

CHAPTER

10

**PREPARING FOR A
FOREST INVENTORY**



Preparing for a Forest Inventory

Planning is key to success. You have seen how important it is to accurately collect measurements in the field. Just as important is recording those measurements in a format that will be useful when you need that information to make decisions about your forestland.

Travel to and from a field site is time-consuming and expensive. You should always collect what you need accurately the first time. Deciding what you want to sample and how many plots to take, determining plot locations, and setting up your tally cards should all be completed before you ever measure anything in the field.

This chapter will introduce some of the things that need to be completed prior to conducting a forest inventory, including determining the number of plots needed, recording plot locations on maps, and developing tally cards.

NUMBER OF PLOTS TO MEASURE FOR A FOREST INVENTORY

In prior chapters you learned how to calculate plot size and measure a plot in your forest. But how many plots should you measure for an adequate forest inventory?

The number of plots of a chosen size (e.g., 1/10 acre, 1/20 acre) determines the percent of the area you measure in your forest. This is called the percent inventory and is dependent upon four factors:

1. The size of the tract
2. The variability of measured resources on the tract
3. The desired degree of precision of the sample estimates
4. The value of the resource being sampled

Some forestry professionals offer guidelines for estimating the number of plots that should be taken on a given forest stand (table 10.1). Agencies or companies may have their

Table 10.1. General "Rule of Thumb" for Number of Plots to Measure Per Acre

Stand Area in Acres	Number of Plots to Measure
Less than 10	10
11–40	1 per acre
41–80	20 + ½ the stand area
81–200	40 + ¼ the stand area
Over 200	Calculate the number using a preliminary cruise

Adapted from B. Husch, C.L. Miller, and T.W. Beers. 1972. Forest Mensuration.

own guidelines based on several factors. In addition, time, money, and labor can become issues. It all relates back to what the objective of the inventory is.

Knowing your objectives and determining the size and number of plots is just one part of a forest inventory. Is the inventory going to be used to prepare for a timber sale? Then more plots might be desired. Other factors to think about are how plots should be spaced in the field and what percentage of the stand will be inventoried. Following are examples of how to calculate the (1) number of plots based on a cruise/inventory percent, (2) cruise or inventory percent, and (3) plot spacing in the field.

CALCULATING NUMBER OF PLOTS BASED ON CRUISE/INVENTORY PERCENT

Assume you have a 75-acre stand to sample and want to use 1/25-acre circular plots in an upcoming forest inventory. You have determined that your plot radius is 23.34 feet. If you want to inventory 5 percent of the stand, how many plots would you need?

1. Multiply the number of acres in the tract or stand by the desired percent cruise to obtain the actual number of acres that will be measured.

$$0.05 \times 75 = 3.75 \text{ acres to be measured}$$

2. Multiply the number of acres to be measured by the plot size denominator to obtain the approximate number of plots to be installed.

$$3.75 \times 25 = 93.75 \text{ or } 94 \text{ plots needed}$$

CALCULATING CRUISE OR INVENTORY PERCENT

Assume you are sampling the same 75-acre tract using 1/25-acre plots, but you only have time to install 50 plots instead of the 94 plots needed for the 5 percent cruise. What would your percent inventory be?

1. Divide the number of plots to be installed by the plot size denominator to obtain the actual number of acres to be measured on the 75-acre tract.

$$50 \div 25 = 2 \text{ acres to be measured}$$

2. Divide actual acres to be measured by tract size to obtain inventory percent.

$$2 \div 75 \text{ acres on tract} = 0.026 \text{ or } 2.6\% \text{ inventory}$$

YOUR TURN

You have a 100-acre, 20-year-old pine plantation that needs to be inventoried. Your forester says that they often use 1/20-acre circular plots in these situations.

1. You request a 6 percent inventory of the stand. How many plots would be needed?
2. On the first day, the forester completes 35 plots. What is the resulting percent inventory?

