MEASURING TREE DIAMETERS

adapted from the

TIMBER CRUISING HANDBOOK

FSH 2409.12
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Forest Service
Washington, D. C.
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14.1. Measuring Tree Diameter

14.11 Reading the Diameter Tape

If the diameter reading is not exactly on a tenth, take diameter tape readings to the next lower one-tenth inch. This compensates for the positive bias incurred by measuring out-of-round trees with a tape. Figure 01, example A is read as 5.3, example B as 5.4, and example C as 5.6.

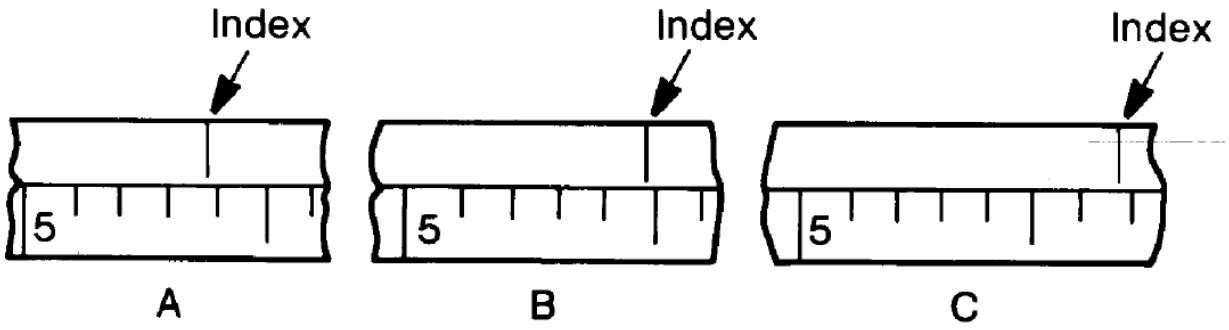

Figure 01. Diameter tape measurement readings.

There are situations where diameter measurements are made and recorded to the nearest 1- or 2-inch diameter class. This may occur when the precision of the measuring instrument can only be to the closest 1 or 2 inches or specified product volume estimation procedures are based on 1- or 2-inch DBH classes. Standard 1- and 2-inch classes are:

1. Examples of 1-inch diameter class are: 5-inch class = 4.6 - 5.5 inches; 9-inch class = 8.6 - 9.5 inches, and so on.
2. Examples of 2-inch diameter class are: 12-inch class = 11.0 - 12.9 inches; 14-inch class = 13.0 - 14.9 inches, and so on.

There are situations where diameter measurements are not rounded. This situation occurs when absolute measurements are specified. Timber sale contract minimum tree DBH and minimum piece specifications are absolute.

Example:

1. Minimum tree DBH specification = 7.0 inches. This means 6.95 would not be rounded to 7.0 inches.
2. Minimum piece specification = 7.6 inches DIB. This means 7.55 would not be rounded up to 7.6 inches.

14.12 Measuring Tree Diameter at Breast Height (DBH)

Measure DBH from the high ground side of the tree at 4.5 feet above the forest floor (fig. 02a). If tree diameter cannot be measured at 4.5 feet because of abnormalities, measure as described in section 14.12d.

14.12a Leaning Trees. Measure DBH on leaning trees at a right angle to the center line of the tree as shown in figure 02b.

14.12b Forked Trees. A forked tree is a tree with two or more stems originating from one stump. Consider forking to start at the point where daylight is seen. When a tree forks below 4.5 feet, consider as two trees and measure DBH on each stem at 4.5 feet above the ground on the high side (fig. 02c). If either stem at this point is abnormal, measure as described in section 14.12d. When a tree forks at or above 4.5 feet, consider as one tree and record the smallest diameter at 4.5 feet or below (fig. 02d).

14.12.c Trees Growing Together. Two methods may be used to determine DBH on trees growing together.

1. If calipers are available, measure each tree at normal DBH point, 4.5 feet above high ground side.
2. To use one-half diameter method, make two marks opposite each other on the stem at 4.5 feet. Measure the distance between the marks with a diameter tape; double the measurement to determine DBH (fig. 02e).

