

# **4-H Virtual Forest User's Guide**

## **Let's Cruise!!!**

### **Concept**

Measuring trees to estimate the volume of timber in a forest is an important part of a forester's job. For example, if a forest landowner decides to sell timber, they must know the timber volume that they own in order to receive a fair price for their product. A forester's tools, along with the measurement techniques used, are based upon mathematic principles that are learned in school at an early age.

This module supports the following SOL's:

#### Science

Scientific Investigation, Reasoning, and Logic

- 5.1     b) estimations of length, mass, and volume are made
- d) accurate measurements are made using basic tools

Resources

- 4.8     d) forests, soil, and land

#### Math

Computation and Estimation

- 5.2     The student will create and solve problems involving addition, subtraction, multiplication, and division of whole numbers, using paper and pencil, estimation, mental computation, and calculators.

Measurement

- 5.9     The student will identify and describe the diameter, radius, chord, and circumference of a circle.

### **Module Description**

Frame 1. An introductory frame that contains the title "Let's Cruise!!!", credits, and a list of menu options entitled "Introduction", "How old is this tree?", "What is the merchantable height?", "What is this tree's diameter?", "What is the volume of this tree?", "What is this tree worth?", and "Summary".

Although users can click on the menu bars in any order to navigate through the module, it will be beneficial to visit the merchantable height, diameter, volume, and value screens in sequence. The reason is that determining the value of a tree involves a series of sequential steps.

Introduction. The “introduction” frame describes the importance of tree measurements:

“Measuring trees to estimate the volume of wood in a forest is called timber cruising. It is an important part of a forester’s job. For example, if a forest landowner decides to sell timber, the forester must measure the timber volume in order for the landowner to receive a fair price for his or her trees. A forester’s equipment, along with the measurement techniques used, are based on mathematic principles that we learn in school.”

The forester encourages the user to “Click on the boxes on the left in order from top to bottom to learn more about measuring the tree on the right.”

Advance to the next frame by clicking the menu bar entitled “How old is this tree?”

How Old is This Tree? Although not required to measure a tree’s volume and value, the increment borer is a versatile piece of equipment that interests many people. Foresters use an increment borer, pictured on this frame, to determine the age of a tree without cutting it down. Simply count the growth rings on the core sample to arrive at the age.

Notice that the core sample pictured has alternating light and dark growth rings. The light rings are called earlywood or springwood. They grew early in the year when water was plentiful. More water means thinner cell walls, causing the wood to look light to our eye. The darker growth rings are called latewood or summerwood. They grew later in the year when less water was available. As a result, the cell walls are thicker and look darker to our eye. One light ring plus one dark ring make one year, so count one or the other to get the age of the tree, but not both.

We get other information from core samples as well. For example, when rings are close together, it indicates slow growth. Foresters manage forests to maintain healthy trees with good growth rates. This reduces insect and disease problems, and increases the volume and value of trees.

Click the button on the TV set to watch a movie and learn more about how the increment borer is used. Video footage in *Let’s Cruise!* was collected at Natural Resources Weekend, a youth education event held each winter at Holiday Lake 4-H Center. Contact your 4-H Extension Agent or 4-H volunteer to learn more about this fun event!

When you are finished, click on the tab entitled “What is the merchantable height?” to advance to the next frame.

What is the Merchantable Height? Foresters determine a tree's value by measuring the merchantable height and diameter. Merchantable height is the portion of the tree that can be used to produce a product, and is measured from about 1 foot above the ground to a major fork or a certain size. The illustration shows the merchantable height. Click to play the video for a detailed explanation about using a Biltmore stick to measure merchantable height.

When comfortable with this concept, the user clicks the "Click here to measure" feature to proceed to an interactive activity. Here, the user can click and drag a Biltmore stick to measure the merchantable height of the illustration. The bottom of the stick should be aligned with the dotted red line near the base of the tree. The dotted red line just beneath the fork of the tree indicates the cut off point. Read off the number that corresponds with this line and enter this number in the box to the left. Click to check the answer where indicated. The correct answer is "4".

When you are finished, click on the tab entitled "What is this tree's diameter?" to advance to the next frame.

What is this Tree's Diameter? Diameter is measured at 4.5 feet above the ground using a measuring tape, Biltmore stick, or calipers. The video contains a detailed explanation about using the Biltmore stick to measure a tree's diameter.

When comfortable with this concept, the user once again clicks on the "Click here to measure" icon to proceed to an interactive activity. Here, the user can click and drag a Biltmore stick to actually measure the diameter of a tree. The left edge of the stick should be aligned with the left edge of the tree. Read off the number that corresponds with the right edge of the tree and record the answer in the box to the left. Click to check the answer where indicated. The correct answer is "30".

When you are finished, click on the tab entitled "What is the volume of this tree?" to advance to the next frame.

What is the volume of this tree? Users will now have an opportunity to determine the tree's volume themselves using the volume table shown. To determine the subject tree's volume, find the number of logs along the top (4), and the diameter along the side (30). Read down and across from these numbers. These lines will intersect at the tree's volume. Enter this number in the box at the left and check your answer. For example, a tree 10 inches in diameter with a merchantable height of 1.5 logs will have a volume of 48 board feet. (The dimensions of one board foot are 1" by 12" by 12"). Our tree contains 1198 board feet.

When you are finished, click on the tab entitled "What is this tree worth?" to advance to the next frame.

What is This Tree Worth? Do you want to know what this tree is worth? This is how we do it...

1) Our tree is a sawtimber tree, meaning that it will be sawn into lumber. This type of tree is purchased in units called “thousand board feet” symbolized by the letters MBF. You already figured out that our tree has 1198 board feet. To convert this to MBF we divide by 1,000. Type the number of MBF in this tree into the appropriate box (1.198).

2) Now, this tree is worth \$250 per thousand board feet. This value will change depending on distance to markets, how steep the ground is, and even weather! Type this number in the box labeled ‘Price per MBF’.

3) To calculate the tree’s value, multiply \$250 by the number of MBF. Type this number into the box below.

Clicking the “check your answers” bar will automatically calculate the value for the user. Users should calculate that the tree is worth  $1.198 \times \$250 = \$299.50$ . Click the “Next” arrow to advance to the summary frame.

Summary. The concluding frame describes the other values that trees provide.

“In addition to value for products, trees have other values as well. Did you know a 30 inch tree 75 feet tall that is growing on the west side and within 40 feet of your house can save your family \$42 in electricity each year? Also, people spend a great deal of money each year--about \$3 BILLION--on forest related recreation activities, like hiking, and wildlife activities like hunting or bird-watching. So, as you can see, Virginia’s forests have a lot of value!”

Click the “Credits” button to return to the title slide.

## References

- McPherson, G.E., D.J. Nowak, P.L. Sacamano, S.E. Prichard, and E.M. Makra. 1993. Chicago's evolving urban forest. USDA-FS GTR NE-169. 55 p.  
<http://www.srs.fs.usda.gov/pubs/viewpub.jsp?index=4256>.
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