus per cord? If you don't know the answers, read on!

Converting pine timber volume to tons (or tons to volume) can be useful for tax record keeping, growth monitoring, and marketing. Measurement standards for pine timber are changing. Inventories of standing timber in the past were kept in units of volume (cords and MBF). Today, we measure standing timber by weight. You need conversions to keep consistent records and estimate timber growth. Conversions can be particularly helpful when determining timber basis and deducting timber depletion from income.

Most high-production pine sawmills have changed to weight scaling and buy timber by the ton (2,000 pounds). Mills producing fuel, chips, pulp, or paper are also measuring timber only by weight. But many high-grade pine lumber and specialty mills still measure volume using the Doyle Log Rule and pay per MBF (1,000 board feet). Local wood yards may also still stick-scale pulpwood and pay by the cord (128 cubic feet).

This is important because state law requires mills in Mississippi to buy timber using a consistent measurement (Mississippi Statute 75-27-113). Mills that weigh timber logs must buy by weight. Mills that stick-scale timber volume must use the same unit of volume.

Timber owners may experience measurement confusion during pay-as-cut timber sales (selling on a per-unit basis). Thinning, salvage, and small acreage sales are the most common examples. These are the types of sales most likely to receive bids based on different units. This publication helps you know how to compare a bid in $/cord or $/MBF to another bid in $/ton.

The volume-to-ton conversions presented are "ballpark" figures close enough for most landowners' needs. Procurement experts in the forest industry checked the numbers and agreed they are close to theirs. The conversions presented are useful statewide for loblolly, shortleaf, longleaf, and slash pine. Do not use these conversions for spruce pine, or for damaged, beetle infested, or dead timber.

Use the conversions only as estimates and guidelines. The weight of wood is determined by moisture content and specific gravity. These vary from tree to tree, making the exact volume-to-ton conversion for your timber different.

Volume-to-Ton Conversions

For conversion purposes, pine timber is divided into three product types: shortwood pulpwood, longwood (pulpwood and chip-n-saw), and pine sawtimber (**Table 1**). Pines with DBH (diameter at breast height) ranging from 4 up to 22 inches can qualify for pulpwood. Chip-n-saw is a medium-valued timber product that yields two-by-fours and chips. Straight, clear stems with DBH from 6 to 14 inches can qualify for chip-n-saw. Highly valued sawtimber ranges from 10 to 28 inches DBH. Larger trees go for specialty products and plywood.

Shortwood (8 feet and less in length). The standard weight for shortwood pulpwood is 2.6 tons (5,200 pounds) per cord (MS statute 75-27-39). This type of product is getting rare. Most mills do not accept shortwood pulpwood because of debarking problems and inferior quality chips.

Longwood (more than 8 feet in length). Longwood pulpwood and chip-n-saw are exempt from the standard weight for shortwood. These are commonly delivered tree-length. The weight of a cord of longwood varies by species. Loblolly and shortleaf pines average the same weight as shortwood, 2.6 tons per cord. Longleaf and slash pines have a higher specific gravity, making their timber heavier. Longleaf and slash pine average 2.78 tons per cord.

Sawtimber. The Doyle Log Rule commonly is used to estimate volume of lumber in standing trees. Doyle was the only legal measure in Mississippi until 1996, even though it is not accurate. The Doyle Rule greatly underestimates lumber volume in small DBH trees (10–16 inches) and overestimates volume in very large trees (30+ inches). To account for Doyle rule inaccuracies, volume-to-ton conversions are presented by two-inch DBH classes (**Table 1**). Weight can vary from a high of 14 tons/MBF for 10-inch DBH timber down to 4.4 tons/MBF for 36-inch timber. If you know both sawtimber average DBH and merchantable height, you can use **Table 2** for a more accurate conversion.

Table 1. Volume to ton conversions for various pine products in Mississippi.
The weight of wood can vary from tree to tree, so use these conversions as estimates and guidelines only.

