

Forestry Measurements

DBH

This measure is taken at breast height (4.5 feet) and known as *diameter breast height (DBH)*. When taking the DBH, one should avoid tree swellings like branch whorls. If a tree is forked, and the fork begins below the 4.5 ft mark, then measure each fork individually. If the fork begins above the 4.5 mark, then measure the tree as a whole.

DBH can be measured with a specially calibrated tape measure called a diameter tape (d-tape) available from arborist or forestry supply dealers. These tapes have a two sides; one indicating regular inch measurements and one indicating inches of diameter. If you do not have a D-tape, use a regular measuring tape and then find the diameter using the tree's circumference.

Measuring diameter – D-tape

Stand next to the trunk of the tree and measure at 4.5 ft. above ground.
Wrap the diameter tape around trunk and make sure tape is level.
Record the DBH as taken from the *inches of diameter* side of the tape.

Measuring Tape

Stand next to the trunk of the tree and measure at 4.5 ft. above ground.
Wrap the measuring tape around trunk and make sure tape is level.
Record the circumference in inches.

Diameter is the relationship between the circumference of the a circle (in this case the trunk) and the number π (3.14). It can be expressed as:

$$\text{Diameter} = \text{Circumference} / \pi$$

Ex:

The circumference of the tree is 46.5 inches, So...

$$\text{Diameter} = 46.5 / 3.14$$

$$\text{Diameter} = \sim 14.8$$

***Record the DBH**

Height

Merchantable height is the length of a tree's usable timber and is measured from stump height to a cutoff point at the top. Cutoff points will vary depending on geography, species and the number of limbs.

Using a Biltmore or Tree Scale Stick

- Find the side of the stick that gives the number of logs. On a Biltmore sticks it maybe on the narrow side that says "number of 16 ft logs" and on Tree Scale sticks it may be on the side labeled Merritt Hypsometer.
- Stand 66 feet (approximately 12 paces) from the tree you want to measure. Holding the stick in an upright vertical position 25 inches from your eye, line up the zero end of the stick with the base of the tree.
- The number of logs can be read directly off the stick starting upward from the base of the tree to the tree's determined cutoff point (the point where the wood is no longer suitable for product use).
- Read to the nearest half-log. If height measurement is desired in feet, the conversion factor is 16 feet for each log.

Using a Clinometer

A *clinometer* is a device used to measure the angle of a line of sight above or below horizontal and will determine ground slope or height. When using a clinometer, one is estimating the angle from his/her eyes to the top of the tree and the angle from his/her eyes to the bottom of the tree. The instrument then converts these angles to feet, allowing one to estimate the height.

- Stand a convenient distance from the tree to measured, which allows a view of the tree's top and the tree's bottom (66' is a standard distance in Forestry, and is known as a cord – Try standing this distance from the tree). Make sure the spot where you stand has the same elevation as the base of the tree.
- *Record* your horizontal distance in feet from the base of the tree.
- Look through the viewer until the top of the tree is in sight. The clinometer will give a reading in percent (%) at the index line. This number is called the A (+) reading. *Record* this number.
- Look through the viewer until the bottom of the trunk is in sight and read the percent at the index line. This is called the B (-) reading. *Record* this number.

- Subtract the bottom reading from the top reading and multiply this by your horizontal distance from the base of the tree.

- **Ex:** $A(+)$ = 63%

- $B(-)$ = -7%

- Distance from Tree Base* = 66'

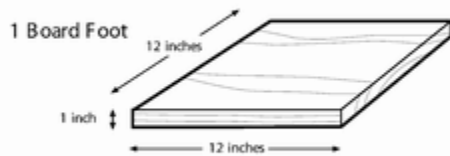
- $63\% - (-7\%) = 70\%$

- $.70 \times 66' = 46.2'$ tree height.

*** Record the Height (in Feet)**

Volume

In Forestry, trees are often measured for their volume. *Board feet* is a unit of measurement used to estimate how much lumber would be available if a particular tree were cut down. One board foot is a slab of wood which is one foot wide by one foot long by one inch thick.



The following will guide you through the conversion (From the USDA National Forest Website):

1. Measure the height of the tree you are studying.
2. Measure the diameter of the tree you are studying. Make sure you write these two measurements down very carefully on the data sheet below.
3. Remember the formula to find the area of a circle is ($A=r^2 \times \pi$). Area = radius squared times 3.14). Since a tree is almost circular, use this formula to find the area of your tree at DBH (diameter at breast height). Since the formula requires the radius of the tree and you just measured the diameter, divide the diameter by 2. Dividing the radius by 12 converts inches to feet.
4. Now use this number to calculate the area of your tree.
5. Don't relax now! We are only beginning! Use the formula in step 5 of the data sheet to find out how many cubic feet of lumber are in your tree.

$$\text{Cubic Feet} = \text{Area (ft)} \times \text{Height (ft)} / 4$$

(note: 4 is used to account for the taper of the tree)

6. There are 12 board feet of lumber for every one cubic foot, so multiply cubic feet by 12. You have calculated how many board feet of lumber your tree has.
7. Practice on several other trees to get comfortable with this series of calculations.

(Example: If you have 40 foot tree, with a 22 inch DBH, you should get ~314.3 board feet: Try it!)

Height _____ feet

Diameter _____ inches

To get Diameter in feet: $\text{DBH} / 2 = \text{_____ radius in inches} / 12 = \text{_____ feet}$

Area of tree cross-section = above number squared $\times 3.14 = \text{_____ sq.ft.}$

Volume of tree in cubic feet = above number \times tree height $/ 4 = \text{_____}$

Volume of tree in board feet = above number $\times 12 = \text{_____}$