

What Do You See?

Message of the Day: Even when using the correct equipment, unforeseen errors may occur

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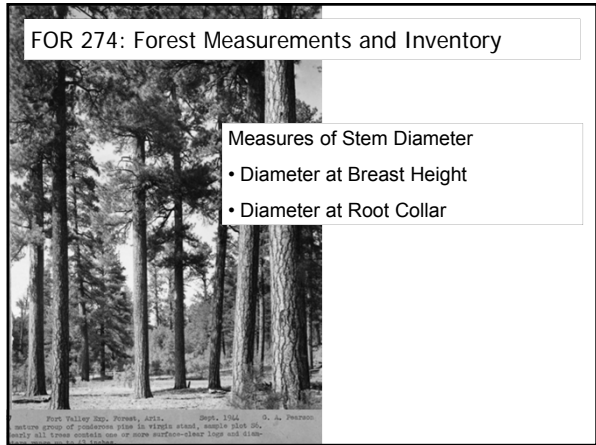
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FOR 274: Forest Measurements and Inventory

- Measures of Stem Diameter
- Diameter at Breast Height
  - Diameter at Root Collar

Fort Valley Reg. Forest, Ga., Sept. 1944. Mature group of ponderosa pine in single stand, sample plot 26. Note all trees outside line of main northern-south line and circle.

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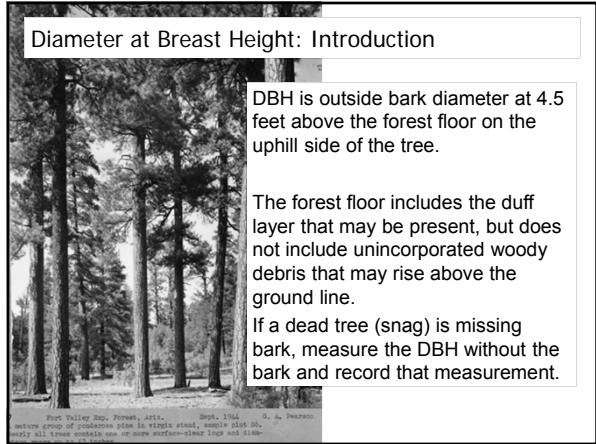
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Diameter at Breast Height: Introduction

DBH is outside bark diameter at 4.5 feet above the forest floor on the uphill side of the tree.

The forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

If a dead tree (snag) is missing bark, measure the DBH without the bark and record that measurement.

Fort Valley Reg. Forest, Ga., Sept. 1944. Mature group of ponderosa pine in single stand, sample plot 26. Note all trees outside line of main northern-south line and circle.

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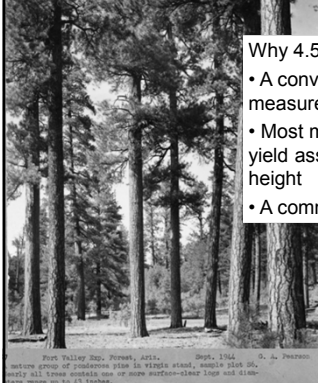
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### Diameter at Breast Height: Introduction



#### Why 4.5 Feet?

- A convenient height for people to measure
- Most models of forest growth and yield assume measurement at this height
- A commonly accepted standard

Fort Valley Exp. Forest, Ariz. Sept. 1944. J. A. Peabody  
active group of individuals plus in single stand, sample site 20,  
nearly all trees contain one or more surface-bleed logs and diam-

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### Diameter at Breast Height: Measurement Tools



Tapes: DBH and Loggers tapes



Biltmore Stick



Calipers

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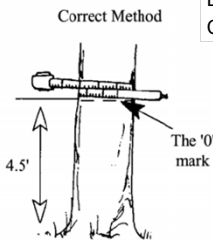
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### Diameter at Breast Height: Using DBH Tapes



DBH Tapes rely on the calculation:  
 $Circumference = \pi * D (= 2 * \pi * r)$

The tapes are made so that wrapping the tape around a tree of a given circumference you can directly read off the tree's diameter.