Pine Product[1]	Average DBH[2]	Tons per Unit Volume Conversion[3]
Shortwood pulpwood		2.6 tons per cord
Longwood pulpwood and chip-n-saw		2.6 tons per cord for loblolly and shortleaf 2.78 tons per cord for longleaf and slash
Sawtimber (when only DBH is known)	10	14.0 tons per MBF
	12	9.8
	14	8.5
	16	7.7
	18	7.2
	20	6.7
	22	6.3
	24	5.9
	26	5.5
	28	5.2
	30	5.0
	32	4.8
	34	4.6
	36	4.4

[1]Shortwood pulpwood is defined as any timber product delivered in short lengths (8 feet or less) for the manufacture of pulp and pulp products. Longwood pulpwood (over 8 feet in length) and chip-n-saw are typically delivered tree length to the mill. Chip-n-saw is a timber product that yields two-by-fours and chips. Sawtimber is a log large enough to saw into lumber, usually at least 16 feet in length.
[2]Average DBH = average diameter at breast height in inches.
[3]1 ton = 2,000 pounds; 1 cord = 128 cubic feet stacked wood; 1 MBF = 1,000 board feet, Doyle Log Scale. Shortwood pulpwood conversion specified by Mississippi Statute 75-27-39. Sawtimber conversions adapted from unpublished research by the late James McCreight, consulting forester, Busy Corner, MS, and Lee, G.S., R.C. Parker. 2003. Standing tree weight and volume tables for natural loblolly pine at the first delivery point. Forest and Wildlife Research Center, Bulletin FO 222, Mississippi State University. 14 pp.

Table 2. Volume to ton conversions for pine sawtimber when you know both diameter at breast height (DBH) and merchantable height to an 8-inch tip.
The weight of wood can vary from tree to tree, so use these conversions as estimates and guidelines only.

DBH inches	Merchantable height in number of 16-foot logs								
	1	1.5	2	2.5	3	3.5	4	4.5	5
	Tons per MBF Doyle[1]								
12	10.9	9.8	9.3	8.9	8.5	8.2	7.9	7.7	7.6
14	10.4	9.5	9.0	8.5	8.2	7.9	7.6	7.4	7.3
16	9.9	9.0	8.5	8.1	7.7	7.5	7.2	7.1	6.9
18	9.4	8.6	8.0	7.6	7.3	7.0	6.8	6.7	6.5
20	8.9	8.0	7.5	7.2	6.9	6.6	6.4	6.3	6.1
22	8.4	7.6	7.1	6.8	6.5	6.3	6.1	5.9	5.8
24	7.9	7.2	6.8	6.4	6.2	5.9	5.8	5.6	5.5
26	7.5	6.8	6.4	6.1	5.8	5.6	5.5	5.3	5.2
28	7.1	6.5	6.1	5.8	5.6	5.4	5.2	5.1	5.0
30	6.8	6.2	5.8	5.5	5.3	5.1	5.0	4.8	4.7

[1]1 ton = 2,000 pounds; 1 MBF Doyle = 1,000 board feet, Doyle Log Scale. Adapted from Lee, G.S., R.C. Parker. 2003. Standing tree weight and volume tables for natural loblolly pine at the first delivery point. Forest and Wildlife Research Center, Bulletin FO 222, Mississippi State University. 14 pp.

Occasionally timber is measured in cubic feet. Pine timber (wood and bark) averages 56 pounds per cubic foot for loblolly and shortleaf and 59 pounds for longleaf and slash. To estimate tons, multiply cubic feet by weight in pounds and then divide by 2,000.

Use Conversions

One way to convert a timber inventory to weight is to multiply volume by the appropriate tons/volume (**Table 1**). **Example 1** shows how to convert an inventory in cords and MBF to tons. Determine the species you are growing and the average sawtimber DBH to find appropriate conversions in **Table 1**.

Conversions can also help you evaluate timber bids in your most familiar unit. Many timber owners are still more comfortable knowing the $/cord or $/MBF bid price. To estimate these from a $/ton bid, multiply each bid by tons/volume, as in **Example 2**.

Selling sawtimber by the ton is tricky. In Example 2, look closely at the effect tree DBH has on the equivalent price per MBF. Large diameter sawtimber should receive more per ton than smaller timber.

