

**FOR 2542 - Forest Inventory
Diameter Measurement**
David Larsen

Tree diameter is the distance through the cylinder of the tree stem or bole. Diameter is the most common tree measurement because it is the easiest measurement to collect. Diameter can be collected at any point on the stem, but there are some common points where diameter is taken. These include ground level or basal, stump height, breast height, some percentage of tree height, and crown base. Of these, diameter at breast height (DBH) is the most common. In English units, breast height is 4.5 feet above the ground on the high side of the tree. In metric units, breast height is 1.3 meters. Note that these are not the same point as $4.5' = 1.37\text{m}$. Let us consider some common methods of measuring DBH (Figure 1).

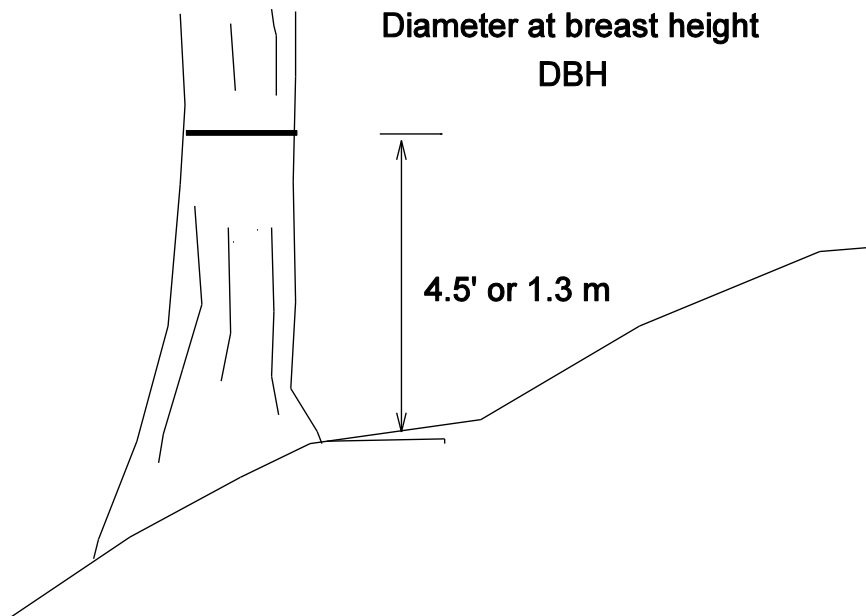


Figure 1. Where to measure DBH

Diameter calipers

Diameter calipers are among the simplest diameter measurement tools. It has a scale with two arms that can be set on either side of the tree and the diameter is read on the scale. If the tree is eccentric more than one measurement must be taken and then averaged to get an accurate diameter measurement (Figure 2).

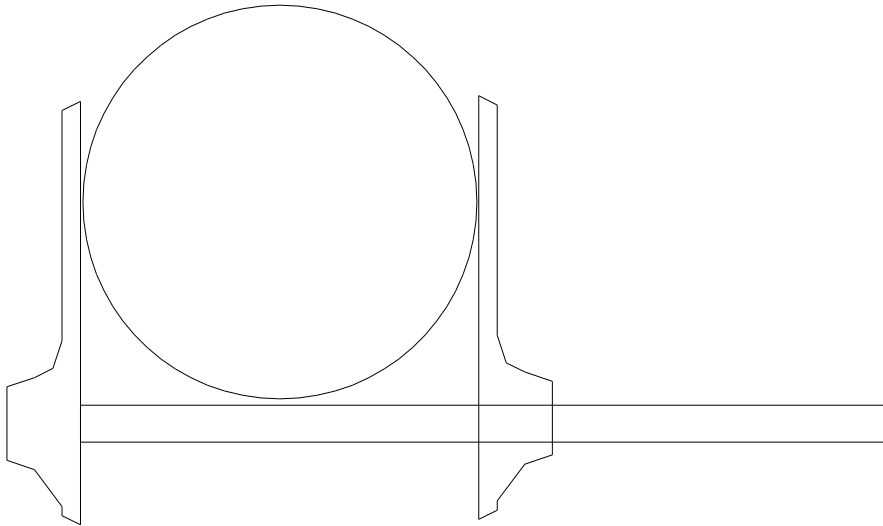


Figure 2 Measurement of diameter with tree calipers

Diameter Tape

Diameter tapes are the most common diameter measurement tools. It is a flexible metal tape which is used to measure circumference, but reads in units of diameter (figure 3).