End of tape (with the '0' mark or hook) crossed under.

How do we infer cross-sectional area?

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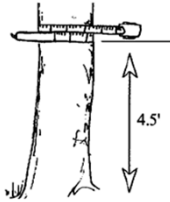
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Diameter at Breast Height: Using DBH Tapes

Optional method if left handed



End of tape crossed under.  
(Be careful - reading will be made from upside down d-tape marks.)

DBH is one of the most common forest measurements that you will make

In forestry we use the tape such that the "0" mark is below the main tape

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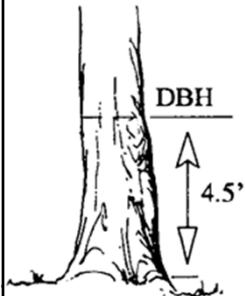
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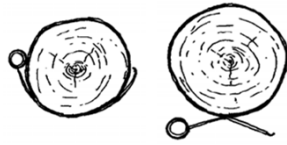
Diameter at Breast Height: Using DBH Tapes



Tree on level ground

When using (as you will later), press the tape firmly against the tree:

Do not pull it out at an tangent just before the measurement!



Correct

Incorrect

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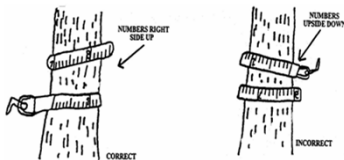
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Diameter at Breast Height: Using DBH Tapes

To reduce errors make sure the numbers are read the correct way up. Numbers should be rounded down to the nearest 1/10<sup>th</sup> inch.



NUMBERS RIGHT SIDE UP

CORRECT

NUMBERS UPSIDE DOWN

INCORRECT

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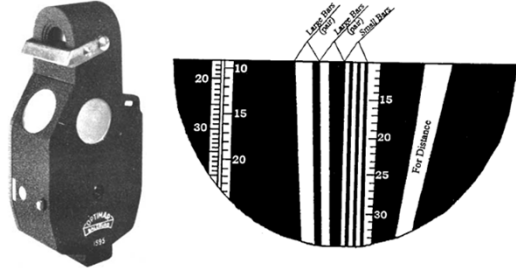
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### Diameter at Breast Height: Using Relaskops

The viewable bar widths in the relaskop can be used to estimate diameter at set distances from the tree. Per 33' small bar pairs represent 2" and large bar pairs represent 12".




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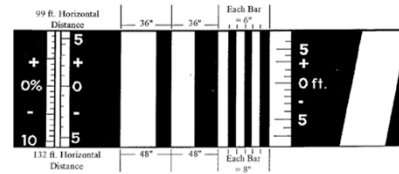
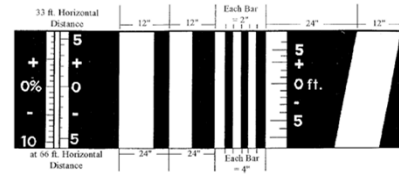
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### Diameter at Breast Height: Using Relaskops




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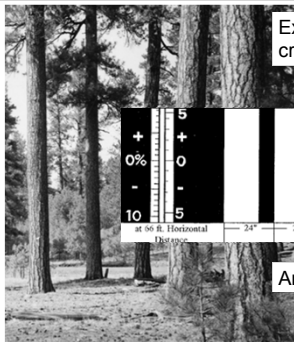
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### Diameter at Breast Height: Using Relaskops



Example: Tree is 1 chain from cruiser – what is its diameter?

Answer: 24" DBH

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Diameter at Breast Height: What would you do here?



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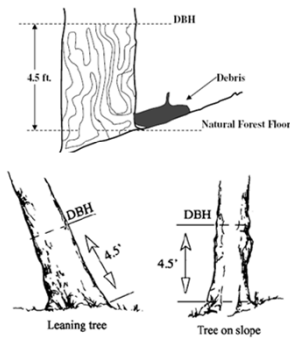
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Diameter at Breast Height: Sloping Ground and Trees



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Diameter at Breast Height: What would you do here?



