

In today's sustained yield forestry management programs, trees are often harvested selectively rather than in a single cutting. In order to maximize the timber harvested during forestry operations, an accurate assessment of the forest's species composition, density and tree size is necessary. The methods by which this data is gathered are collectively called Timber Cruising.

Timber Cruising

Simply stated, *timber cruising* involves walking or "cruising" a forest in order to measure the trees and collect other information about the forest. Timber cruising is usually done by a one- or two-person crew. The detailed data collected by timber cruisers is referred to as a *forest inventory*. Some of the information in a forest inventory typically includes species of trees present, quantity of each species present, relative size and age of each tree, density or crowding of the trees and canopy coverage. Information about the undergrowth and wildlife present may also be collected.

Of all information collected, perhaps the two most useful pieces are tree size and tree density. The size of the trees will determine if they are ready for harvest and the amount of material they will yield. In fact, tree heights are often measured in terms of how many board lengths the tree will yield (typically 16-ft. lengths for lumber and 8-ft. lengths for pulp wood). The density or crowding of the trees in the forest is useful in determining whether or not thinning of the forest is needed. A term that is often used to describe both tree size and crowding is *basal area*. The basal area of a tree is defined as the area (in sq. ft.) of a tree trunk at 4½' above the ground.

When the term basal area is applied to multiple trees (or more specifically, a plot of land containing trees), it refers to total basal area of all the trees in that plot. When used this way, basal area can indicate the density or crowding of the tree within the plot, i.e., the greater the basal area, the greater the crowding.

Sampling

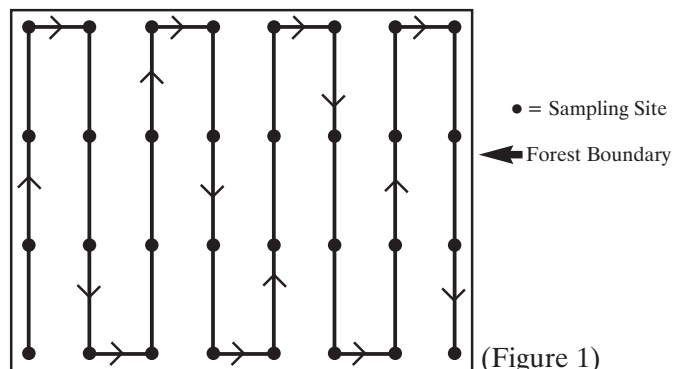
In most cases, measuring each and every tree within a forest would be an overwhelming task, if not outright impossible. For this reason, most foresters will use a *sampling method* when timber cruising. When sampling a forest, data is collected only in certain plots or areas throughout the forest. The information collected at these sites will give a reasonably accurate average of the information that would be collected if each and every tree were measured.

The two most common types of sampling methods used are *fixed area plots* and *point sampling*.

Fixed area plot refers to sampling an area of a predetermined size. The size of this plot can vary, depending on the timber cruiser's requirements. Once the plot size is determined and marked out, the timber cruiser proceeds to measure all trees within the plot. The cruiser will then proceed to another plot within the forest and continue this process until enough data has been gathered to estimate the entire forest. Often the same plots will be revisited, year after year. The U.S. Forest Services currently uses fixed area plot to determine the average growth rates for a given area within U.S. forests.

Point sampling, rather than using a plot of defined size, the cruiser will measure all trees that can be seen in a 360° circle around the point where the cruiser is standing. Like fixed area plot sampling, multiple points throughout the forest are used to create a total estimate.

Once the method of sampling has been chosen, the actual sampling sites (either plots or points) must be selected. The sampling sites can be selected in a variety of ways, from random stops throughout the forest to a more thorough, predetermined pattern. Aerial photographs of the forest can be used to pre-select sampling sites which the cruiser will proceed to on foot to take the measurements. Another means of selecting sampling sites is to use what's called a *transit line*. To sample a forest using a *transit line*, the cruiser starts at one edge of the forest and proceeds to the opposite side in a straight line. Along the way, the cruiser stops at regular intervals and takes the measurements. Upon reaching the other side, the cruiser turns 90°, proceeds a predetermined distance, turns another 90°, and then proceeds back in a straight line to the opposite side. This pattern is repeated until the entire forest has been sampled (see Figure 1).



Timber Cruising Instruments

In addition to a choice of sampling techniques, cruisers also have a choice of tools for measuring trees. The most accurate methods for measuring trees are direct measurements. A direct measurement means that the cruiser physically measures the diameter of the tree. Two of the more common tools for direct measurements are *calipers* and *logger's tapes*. Calipers will give you the greatest degree of accuracy and provide a direct diameter reading. Logger's tapes are available with either standard feet and inch graduations or diameter equivalent. The feet and inch versions require the cruiser to convert their circumference reading to a diameter reading (diameter = circumference/ π). A tape with diameter equivalents has the diameters already marked on the tape allow direct diameter readings.

In some cases, speed and convenience is more important than an extremely precise measurement, in which case the cruiser may use a visual guide for estimating tree diameters. Visual guides are most often used in point sampling. Some of the common visual guides include angle gauges, cruising prisms and cruising sticks. These types of devices are usually held at arm's length (approximately 25" from the eye) and used to judge to the relative diameter of the trees visible from that point. Often times, the visual guide will have a number assigned to it called the *basal area factor*. When the basal area factor of the instrument is multiplied by the number of trees, the cruiser judged large enough using the guide, an estimate of the total basal area for that point is generated.

Common Questions

- Q.** You mentioned that basal area is calculated in square feet. Can basal area also be calculated in metric units?
- A.** Yes. Outside the United States, basal area is usually calculated in square meters. Visual guides such as angle gauges or prisms are often available with a metric basal area factor. Instruments designed to read in English units typically have a basal area factor of 10, 20, 30 or 40. Instrument designed to read in metric units will most often have basal area factors of 2, 3 or 5.

Sources for More Information

Wisconsin Dept. of Natural Resources ~
www.dnr.state.wi.us/org/land/forestry/

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