

# Measuring Trees

**C**AN YOU think of any reasons why trees are measured? One reason is to identify the largest trees. However, the most common reason for measuring trees is to determine the potential value of the wood in a tree. Over time, the largest specimens of different types of trees have been located around the country.



## Objective:



Explain techniques for measuring trees.

## Key Terms:



basal area

board foot

breast height

cord

cubic foot

cubit

dbh

hypsonometer

linear foot

merchantable height

piece

## Measuring Forest Trees

Tree measurements are necessary to determine the volume of wood in each tree. The total of individual tree measurements and volumes provides an inventory of a whole timber stand.

## UNITS OF MEASURE

Timber trees are measured with a variety of units of measure.



FIGURE 1. These stacks of lumber have been appropriately measured.

Some of these units are unique to the wood industry. Some are also used for generally measuring.

### **Board Foot**

**Board foot** is a unit of measurement represented by a piece of rough wood 1 foot square and 1 inch thick. The board foot is generally used to measure sawtimber and veneer timber. In surfaced or finished lumber, width and thickness are based on measurements before surfacing or other finishing.

### **Cubic Foot**

**Cubic foot** is a unit of measurement equal to the volume of a cube of rough wood 1 foot in length on each of its six sides. A cubic foot contains 12 board feet. The unit is used to measure all kinds of timber products.

### **Cord**

A **cord** is a stack of wood, including air space between pieces, that measures 4 feet × 4 feet × 8 feet, or 128 cubic feet. The cord is used to measure pulpwood and fence posts.

### **Cubit**

A **cubit** is a stack of wood containing 100 cubic feet of solid wood.

### **Piece**

A **piece** is a unit of measurement that refers to the number or quantity of timber products of a specified dimension.

### **Linear Foot**

**Linear foot** is a unit of measurement used to express the length of a product in feet.

### **Basal Area**

**Basal area** is a unit of measurement applied to standing timber to indicate the level of stocking. It is the cross-sectional area of trees at **breast height**, or 4½ feet above the average ground line. Basal area is expressed in square feet. It may apply to individual trees, or it may apply to all trees when it is used on an acre basis.

## **TREE DIAMETER**

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In the United States, the diameter of standing trees is most commonly measured as diameter at breast height, or **dbh**. Diameter measurements are taken outside the bark, with deduc-

tions made for bark thickness. Tree diameters are usually recorded in even 2-inch classes to facilitate volume determination. Typically, diameter classes are 6-, 8-, 10-, 12-, and 14-inch diameters. A tree is placed according to diameter in the nearest 2-inch class.

A diameter tape is the most accurate tool for measuring a tree. It is calibrated so that each inch on the diameter side of the tape is actually 3.1416 inches in length. Because the tape is calibrated in this way, taking a measurement of the tree's circumference produces its diameter.

A technique similar to the one described for using a diameter tape can be used for roughly measuring tree diameter with a Biltmore stick. This procedure is based on the geometric principle of similar triangles, with the scale on the stick graduated to read directly in inches.



FIGURE 2. The dbh of this tree is being measured with a diameter tape.

## MEASURING TREE HEIGHT

Tree height may be measured in terms of feet or number of logs or bolts. A tree is measured to either its total height or its merchantable height. **Merchantable height** refers to the usable length of a tree for a specific product and is measured from the stump height to the cut-off point near the top. This cut-off point is located where the stem diameter reaches a minimum size for the product for which the tree is to be harvested or where excess limbs or forks prevent closer utilization. Merchantable height for a sawtimber tree is determined by the number of 16-foot logs and half logs that can be cut from a tree. The cut-off point for sawtimber trees varies from 6 to 10 inches. Merchantable height for a pulpwood tree is usually tallied to the nearest pulpwood bolt of a given length. This will be 4 feet, 5 feet, or 5 feet 3 inches, depending on pulp mill specifications. The cut-off point for pulpwood is generally 4 inches.

One instrument that is used to measure tree height is a **hypometer**. Hypometers (graduated in log length) are normally found on the edge of tree scale sticks. Most tree scale sticks also have volume tables printed on one of the wide sides.



FIGURE 3. This forester is measuring the height of a tree.

## Summary:



Tree measurements are necessary to determine the volume of wood in each tree. The total of individual tree measurements and volumes provides an inventory of the whole timber stand.

Timber trees are measured with a variety of units of measure including board feet, cubic foot, cord, cubit, piece, linear foot, and basal area.

The diameter of standing trees is most commonly measured as diameter at breast height. A diameter tape is the most accurate tool for measuring a tree. A Biltmore stick is used to roughly measure tree diameter.

Tree height may be measured in terms of feet or number of logs or bolts. A tree is measured to either its total height or its merchantable height. Merchantable height refers to the usable length of the tree for a specific product and is measured from the stump height to the cut-off point near the top. A hypsometer is used to measure tree height.

## Checking Your Knowledge:



1. Why is the measuring of timber necessary?
2. What units of measure are applied to trees?
3. How is the diameter of a tree determined?
4. How can the height of a tree be determined?
5. What does merchantable height mean?

## Expanding Your Knowledge:



Obtain a Biltmore stick, hypsometer, and diameter tape and practice measuring trees in a nearby forested area.

## Web Links:



### Measuring Standing Trees

<http://ohioline.osu.edu/for-fact/0035.html>

### Measuring Standing Trees and Logs

<http://www.ext.vt.edu/pubs/forestry/420-560/420-560.html>

### Measuring Guide

<http://www.americanforests.org/resources/bigtrees/measure.php>

### Measuring Tree Volume

[http://www.kbs.msu.edu/extension/marketing/Tree\\_volume.html](http://www.kbs.msu.edu/extension/marketing/Tree_volume.html)