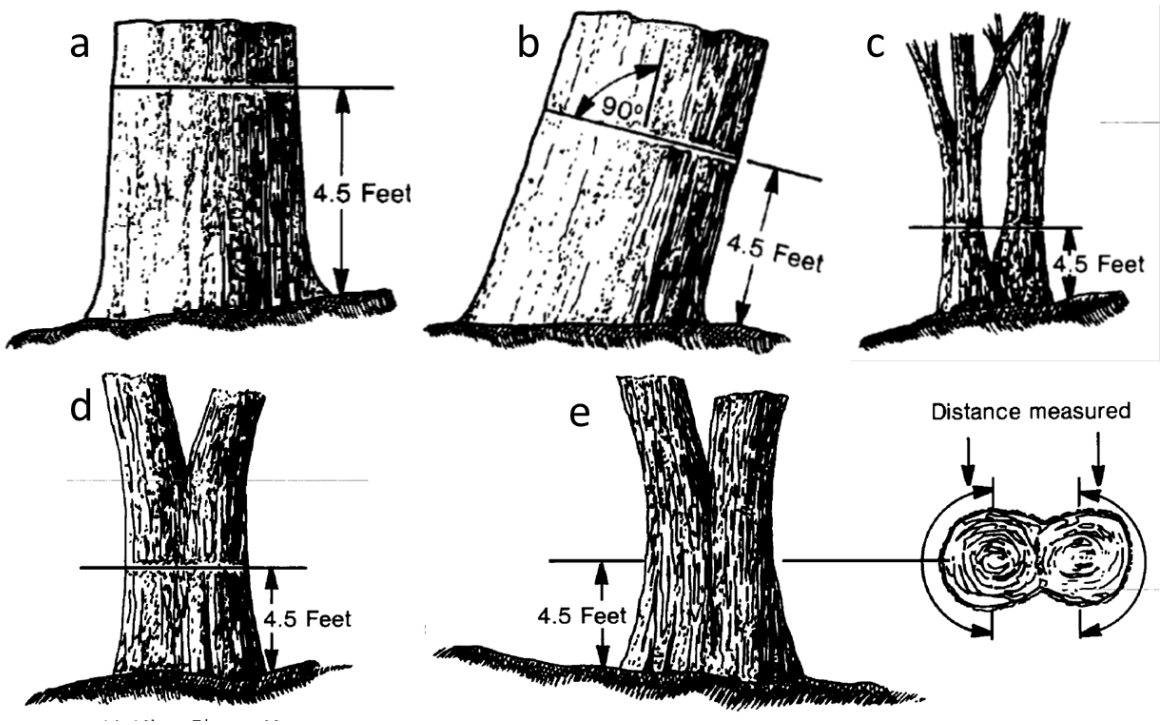

Figure 02. Measuring DBH a) a normal case, b) a leaning tree, c) a fork occurs below 4.5 feet, d) a fork occurs above 4.5 feet, and e) trees growing together.

14.12d Trees With Abnormalities at 4.5 Feet. Figure 03 illustrates examples of trees with abnormalities such as canker, swell, catface, or excessive branching.

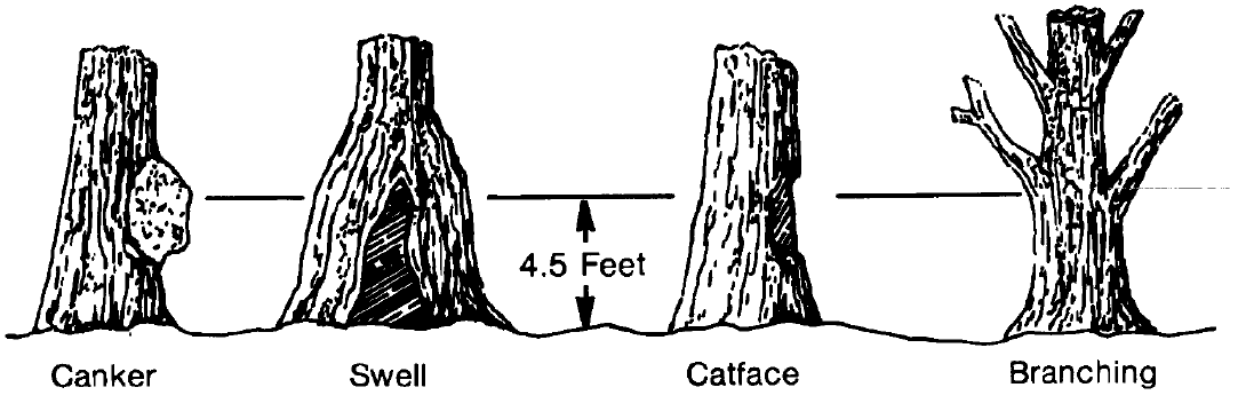

Figure 03. Abnormalities at 4.5 feet.

