Sample Type Selection

There are two basic methods of sampling commonly used in forestry, fixed area plots and variable point samples. Fixed area plots are simply a fixed area that is selected within which all trees are measured. Variable point samples have with no specific area. Each sample tree represents a fixed *basal area* per acre.

Table 1. Plot type selection table.

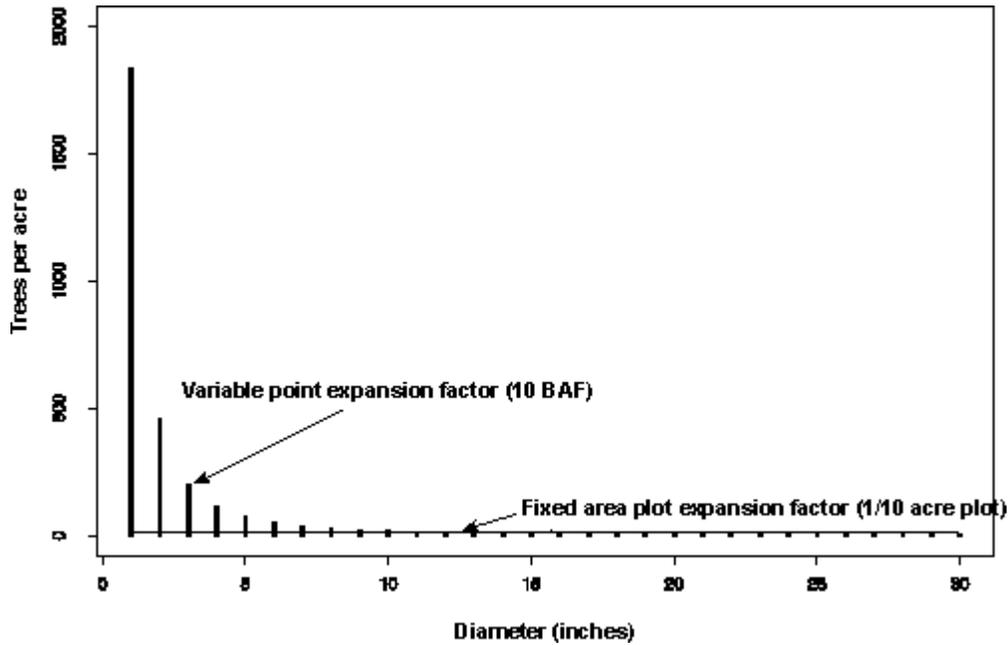| Plot type	Reasons to select
Fixed Area Plots	Estimation of trees per acre
	Estimation of diameter distributions
	Repeat measurements
Variable point samples	Volume estimation
	Basal area estimation
	Temporary plots

Why select a plot type?

Figure 1. Comparison of expansion factors for fixed area plots and variable point samples.

The first consideration is to compare the Fixed Area Plot and Variable Point Sample expansion factors (the trees per acres represented by one sample tree.) The following figure plots the trees per acre represented by one tree of the specified diameter. Consider this as the effect of missing a tree that should be included or including a tree that should not be sampled. Note in variable point sampling one 1-inch tree represents 1833 trees per acre. Also note that on variable point sample large trees represent many fewer trees per acre than a 1/10 acre fixed are plot. Now consider that you are more interested in size that the number of trees. Basal area is related to squared diameter by a constant. So I have plotted the squared diameter on the same figure. You will note that the trees per acre represented by one tree on a variable point sample are smallest where the squared diameter is the largest.
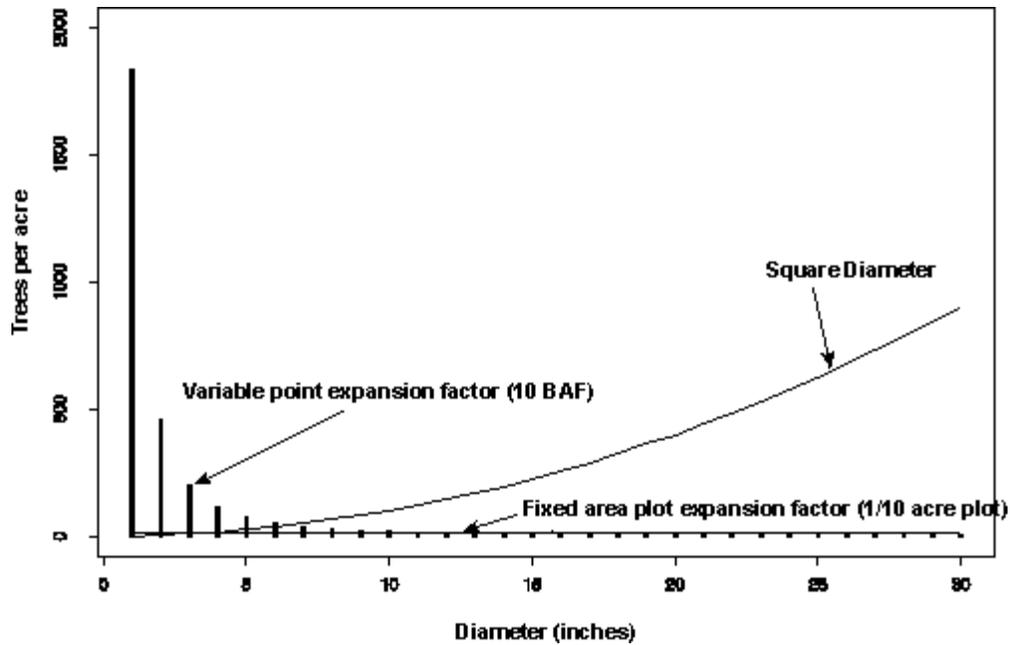
Figure 2. Illustration of the square diameter on the comparisons plot for Figure 1.