Example 3 shows how to estimate a $/ton bid price by dividing the $/cord or $/MBF bid by the tons/volume conversion.

Example 4 is for pay-as-cut timber sales. You can use conversions to compare two different bids, one based on volume and the other tons. But before deciding which bid to accept, find out if mill standards are equal. Some mills that pay a lower $/ton price also harvest a longer merchantable length (more weight/tree), bringing you more dollars.

Summary

Volume-to-ton conversions may not be exact, but they can be very useful. You can use these conversions to update timber inventories and keep timber bids in familiar units. Conversions also help you compare timber bids that differ in units of measure.

Volume-to-ton conversions are different for shortwood, longwood, and sawtimber. Shortwood pulpwood conversion is set by Mississippi law. Longwood conversion varies by species, with longleaf and slash timber heavier than loblolly and shortleaf pine. You need average DBH to find an appropriate conversion for sawtimber. A better sawtimber conversion is possible if you also know average merchantable height. Example 3. A timber buyer offers a landowner $500/MBF for longleaf sawtimber averaging 12 inches DBH and $40/cord for pulpwood. What are the equivalent $/ton bids?

Example 1. An inventory was taken of a loblolly pine stand with the sawtimber averaging 16 inches DBH. The volume estimate was 100 MBF Doyle pine sawtimber, 50 cords chip-n-saw, and 120 cords of pulpwood. How many tons does this pine timber weigh?

Step 1. Find the appropriate conversions in Table 1.

sawtimber	16 inches DBH	7.7 tons/MBF
chip-n-saw	loblolly	2.6 tons/cord
pulpwood	loblolly	2.6 tons/cord

Step 2. Convert to tons.
Sawtimber
100 MBF Doyle x 7.7 tons/MBF = 770 tons

Chip-n-saw
50 cords   x 2.6 tons/cord = 130 tons

Pulpwood
120 cords   x 2.6 tons/cord = 312 tons
                                  _____
Total weight   1,212 tons

Example 2. A landowner is offered $30/ton for pine sawtimber in three different stands. The first stand averages 10 inches DBH, the second averages 20 inches, and the third averages 30 inches. What are the equivalent $/MBF bids for these stands?

Step 1. Find the appropriate conversion in Table 1.

sawtimber	10 inches DBH	14.0 tons/MBF
	20 inches DBH	6.7 tons/MBF
	30 inches DBH	5.0 tons/MBF

Step 2. Compare bids on $/MBF basis.
Stand 1 (10 inches)
$30/ton x 14.0 tons/MBF = $420/MBF

Stand 2 (20 inches)
$30/ton x 6.7 tons/MBF   = $201/MBF

Stand 3 (30 inches)
$30/ton x 5.0 tons/MBF   = $150/MBF

Example 3. A timber buyer offers a landowner $500/MBF for longleaf sawtimber averaging 12 inches DBH and $40/cord for pulpwood. What are the equivalent $/ton bids?

Step 1. Find the appropriate conversion in Table 1.

sawtimber   12 inches DBH   9.8 tons/MBF
pulpwood   longleaf   2.78 tons/cord

Step 2.   Convert bids to $ per ton.

Sawtimber bid

$$\frac{\$/MBF\ bid}{tons/MBF} = \frac{\$500/MBF}{9.8\ tons/MBF} = \$51.02/ton$$

Pulpwood bid

$$\frac{\$/cord\ bid}{tons/cord} = \frac{\$40/cord}{2.78\ tons/cord} = \$14.39/ton$$

Example 4. A landowner receives two bids for pine sawtimber averaging 14 inches DBH. The first bid is $30/ton and the second $350/MBF. Which is the higher bid?

Step 1. Find the appropriate conversion in Table 1.

sawtimber   14 inches DBH   8.5 tons/MBF

Step 2. Compare bids on a $/ton basis.

Bid 1   = $30.00/ton

Bid 2 $\dfrac{\$bid/MBF}{tons/MBF} = \dfrac{\$350/MBF}{8.5\ tons/MBF} = \$41.18/ton$

The second bid is higher by $11.18/ton.

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