

Revised 2004

Publication 420-560

# Measuring Standing Trees & Logs

Virginia Cooperative Extension

*Knowledge for the Commonwealth*



VIRGINIA POLYTECHNIC INSTITUTE  
AND STATE UNIVERSITY



VIRGINIA STATE UNIVERSITY

# Measuring Standing Trees And Logs

Richard G. Oderwald, Professor of Forestry and  
James E. Johnson, Professor of Forestry and Extension Specialist, Virginia Tech

Timber may be sold as stumpage (trees before they are cut) or as harvested products (sawlogs, veneer logs, or pulpwood). If trees are sold as harvested products, the sale is customarily based upon measured volume. Trees marketed as stumpage may be sold by boundary, a measured estimate of stand volume, or individual tree measurements.

Regardless of the price offered, a purchaser always estimates timber volume in a stand before buying it. In contrast, the seller too often has no idea what volume of timber is being sold. This publication explains how you can make your own tree or log volume measurements.

Standing-tree and log volumes can be measured using a scale stick designed to fit Virginia timber conditions. With it you can measure the diameter of a tree, the number of 16-foot logs or the length of pulpwood in a tree, and the diameter and length of sawlogs. Tables printed on the stick provide for varying board-foot volumes for standing trees and for sawlogs of varying lengths.

A Virginia Tree and Log Scale Stick can be purchased from:

Extension Forestry  
324 Cheatham Hall  
College of Natural Resources  
Virginia Tech (0324)  
Blacksburg, VA 24061  
540-231-7051

Enclose a check for \$10.00, payable to: *Virginia Tech Treasurer.*

## Standing Tree Measurement

The diameter of a tree at 4-1/2 feet above the ground is called the “diameter at breast height” (DBH). Both the diameter and merchantable height are used to obtain tree volume. The merchantable height is measured from the stump (usually 6 inches above the ground) to the point where the trunk becomes too small in diameter to have any value. The minimum usable diameter for pine and other conifers is usually 6 inches if such trees are to be cut for sawlogs and 4 inches if they are to be harvested for pulpwood. For hardwoods, the minimum merchantable diameter is 8 inches, or the point at which the trunk breaks up into

branches. After the diameter and height of the tree have been measured, the sawlog volume for a tree with one to four logs may be read directly from the table on the stick.

### A. Diameter Measurement

With the side marked “Tree Scale Stick” facing you, hold the stick against the tree at a right angle to the trunk, 4-1/2 feet from the ground and 25 inches from your eye (Figure 1). The 25-inch distance may be measured with the side of the stick labelled “Log Scale” (Figure 2). Next, move the stick so that its zero end is in line with your eye and the left side of the tree. Then, with your head in the same position, note where your line of sight cuts across the stick to the right side of the tree. The reading on the stick at this point gives the diameter of the tree (Figure 3).



Figure 1.



Figure 2.

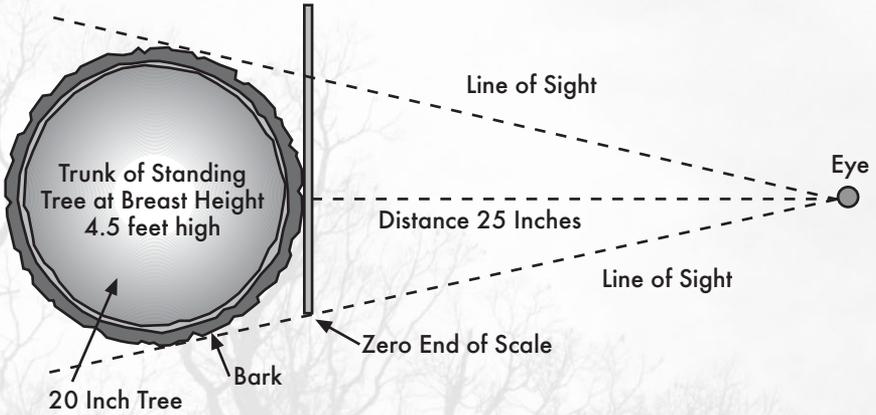


Figure 3.