Use one of the following procedures when DBH measurement cannot be taken at 4.5 feet:

1. If the tree can be measured at normally formed points above and below the abnormality, take measurements for "A" and "C" where tree exhibits normal taper and is free from influences of abnormality (fig. 04a).
    a. Measure diameter above DBH, point "A."
    b. Measure diameter below DBH, point "C."

If these measurements are at equal distances from 4.5 feet, average A and C to arrive at DBH measurement.

Example:

- Diameter "A" = 16 inches
- Diameter "C" = 18 inches
- DBH = (16 + 18) / 2 = 17 inches

If point A and point C are at unequal distances from 4.5 feet, interpolate the distances to arrive at DBH measurement.

Example:

- Diameter "A" = 16 inches
- Diameter "C" = 22 inches
- Height of "A" above ground = 12 feet
- Height of "C" above ground = 2 feet
- Normal taper = (22" - 16") / (12’ - 2’) = 0.6 inches/foot
- DBH = 22" - [(4.5' - 2') x 0.6"/ft.] = 20.5 inches, or
- DBH = 16" + [(12' - 4.5') x 0.6"/ft.] = 20.5 inches

2. If the tree cannot be measured at normal points above and below the abnormality, measure above the abnormality and apply taper from comparable trees of the same species (figure 04b).
    a. Measure diameter above DBH where shape is normal, point "A."
    b. Measure height to point "A," length "B."
    c. Determine average taper from comparable trees of the same species in immediate area.
    d. Interpolate DBH measurement "C" based on diameter measurement "A," the estimated average taper, and length "B."

Example:

- Diameter "A" = 18.0 inches
- Length "B" = 12 feet
- Estimated taper = 2 inches in 8 feet or .25 inches per foot
- DBH = 18 + ((12 - 4.5) x .25) = 19.88 inches or 19.9 inches

14.12e Trees Growing on Objects. When trees are growing on objects, such as rocks or logs, measure at 4.5 feet above the root crown rather than above the forest floor.

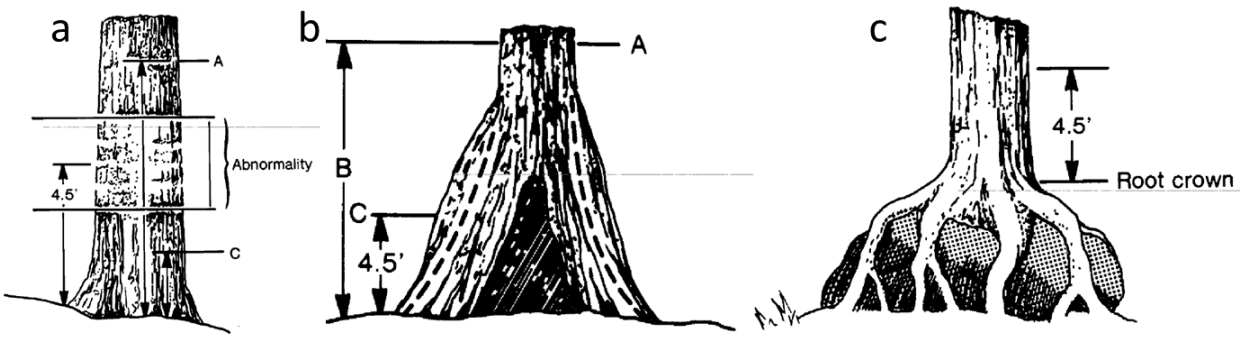

Figure 04. Techniques for determining DBH when trees a) have abnormalities at 4.5 feet, b) have abnormal butt swell, or c) are growing on objects such as rocks or logs.