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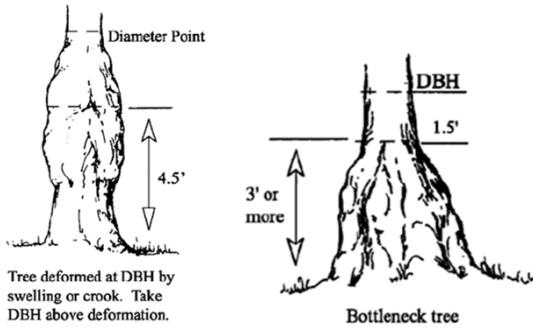
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Diameter at Breast Height: Using DBH Tapes




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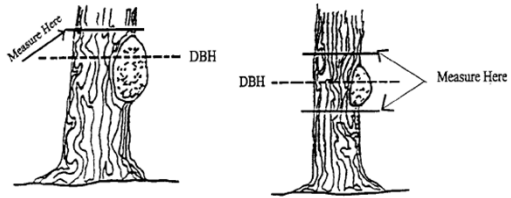
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Diameter at Breast Height: Using DBH Tapes

For cankers occurring at DBH you can either measure as close as possible above and account for taper OR take an average above and below.




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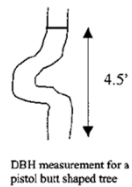
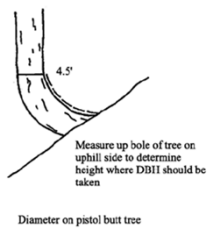
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Diameter at Breast Height: Using DBH Tapes




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Diameter at Breast Height: What would you do here?



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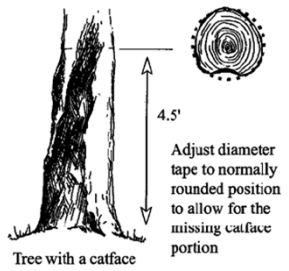
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Diameter at Breast Height: What would you do here?



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Diameter at Breast Height: What would you do here?



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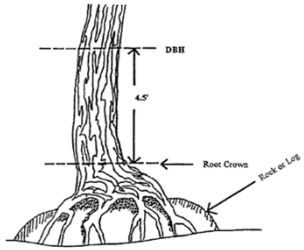
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Diameter at Breast Height: What would you do here?

For trees growing on objects (rocks, logs, etc), the DBH is measured by assuming the tree's base is at the root crown.



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Diameter at Breast Height: What would you do here?



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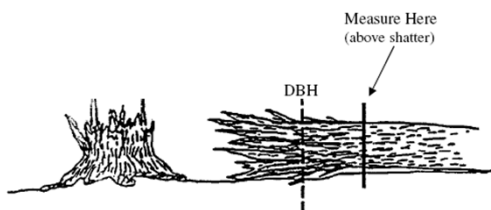
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Diameter at Breast Height: What would you do here?



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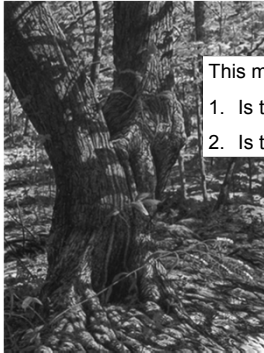
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Diameter at Breast Height: What would you do here?



- This measure of DBH depends on:
1. Is the junction above 4.5 feet?
  2. Is the junction a fork or a branch?

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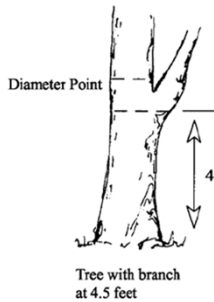
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Diameter at Breast Height: Branches and Forks



A fork in a tree is defined as:  
Where the stem is at least 1/3 the diameter of the main stem and must branch out from the main stem at an angle of 45 degrees or less.

