HOW MANY STOCK INVENTORY PLOTS DO I NEED?

A graphical approximation method for estimating the number of sample plots required for a desired level of accuracy.

Stephen E. McDonald
Western Nursery and Greenhouse Specialist, State and Private Forestry, U. S. Department of Agriculture, Forest Service, Lakewood, Colo.

For a nursery stock inventory to be reliable, the nurseryman must have some idea of how many samples to take to achieve a certain reliability of estimate. Numerous reports have pointed out how to derive such information once sample inventory plots have been taken (1), In these cases, however, if added samples are needed, the inventory crew must return to the field to acquire the data. If the nursery has a large number of seedlots, the process of added sampling can be very time-consuming and inventory completion can be delayed.

At the Forest Service's Nursery at Coeur d'Alene, Idaho, the problem described above was encountered following institution of a computerized inventory program in 1971 (2). The program printout provided the number of sample plots required, per seedlot, to achieve a 5 percent and 10 percent sampling error (at one standard deviation) from the variability expressed in the previously submitted sample data. The problem became estimation of the required number of samples in the first sampling to minimize the number of times the inventory crew returned to the fields to take added samples.
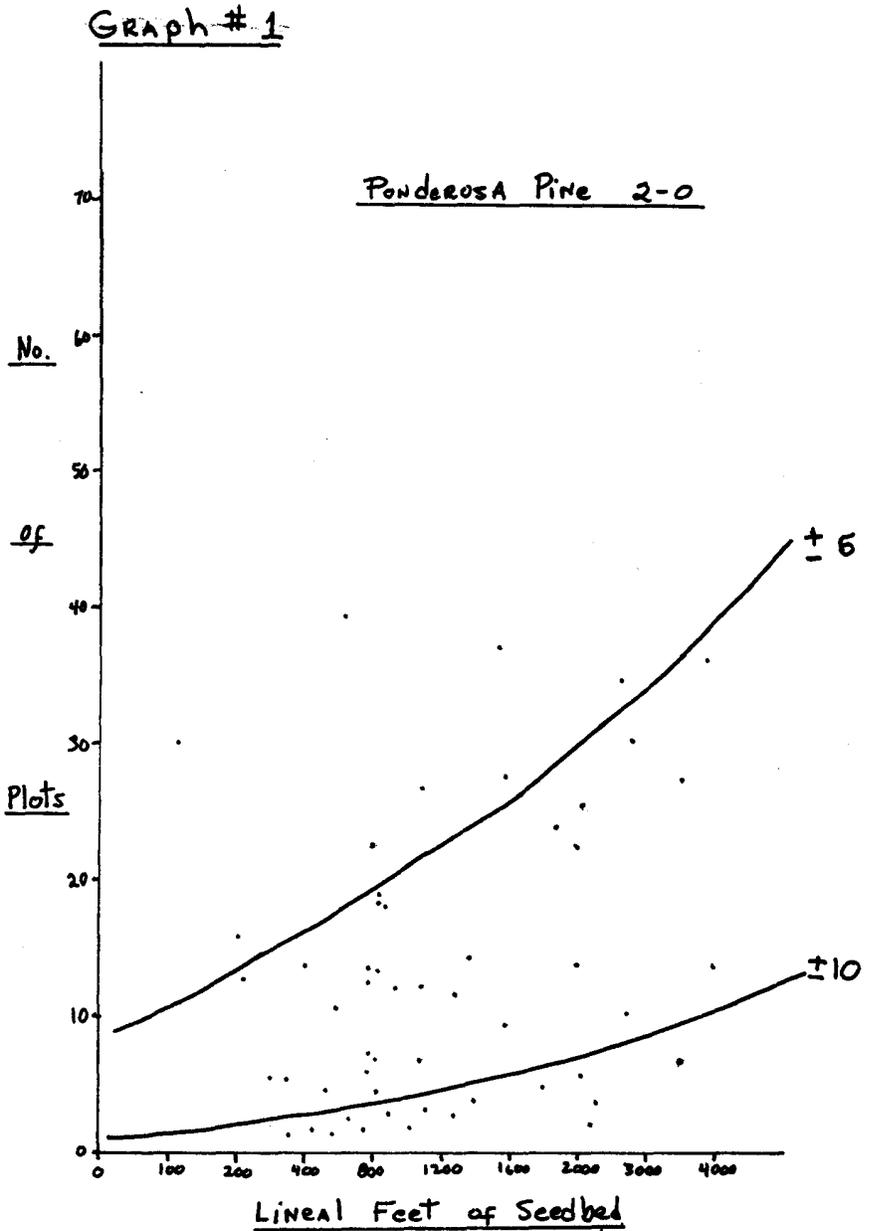

Figure 1. – *Graph plotting inventory data of ponderosa pine for sampling error of ± 5 percent and ± 10 percent.*

To overcome the problem, graphs were developed for each age class and species inventoried. Lineal feet of bed was expressed on the horizontal axis and the number of sample plots shown on the vertical axis (fig. 1). As inventory data for each subsequent group of trees of a given age class and species was generated, the points on the graph indicating the lineal feet of bed for that seedlot (a population size correlation, roughly) and the number of plots required for $\pm$ 10 percent and $\pm$ 5 percent sampling error were established. Numbers of these points were accumulated. Soon, enough points were available to draw a curved line approximating the mean number of plots required per lineal foot of seedbed length for each sampling error level.

Then, prior to any inventory sampling, the graph could be used to estimate the number of plots required to achieve the sampling error limit selected ($\pm$ 5 percent or 10 percent). In other words, by finding the bed length of the seedlot in question (known) on the horizontal abscissa and reading vertically to the desired sampling error line the necessary number of plots could be found on the vertical axis. Two or three plots were usually added as "insurance" to cover divergence from the mean, especially in smaller seedlots. Using this "approximation" significantly reduced the number of times added sample plots were needed to meet desired sampling error limits. However, it is important to remember the curves represent averages of past variabilities. Changes in the variability due to nursery cultural changes or climatic catastrophes in a current inventory must still be compensated-for.

Literature Cited

1. Lund, G. H. and Hunt, C. M. Tree nursery inventory methods—an annotated bibliography. U.S. Dep. Agric. For. Serv., Northeast. Area State and Private Forestry, Upper Darby, Pa., 1976. 12 pp.
2. Space, J. C., and McDonald, S. E., Tree inventory program saves time, Tree Plant. Notes 24, (1): 8-9. 1973.