Let us consider the effect of combining size and number of trees. In the following graph I have plotted the basal area represented by one tree of a given diameter in the two sampling methods. If your objective is to sample basal area there seems to be less chance of error using the variable point sample method. Also note that one 30-inch tree in a 1/10 acre fixed area plot can represent as 49 ft^2/acre.

Most sampling designs in forestry are optimized to estimate volume. This graph illustrates the effect on volume when considering the effect of including or excluding trees with these two sample methods. From this graph you can see that variable point sampling will usually make a 260 board foot error for including or excluding a sample tree. Where a 30-inch tree in a fixed area plot can represent 1282 board feet per acre in the Missouri Ozarks.
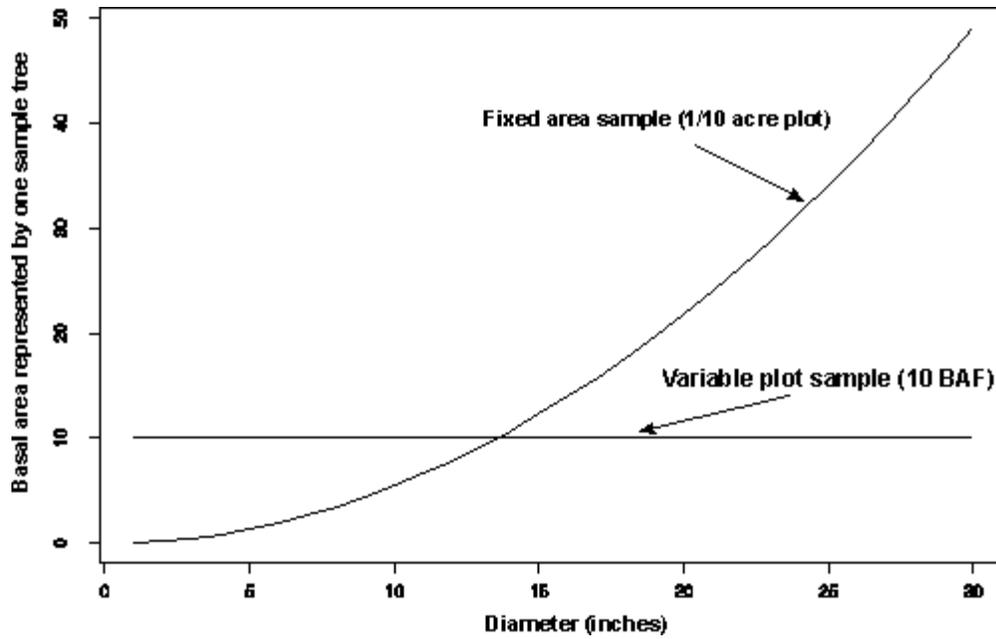
Figure 3. Basal area per acre represented by one tree of a given diameter.
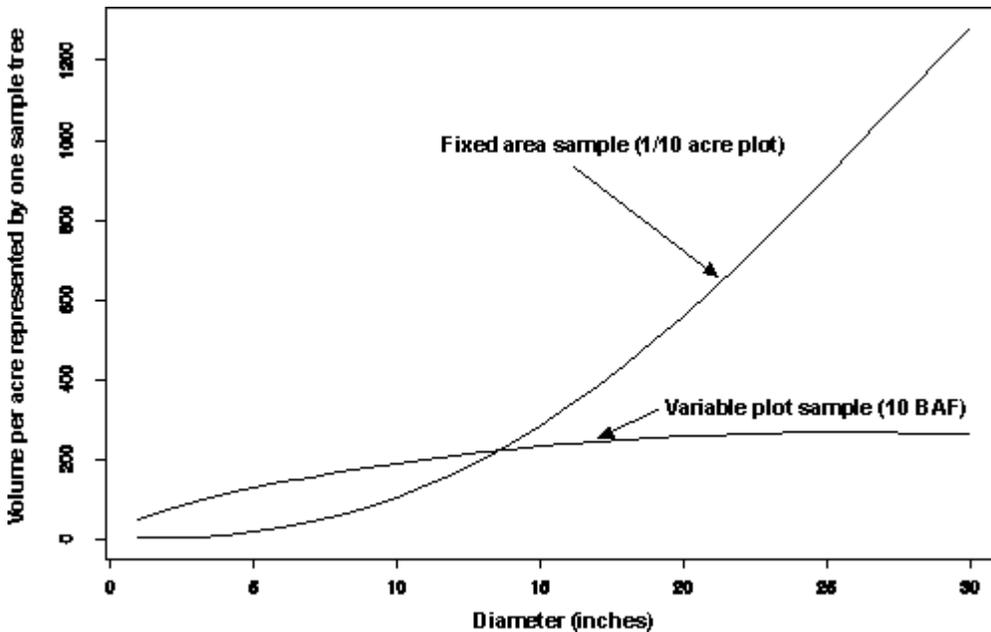

Figure 4. Volume per acre represented by one tree of a given diameter.

From this you can see that variable point sample have advantages in estimating basal area or volume but is quite poor at estimating tree per acre or diameter distributions. Fixed area plots have basically the reverse advantages and disadvantages. Fixed area plot also have many advantages when developing plots that will be measured repeatedly such as a Continuous Forest Inventory (CFI).