Forks originate at the point on the bole where the piths intersect.

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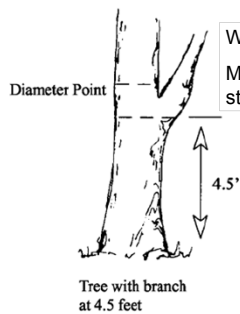
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Diameter at Breast Height: Branches and Forks



When branches occur at 4.5 feet:  
Measure the DBH on the main stem just above the branch

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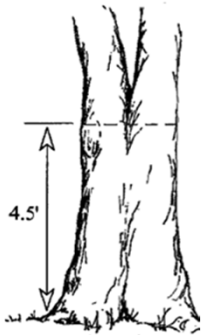
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Diameter at Breast Height: Branches and Forks



If fork occurs close to 4.5 feet:  
IF you can see light between the two stems at DBH, we measure each stem as 2 separate trees  
IF you can see no light, we measure the combined DBH as one tree

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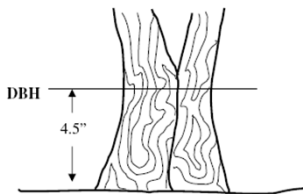
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Diameter at Breast Height: Branches and Forks

Special Case:

If two trees have grown together (as indicated by a bark seam above and below DBH), then each tree is measured separately.



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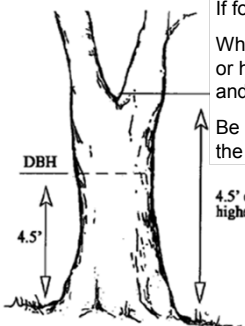
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Diameter at Breast Height: Branches and Forks



If fork occurs above 4.5 feet:  
When trees are forked at 4.5 feet or higher we record only one tree and measure the main fork.  
Be sure to measure DBH below the swell of the fork!

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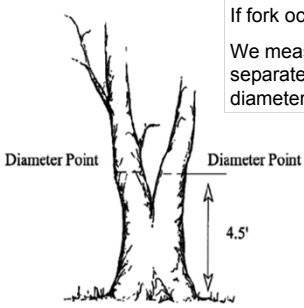
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### Diameter at Breast Height: Branches and Forks



If fork occurs below 4.5 feet:  
We measure each fork as a separate tree and measure both diameters at 4.5 feet

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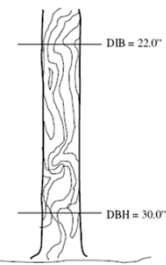
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### Bark: Diameter Inside Bark (DIB) Measurement

Form Class describes a set of methods to estimate the top diameter of the first log. This diameter is needed as it will effect all subsequent log diameters and thus the merchantable volume.



A common Form Class is the ratio of diameter inside bark (DIB) at the top of the first log to the DBH.

This ratio captures the taper that occurs during the first log.

The Bark Thickness Ratio (BTR) is the ratio of the DIB to the diameter outside bark (DOB) at the top of the first log.

$$FC = (DIB/DBH) * 100 = (22/30) * 100 = 73$$

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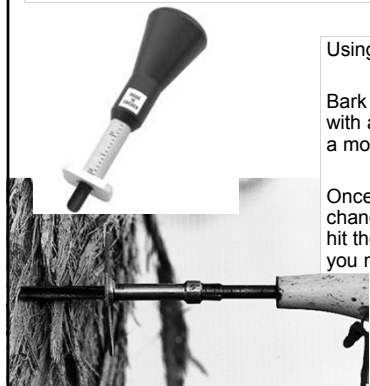
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### Bark: Diameter Inside Bark (DIB) Measurement



#### Using Bark Gauges:

Bark thickness is measured with a small chisel that has a movable scale

Once you "feel" the chisel change in pressure as you hit the wood under the bark you measure the scale

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Bark: Measurement



Using Bark Gauges:

- Minimize any twisting of the gauge and the chisel tip is easily (and often!) broken
- For trees with rough bark – measure thickness on ridges
- Repeat several times around stem to get average measurement
- If measuring DBH, use gauge at same height

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Diameter at Breast Height: What would you do here?



