

Basic Inventory Calculations

Once you learn how to establish and take measurements in sample plots, the next step is to make some basic calculations with your inventory data that will help you to better understand and steward your forest. It is important to decide which calculations are appropriate to the scale of the property and its management objectives. Trees per acre is an easy calculation to generate and, when combined with tree diameters and live crown ratios, can provide important information about the stocking of the stand, potential need for thinning, and forest health. Basal area is another measure of stand density or stocking, but is less intuitive. Volume data is not required for a forest management plan, but is useful when considering timber harvest options.

Determining TPA from fixed plots

1. Determine the expansion factor for the plot trees (the number of trees per acre a given plot tree represents; e.g., 20 for a 1/20th acre plot).
2. Add up the total number of trees in a plot and multiply by the expansion factor to get the trees per acre represented by that plot.
3. Repeat this for the other plots in the stand.
4. Add up the TPA for all plots in the stand and then divide by the number of plots to get the average TPA for the stand.

Example: Suppose you acquired data on two 1/20th acre plots. Suppose that there were six trees in the first plot and five in the second.

1. With 1/20th acre plots, the expansion factor would be 20.
2. The TPA represented by the first plot is $6 \times 20 = 120$.
3. The TPA represented by the second plot is $5 \times 20 = 100$.
4. Adding 120 and 100 and then dividing by 2 yields an average of 110 TPA for the whole stand.

Determining basal area from variable plots

Determining basal area is a little easier for variable plots because each “in” tree in a plot represents a given amount of basal area, as determined by the basal area

factor (BAF). For example, if you established variable plots using a BAF of 30, each tree would represent 30 square feet of basal area. Here are the steps for determining basal area per acre from variable plots:

1. Add up the total number of trees in a plot and multiply by the BAF to get the basal area per acre represented by that plot.
2. Repeat this for the other plots in the stand.
3. Add up the basal area for all plots in the stand and then divide by the number of plots to get the average basal area per acre for the stand.

Example: Suppose you did two variable plots using a BAF of 30, with eight trees in the first plot and six in the second.

1. The basal area for the first plot is $8 \times 30 = 240$ sq ft/ac.
2. The basal area for the second plot is $6 \times 30 = 180$ sq ft/ac.
3. Adding 240 and 180 and then dividing by 2 yields an average basal area for the stand of 210 sq ft/ac.

Determining tree volume

If you are managing for timber and wood products, knowing how much wood volume you have will be of particular importance. Determining the volume of wood in a tree can be challenging, as the stem of the tree is not a perfect cylinder. Rather, the stem is tapered, meaning that it starts out wide at the bottom and becomes narrower as you go up the tree, giving the tree a cone shape. Tree volume is most commonly determined using volume tables, which list volumes by tree height and DBH based on species and location. Using a volume table requires that heights be measured for all plot trees, which can be the most time-consuming part of doing a forest inventory.

Once you have determined the volume of each tree, multiply that volume by the tree's expansion factor (which you determined above when calculating TPA and basal area) to get volume on a per acre basis. Add the per acre volumes for all the trees in each plot and then take the average across all plots to get the average volume per acre in your stand. A computer spreadsheet is very helpful for doing these computations.

Once you have determined the volume per acre in your stand, you can multiply by the number of acres to find the total stand volume. If you know the current price per volume of wood in your area, you can estimate the approximate commercial value of the timber in your stand.