CHAPTER

9

ASSESSING FORESTS USING PLOTS

Assessing Forests Using Plots

There are many reasons why we assess forests. It may be to help us buy or sell timber products, make forest management decisions, or evaluate nontimber forest resources, such as recreation, wildlife, forage, or pine straw. Regardless of the reason, we collect information about the forest to gain knowledge so that we may adapt our management practices. In this section we will discuss why and how we sample forests.

In general, it is not feasible to measure all trees on a tract of land. Suppose that a 40-acre tract of forest has an average of only 300 trees per acre. We would have to measure 12,000 trees to get a complete measurement of all trees. Instead, we attempt to obtain a representative population sample of the 12,000 trees. To accomplish this, we often use plots to sample forests.

> We often use plots to sample forests because it is not feasible to measure all trees in a forest stand.

PLOT TYPES AND USAGE

A fixed-area plot is a sample area of a known shape and size. Fixed-area plots are often circular, square, or rectangular. They can vary in size from just a few feet across to several feet in diameter.

Sizes, shapes, and locations of plots across a forest will vary and be based on your objectives. In an older stand of fewer, mainly larger-sized trees, the appropriate plot size might be 1/5 (0.2) acre or even 1/4 (0.25) acre. In a plantation regeneration survey, where you are sampling a high density of pine seedlings, a plot size of 1/100 (0.01) or 1/50 (0.02) acre would be appropriate.

Benefits of Using Fixed-Area Plots

1. Plots can be completed by just a few people. Circular plots can be completed by one person, although working in pairs is best. Two or three people are needed for larger square or rectangular plots.
2. Stopping for each plot allows for more detailed individual tree assessment.

A logger's tape or 100-foot tape can be used to determine plot size in the field.

CALCULATING PLOT SIZE

Example 1: You want to use 1/10-acre circular plots in an upcoming forest inventory. How do you compute plot radius given plot size?

Divide 43,560 square feet per acre (sq. ft./ac.) by the plot size (in acres) to obtain the number of square feet contained in the plot:

43,560 sq. ft. per ac. ÷ 10 = 4,356 sq. ft. per plot

Then, using the formula for the area of a circle ($A = \pi r^2$), substitute the plot area for A and solve for r (radius):

4,356 sq ft = 3.14 × r^2
4,356 sq ft ÷ 3.14 = r^2
1,387.26 sq ft = r^2

Then take the square root of 1,387.26 for the answer:

$\sqrt{1{,}387.26}$ sq. ft. = 37.25 ft.

Example 2: You want to sample the understory to establish 1/10,000-acre square plots in an upcoming forest inventory. How do you compute plot dimensions?

Divide 43,560 sq. ft./ac. by the plot size in acres to obtain the number of square feet contained in the plot.

43,560 sq. ft. per ac. ÷ 10,000 = 4.356 sq. ft. per plot

Then, using the formula for the area of a rectangle ($A = w \times h$) or square ($A = s^2$), substitute the plot area for A and solve for w (width) and h (height) or s^2 (side squared):

$\sqrt{(4.356}$ sq. ft.) = 2.09 ft. per side of a 1/10,000-acre plot

WHAT TO INVENTORY INSIDE A PLOT

It is important to always have a specific objective or purpose for doing any inventory. Before you leave to go to the field, know what information you need to collect to make an informed decision and how that information will be specifically used. Failure to do this may lead to the following:

- You do not collect information that is needed.
- You observe information incorrectly.
- You observe information that is not needed.

Potential items to inventory on a forested plot can include but are not limited to tree diameter, tree height, number of trees on the plot, dead trees, forage, wildlife habitat, woody debris, litter, cones/seeds, soils, regeneration, percent ground cover, percent canopy cover, animal/insect damage, tree species, and invasive/undesirable plants.