14.12f Coppice Growth. To measure DBH on coppice growth or on trees growing in clumps, follow the procedures described in section 14.12b - 14.12c.

14.12g Broken Trees. Use one of the following procedures to determine DBH on broken trees:

1. If DBH occurs either below the break (A) or above the break (C), measure normally using calipers or diameter tape (fig. 05a).
2. If DBH occurs at the break (B) as shown in figure 05a, use procedures outlined in section 14.12d.

14.12h Broken Off Trees. Use one of the following procedures for determining DBH on broken off trees. Figure 05b illustrates these procedures.

1. If DBH occurs below the break (A), measure normally using calipers or diameter tape.
2. If DBH occurs at the break (B), and if bole is not shattered badly, make the DBH measurement at the break point. If bole is shattered, use procedures in section 14.12d.

3. If DBH occurs above the break (C), measure normally using calipers or diameter tape. If necessary, dig under bole, to pass the tape through.

14.12i Down Trees. On down trees measure DBH at 4.5 feet above original high side ground line at right angles to the center line of the bole (B) as shown in figure 05c. Measure normally using calipers or diameter tape. If necessary, dig under bole, to pass the tape through.

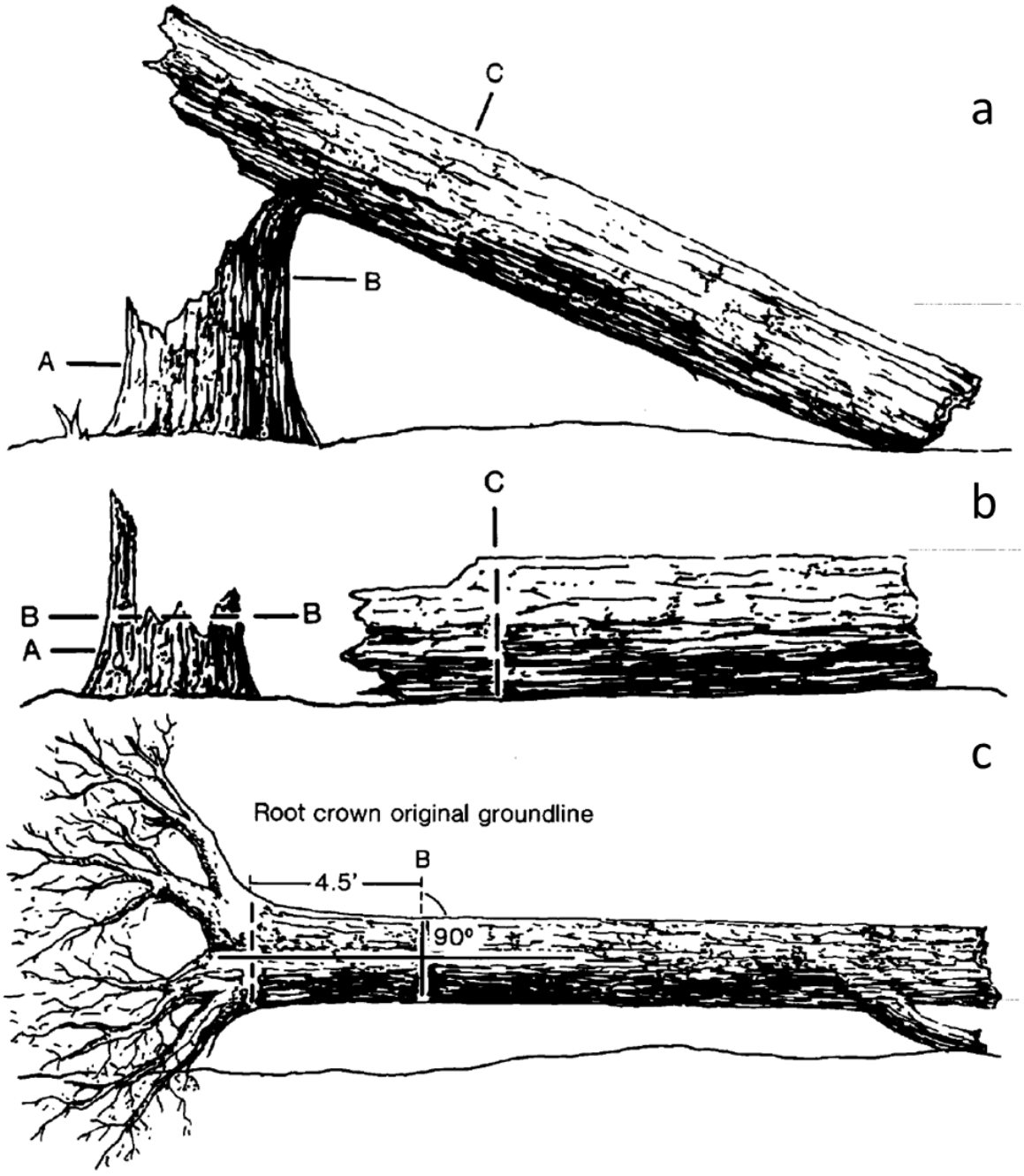

Figure 05. Measuring DBH on, a) a broken tree, b) a broken off tree, and c) a down tree.

14.12j Severed, Down Trees. Measure from the ground on the high side to the saw cut on the stump (AB) and then from the saw cut on the end of the log up the bole (BC) to determine where 4.5 feet above the ground would be (fig. 06). Measure diameter at this point, normally using calipers or diameter tape. If necessary, dig under bole, to pass the tape through.

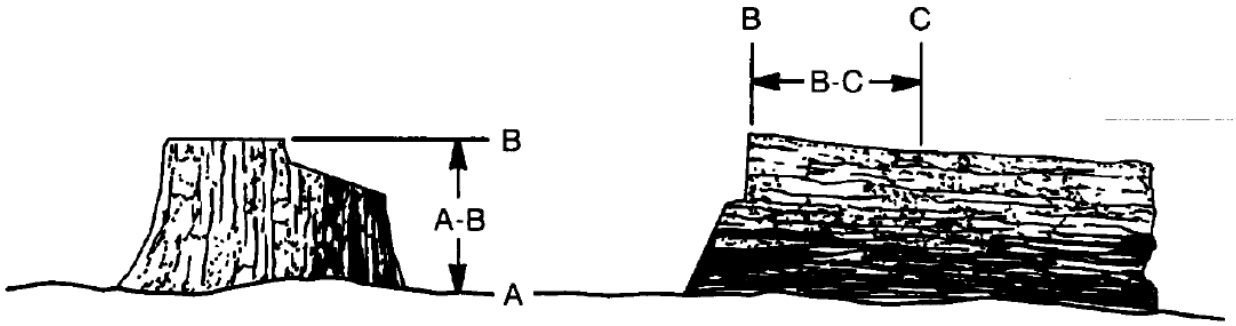

Figure 06. Measuring DBH on severed, down trees.

14.12k Split Trees. Measure DBH with calipers or use the one-half diameter technique described in section 14.12c.