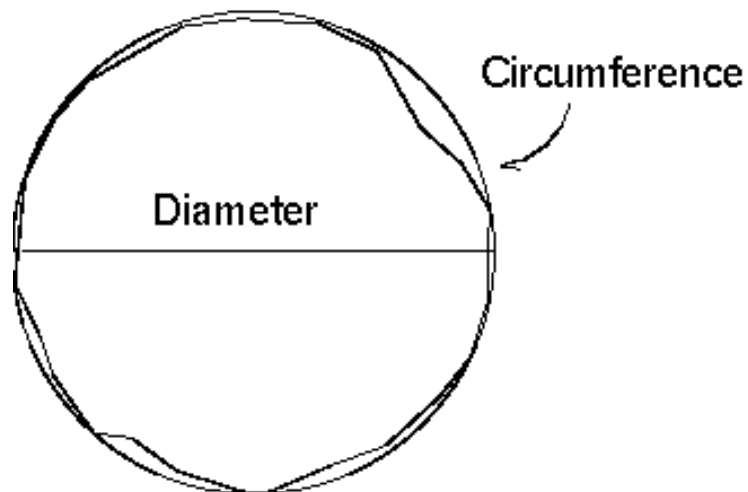


Figure 3 How a diameter tape converts circumference into diameter.

This conversion is accomplished by dividing the circumference by $\pi(3.1415)$.

$$D = \frac{C}{\pi}$$

where D is the diameter, C is the circumference and π is pi (3.1415).

Biltmore Stick

A Biltmore stick is a simple device to measure diameters to the nearest inch class. Its key advantage is that it is fast and simple to use. Biltmore stick is calibrated to read the angles as in the following Figure 4 (Husch et al. 1993).

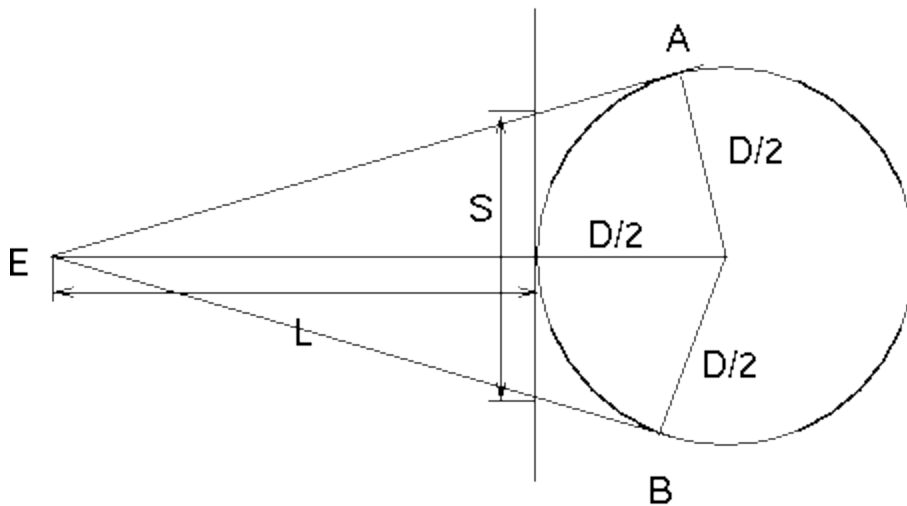
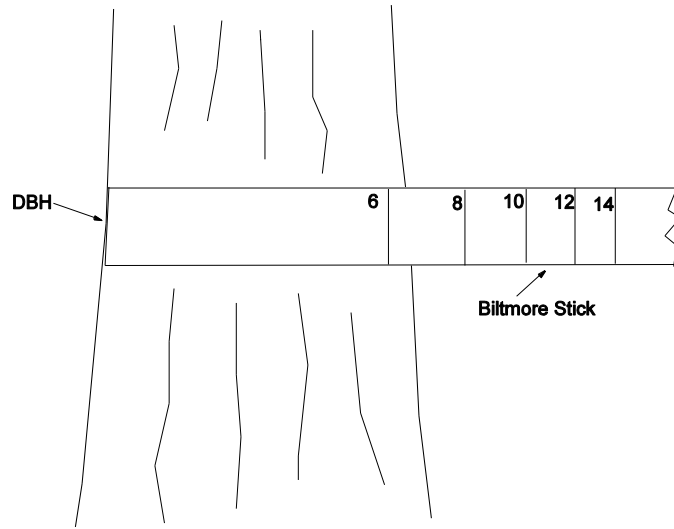


Figure 4 How a Biltmore stick works.

where E is your eye, L is usually 25 inches, S is the tangent to the observed arc AB . Using the following formula you can make a Biltmore stick anywhere and for any L distance.

$$S = \sqrt{\frac{D^2 L}{L + D}}$$



References

Husch, B., T. W. Beers and J. A. Kershaw, Jr.. 2003. Forest Mensuration. Fourth Edition. *John Wiley and Sons, Hoboken, New Jersey* 443 p.