How to Sample a Fixed-Radius Plot in the Field

1. Determine objectives and what you are going to sample before you go to the field.
2. Determine the plot radius.
3. Locate the plot center and mark it with your cruiser stick or flagging.
4. Determine the starting point to begin measuring trees.
   - Start due north, and sample trees in a clockwise direction.
   - Flag, mark, or otherwise note a prominent or distinctive tree or other feature as a starting point that you will readily recognize when you return to it to conclude the plot sample.
5. Proceed in an orderly and consistent manner around the plot, determining if trees are in or out of the plot.
6. Record inventory information on your tally card using a pencil. Pen can smudge and run. Waterproof or "write in the rain" paper is also a good investment.

POINT TO PONDER

A tree is considered in and will be measured and included in the tally if the horizontal distance (not slope distance) from the plot center to the center (not the face) of the tree is less than or equal to the plot radius.

ESTIMATING TREES PER ACRE

Trees per acre (TPA) is a common measure of the number of standing trees that are found on an acre of land. It also is used to quickly estimate stand density, or how crowded trees are in a stand.

Trees per acre is calculated by taking the number of trees counted on a plot and multiplying that number by your plot size. For example, if you measure a 1/5-acre plot, it will take five 1/5-acre plots to cover an entire acre. If you measure one 1/5-acre plot in your forest and count 61 trees on the plot to determine trees per acre, you will multiply 61 trees by 5 (for a 1/5-acre plot) for an estimate of 305 trees per acre. If you are using a 1/20-acre plot, you will multiply by 20, and so on.

A logger's tape or 100-foot tape is pulled from plot center to determine which trees are in or out of the plot field.

For a tree to be in the plot, the plot radius must at least reach the midpoint of the tree bole.

YOUR TURN

1. Calculate the radius of a 1/20-acre circular plot.
2. Calculate the radius of a 1/5-acre circular plot.
3. Calculate the radius of a 1/46-acre circular plot.
4. Calculate the dimensions of a 1/10-acre square plot.
5. Calculate the dimensions of a 1/5-acre square plot.
6. You count six trees on a 1/10-acre circular plot. How many trees per acre do you estimate that plot represents?
7. You count three trees on a 1/15-acre circular plot. How many trees per acre do you estimate that plot represents?
8. You count ten trees on a 1/40-acre square plot. How many trees per acre do you estimate that plot represents?

ANSWERS

1. ***43,560 ÷ 20 = 2,178 sq. ft. per plot***

   Then, to calculate the radius:

   2,178 sq. ft. ***= 3.14 × r^2***
   2,178 sq. ft. ÷ 3.14 ***= r^2***
   693.63 sq. ft. ***= r^2***
   $\sqrt{(693.63\ \text{sq.ft.})}$ ***= r***
   26.34 ft. ***= radius of a 1/20th acre plot***

2. ***43,560 ÷ 5 = 8,712 sq. ft. per plot***

   Then, to calculate the radius:

   8,712 sq. ft. ***= 3.14 × r^2***
   8,712 sq. ft. ÷ 3.14 ***= r^2***
   2,774.52 sq. ft. ***= r^2***
   $\sqrt{(2,774.52\ \text{sq.ft.})}$ ***= r***
   52.67 ft. ***= radius of a 1/5th acre plot***

3. ***43,560 ÷ 46 = 946.96 sq. ft. per plot***

   Then, to calculate the radius:

   946.96 sq. ft. ***= 3.14 × r^2***
   946.96 sq. ft. ÷ 3.14 ***= r^2***
   301.58 sq. ft. ***= r^2***
   $\sqrt{(301.58\ \text{sq. ft.})}$ ***= r***
   17.37 ft. ***= radius of a 1/46th acre plot***

4. ***43,560 ÷ 10 = 4,356 sq. ft. per plot***

   Then, to calculate the dimensions:

   $\sqrt{(4,356\ \text{sq. ft.})}$ = 66.00 ft.

5. ***43,560 ÷ 5 = 8,712 sq. ft. per plot***

   Then, to calculate the dimensions:

   $\sqrt{(8,712\ \text{sq. ft.})}$ = 93.34 ft.

6. ***6 trees × 10 = 60 trees per ac.***
7. ***3 trees × 15 = 45 trees per ac.***
8. ***10 trees × 40 = 400 trees per ac.***