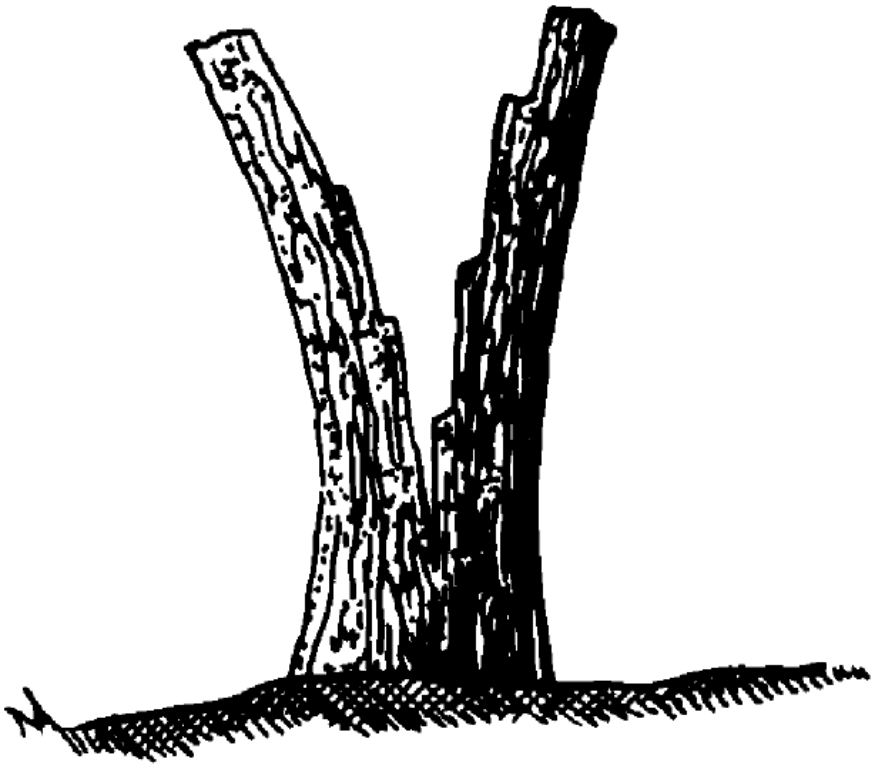

Figure 07. Measuring DBH on split trees.

14.12l Trees Having a Large Catface. Use the most appropriate of the following procedures when measuring trees abnormally formed by a catface at 4.5 feet:

1. Use calipers. Measure DBH at right angle to catface.
2. Use a diameter tape. Adjust the tape to a normally rounded position to allow for the catface portion missing. If the tape is not adjusted but is pulled tight, the tape will be straight across the missing portion and the diameter read will be less than it should be (fig. 08).
3. Use the one-half diameter technique described in section

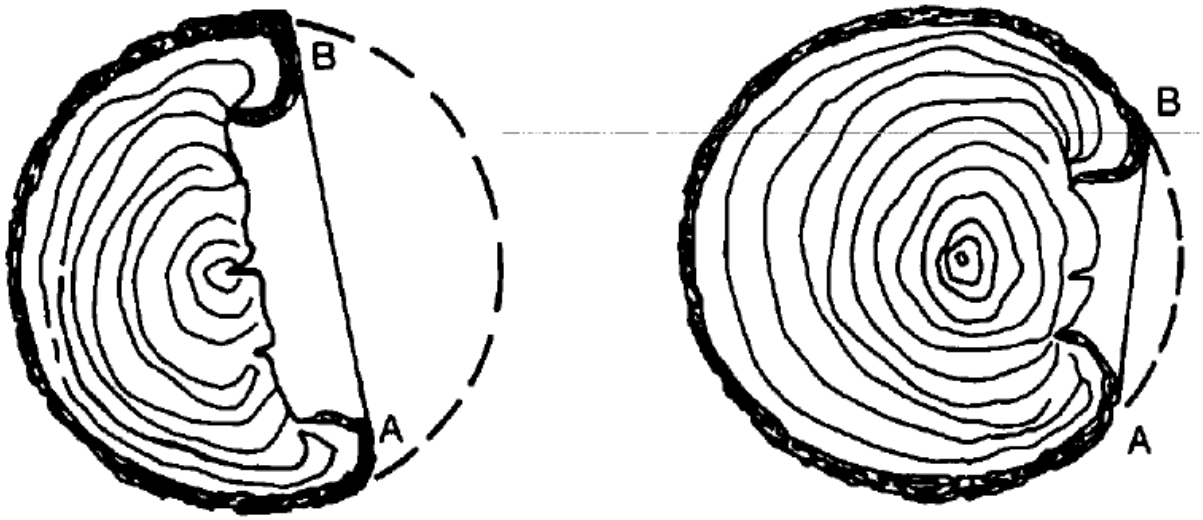

Figure 08. Measuring DBH on trees with large catface.

14.12m Trees Without Bark. Volume estimation procedures assume Diameter Breast Height (DBH) will be measured outside bark. The DBH measurement for trees with no bark or only partial bark at 4.5 feet must be increased to reflect the contribution of the missing bark.

If a tree has no bark at 4.5 feet, add two times the average bark thickness (developed using data from trees with bark, of the same species, size, and geographic location) to the tree's DBH. If a tree has a partial bark covering at 4.5 feet, the individual making the measurement must use their best judgment in determining an accurate DBH.