## B. Merchantable Height Measurement

To measure height, stand 66 feet away from the tree (measured or paced) and on the same level as its base. Hold the stick in a vertical position, 25 inches from your eye (Figures 4 and 5). If the sawlog height is to be measured, the edge of the stick labelled with “1, 2, 3, 4, 5” should face you. If the length of pulpwood sticks is to be measured, the edge of the stick labelled in 5-foot height increments should face you. Move the stick so that its zero end will be at the tree stump height in your line of sight. Then, without moving your head, note on the right side of the stick where your line of sight meets the merchantable top of the tree. Estimate to the nearest half log or nearest 5 feet on the height scale.

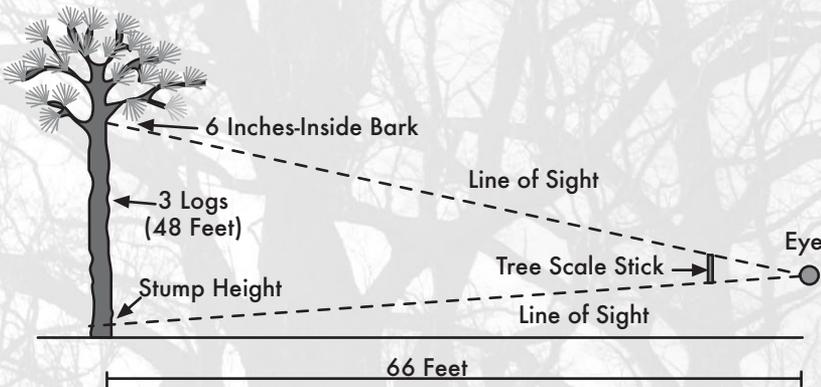


Figure 4.



Figure 5a.

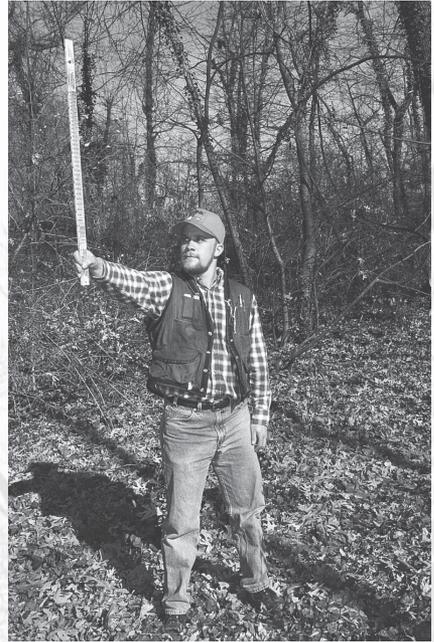


Figure 5b.

## C. Tree Volume Measurement

The sawlog volume of the tree may be found by referring to the table on the “Tree Scale” side of the stick. If, for example, the tree is 16 inches in diameter and contains three 16-foot logs, the volume (241 board feet) will be found under the 16-inch volume on the 3-log line. If the tree is 2-1/2 logs high and 16 inches in diameter, its volume may be found by adding the volumes of a 2-log and a 3-log tree ( $180+241=421$ ) and dividing by 2 ( $421\div 2=210$ ).

Pulpwood volume may be found by referring to Tables 1 and 2. For example, a tree 9 inches in diameter with 40 feet of merchantable height will have a weight of 0.35 tons or a volume of 0.13 cords. Ten trees of this size would have 3.5 tons or 1.3 cords.

The board-foot tree volumes on the stick and the pulpwood weights and volumes in the table are for trees in Virginia growing under average conditions. For better-than-average trees, the volumes may be increased 3% to 6%; for trees poorer than average, the estimated tree volumes should be lowered by the same amount.