ANSWERS

1. $0.06 \times 100 = 6.00 \text{ acres to be measured}$
 $6.00 \times 20 = 120 \text{ plots needed}$
2. $35 \div 20 = 1.75 \text{ acres}$
 $1.75 \div 100 = 0.018 \text{ or } 1.8\% \text{ inventory}$

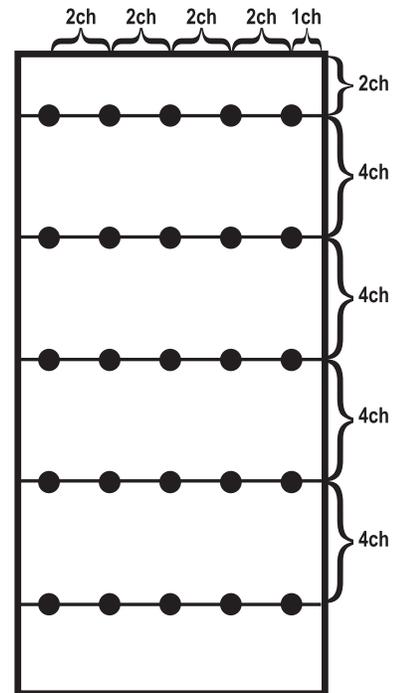


Figure 10.1. Example of rectangular spacing of forest inventory plots in the field.

SPACING PLOTS IN THE FOREST

Once you have decided on a plot size and the percent inventory, you need to determine how plots will be spaced across the forest to get a representative sample. To do this, you must determine (1) the distance in chains between cruise lines or how you will walk through the forest and (2) the distance in chains between plots that are spaced along those cruise lines.

A rectangular spacing between plots and lines of plots gives a pretty good balance between a representative sample and distance traveled between plots. A 2-to-1 ratio of distance (in chains) between cruise lines and distance (in chains) between plots within lines is often a goal. This can be obtained using the following formula:

$$x = \sqrt{\left(\frac{\text{plot size} \times 10 \text{ square chains per acre}}{\% \text{ cruise as a decimal}} \right) \div 2}$$

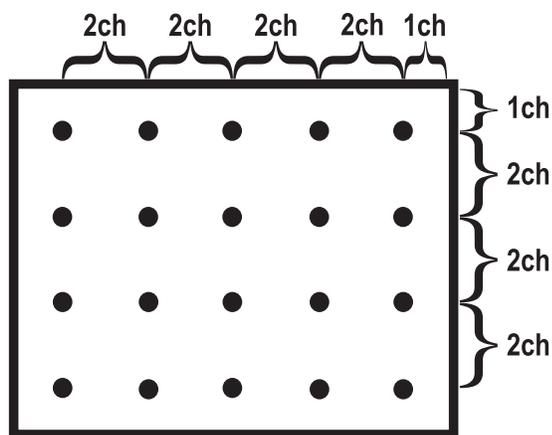


Figure 10.2. Example of square spacing of forest inventory plots in the field.

Example of rectangular spacing technique: Assume your forester plans to conduct a 20-percent inventory using 1/10-acre plots. The plan is to put in the plots on the forest using a rectangular spacing (figure 10.1). Approximately how many chains between lines and chains between plots would the forester plan for?

$$x = \sqrt{\left(\frac{0.1 \times 10}{0.20}\right) \div 2}$$

$$x = \sqrt{\left(\frac{1}{0.20}\right) \div 2}$$

$$x = \sqrt{\left(\frac{5}{2}\right) \div 2}$$

$$x = \sqrt{2.5}$$

x = 1.58 chains between plots and 2x = 3.16 chains between cruise lines, or 1.5 chains between plots and 3 chains between lines

You also can determine the spacing of your plots in the field using a square spacing and the following method:

$$\frac{\text{number of tract acres}}{\text{number of plots}} = \text{acre/plot}$$

$$\text{acres} \times 10 \text{ square chains} = \text{number of square chains}$$

$$\sqrt{\text{number of square chains}} = \text{square spacing on each side}$$

Example of square spacing technique: Assume your forester is going to put in 28 plots on a 35-acre forest stand. The plan is to put in the plots on the forest using a square spacing (figure 10.2). Approximately how many chains between lines and chains between plots would the forester plan for?