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Diameter at Root Collar: Introduction



Diameter at Root Collar (DRC) is the diameter measured at the root collar or at the natural ground line, whichever is higher, outside the bark.

Measure tree stems only, not branches. A stem generally grows in an upright position and contributes to the main structural support of a tree crown.

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Diameter at Root Collar: Introduction



- Shrubs and multi-stemmed trees:
- DRC is equal to the square root of the sum of the squared stem diameters
  - For a single-stemmed tree, DRC is equal to the single diameter
  - For a multi-stemmed tree, DRC is calculated from the diameter measurements of all qualifying stems ( $\geq 1.5$ " diameter and at least one foot in length).

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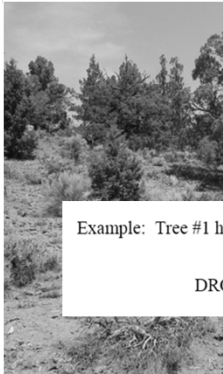
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Diameter at Root Collar: Introduction



$$DRC = \sqrt{\sum_{i=1}^n (\text{stem diameter})^2}$$

Example: Tree #1 has three qualifying stems; 5.9, 2.4, and 1.5

$$DRC = \sqrt{(5.9)^2 + (2.4)^2 + (1.5)^2} = 6.5$$

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Diameter at Root Collar: Introduction



Measure at ground line when reasonable



Measure above butt swell

DRC should be measured as close to the ground as possible

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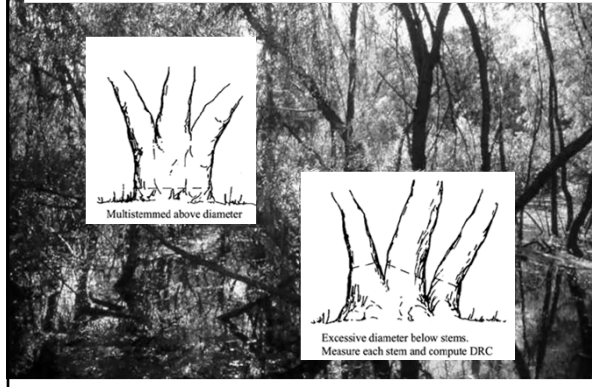
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Diameter at Root Collar: What would we do here?



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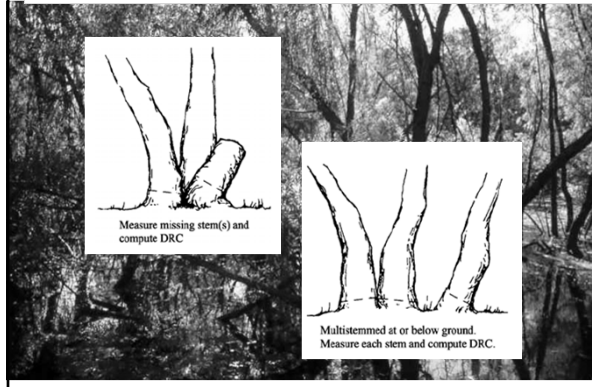
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Diameter at Root Collar: What would we do here?



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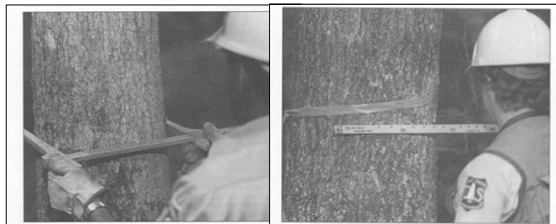
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Extra Credit Question (due Monday)

Describe different sources of error when measuring dbh with a diameter tape, a caliper, or a Biltmore stick?



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