## **Log Volume Measurement**

Sawlogs should always be cut and measured in even lengths – 8, 10, 12, 14, or 16 feet – with 3 inches added for trim allowance. To obtain the volume of a sawlog, first measure the length to the nearest full, even foot. If the log does not have the additional 3 inches for trim allowance, the merchantable length will be the next lower even foot. (For example, if the log measures exactly 14 feet, the merchantable length will be 12 feet instead of 14 feet.) Then, measure the diameter in inches inside the bark at the small end of the log with the log scale side of the stick. If the end is not round, make two measurements at right angles to each other and use their average to the nearest inch for log diameters. Then, referring to the log scale table on the stick, look for the volume of the log measured. For example, if the log is 14 inches in diameter and 16 feet long, the volume is 135 board feet.

The log volumes used on the stick are those of the international 1/4-inch log rule. This rule gives the most accurate measurement of board-foot volume in 1-inch boards that can be sawed from logs of various sizes.

## **Keep a Tally of Trees, Logs, or Pulpwood**

When measuring the volume of standing trees or sawlogs, you should keep a tally of the trees or logs measured. This may be done by recording the dimensions of each tree or log measured (usually by species) and by adding the individual volume measurements to get the total.

## **Special Note**

For further information on how to use the Virginia Tree and Log Scale Stick see your Extension agent. If you want to sell your timber, you should have its value assessed. The nearest Virginia Department of Forestry office will have a list of consulting foresters who work in your area.

**Table 1. Pulpwood volume including bark (in cords).**

Diameter Breast Height (inches)	Height in Feet to 4 Inch Top Outside Bark											
	10	15	20	25	30	35	40	45	50	55	60	
6	0.02	0.03	0.04	0.04	0.05							
7	0.03	0.04	0.05	0.06	0.07	0.07	0.08	0.09				
8		0.05	0.06	0.07	0.08	0.09	0.11	0.12				
9			0.07	0.09	0.10	0.12	0.13	0.15	0.16			0.19
10			0.09	0.10	0.12	0.14	0.16	0.18	0.20	0.22		0.24
11			0.10	0.12	0.15	0.17	0.19	0.22	0.24	0.26	0.28	0.29
12			0.12	0.15	0.17	0.20	0.23	0.26	0.28	0.31	0.34	
13			0.14	0.17	0.20	0.23	0.27	0.30	0.33	0.36	0.40	
14			0.16	0.20	0.23	0.27	0.31	0.35	0.38	0.42	0.46	
15						0.31	0.35	0.39	0.44	0.48	0.52	
16						0.35	0.40	0.45	0.50	0.55	0.59	
17							0.45	0.50	0.56	0.61	0.67	
18							0.50	0.56	0.63	0.69	0.75	
19							0.56	0.63	0.70	0.77	0.83	
20							0.62	0.69	0.77	0.85	0.92	

**Table 2. Pulpwood weight including bark (in tons).**

Height in Feet to 4 Inch Top Outside Bark

Diameter Breast Height (inches)	10	15	20	25	30	35	40	45	50	55	60
6	0.05	0.08	0.11	0.11	0.13						
7	0.08	0.11	0.13	0.16	0.19	0.19	0.21	0.24			
8		0.13	0.16	0.19	0.21	0.24	0.29	0.32			
9			0.19	0.24	0.27	0.32	0.35	0.40	0.43		0.51
10			0.24	0.27	0.32	0.37	0.43	0.48	0.54	0.59	0.64
11			0.27	0.32	0.40	0.45	0.51	0.59	0.64	0.70	0.78
12			0.32	0.40	0.45	0.54	0.62	0.70	0.75	0.83	0.91
13			0.37	0.45	0.54	0.62	0.72	0.80	0.88	0.96	1.07
14			0.43	0.54	0.62	0.72	0.83	0.94	1.02	1.12	1.23
15						0.83	0.94	1.04	1.18	1.28	1.39
16						0.94	1.07	1.20	1.34	1.47	1.58
17							1.20	1.34	1.50	1.63	1.79
18							1.34	1.50	1.69	1.85	2.01
19							1.50	1.69	1.87	2.06	2.22
20							1.66	1.85	2.06	2.27	2.46