$$\frac{35 \text{ acres}}{28 \text{ plots}} = 1.25 \text{ acre/plot}$$

$$1.25 \text{ acres} \times 10 \text{ sq. chains} = 12.5 \text{ square chains}$$

$$\sqrt{12.5} = 3.5 \text{ chain spacing between lines and plots}$$

PUTTING PLOT LOCATIONS ON A MAP

Once you have an idea of how plots will be spaced across the forest, marking plot location on a map can help you see where plots will probably fall and can help you stay oriented in the field when conducting an inventory. When possible, it is best to begin an inventory from a known, easily accessed corner.

Note that your first plot location will come in from the start location half the distance between your plots and half the distance between your lines. For example, if your plot spacing is 4 chains between lines and 2 chains between plots, then your first plot will be in along the boundary line 2 chains and into the stand 1 chain. Each time you start a new line you will pace in 1 chain then resume the 2 chains between plots.

YOUR TURN

How would you space your plots if you want to inventory an 18-acre, 22-year-old pine plantation using 1/20-acre circular plots and a 6 percent inventory of the stand using (1) square spacing and (2) rectangular spacing?

ANSWERS

1. In square spacing, you need to know how many plots are needed:

$$0.06 \times 18 = 1.08 \text{ acres}$$

$$1.08 \times 20 = 21.6 \text{ plots or 22 plots needed to be installed}$$

Once you know how many plots are needed, you can calculate the square spacing of those plots:

$$\frac{18 \text{ acres}}{22 \text{ plots}} = 0.818 \text{ acres per plot}$$

$$0.818 \text{ acres} \times 10 \text{ sq. chains} = 8.18 \text{ square chains}$$

$$\sqrt{8.18} = 2.86 \text{ chain spacing between lines and plots, which can be rounded up to a } 3 \times 3 \text{ chain spacing}$$

2. When calculating rectangular spacing, you do not use the number of plots in the equation.

$$x = \sqrt{\left(\frac{0.05 \times 10 \text{ sq. chain per ac.}}{0.06} \right) \div 2}$$

$$x = \sqrt{\left(\frac{0.5}{0.06} \right) \div 2}$$

$$x = \sqrt{\frac{8.23}{2}}$$

$$x = \sqrt{4.16}$$

$$x = 2.04 \text{ chains between plots and } 2x = 4.08 \text{ chains between cruise lines, or rounded to 2 chains between plots and 4 chains between lines}$$

CREATING A FIELD INVENTORY TALLY CARD

Tally cards are your record of what was measured in the field and can be modified to accommodate different forest types and situations (table 10.2). It is important that you be as accurate as possible and record as much information as you can while you are in the field. Do not count on remembering once you leave the forest!

Suggested information to include on each tally card:

- identification of the stand being inventoried (e.g., a stand name or number and legal description)
- acres in the stand
- names of those who took the measurements
- plot number
- date
- plot size
- species or species group (pine, hardwood) for each tree
- diameter and height units and class (e.g., 1 foot)

Always check your tally cards for accuracy before leaving the woods. Use a pencil but do not erase. Mistakes can be corrected by striking through. Tally cards can be hand drawn using lined or unlined paper, or they may be created using table-making tools in word processing software. It is important to pre-make a tally card for each plot you intend to measure.

The next chapter will explain how to complete a tally card in the field and summarize them for a complete forest inventory.

Table 10.2. Example Field Inventory Tally Card

Stand description: Old Field Pines Stand, Section 4, T14N, R16W, 18 acres				Names: L. Landowner and M. Neighbor	
Plot number: 1			Date: 4/28/2020		Plot size: 1/20
Species (pine/ hardwood)	DBH (0.1 in.)	Height (1 ft.)	Weight (lb.)	Plot Size	Weight per Acre (lb. per ac.)
				Total	
				Pounds per acre	
				Tons per acre	