

Mountain Pine Beetle

Dendroctonus ponderosae Hopkins

Coleoptera: Scolytidae

Knight, F. B. 1960. Sequential sampling of Black Hills beetle populations. Res. Note RM-48. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station; 8 p.

Objective: To develop a sequential plan for predicting trends in *D. ponderosae* populations.

Abstract: The mountain pine beetle, *Dendroctonus ponderosae* Hopkins, is the most destructive western bark beetle species in the USA and Canada. Lodgepole pine, *Pinus contorta* Dougl. ex Loud, is the primary host, although ponderosa, *Pinus ponderosa* Dougl. ex Laws., sugar, *P. lambertiana* Dougl., and western white, *Pinus monticola* Dougl. ex D. Don, pines are also attacked. During epidemics, tree mortality is often extensive.

A procedure for sampling *D. ponderosae* in ponderosa pine was developed to predict infestation trends using a fixed sample size. The method required counting the number of live beetles in early July in 20 15.4 by 15.4 cm bark samples removed from the tree 1.5-2.1 m above ground. One sample taken from the north and south aspect of 10 trees produced accurate estimates. The sequential sampling plan was referenced and sampling was continued until a decision was met. Infestations were classified as increasing, decreasing, or static. Accurate estimates are obtained with minimal effort using this procedure. However, in some infestations as many as 80 samples were required. If no decision was reached after 80 samples, infestations were classified as the greater of the two classes.

Sampling Procedure: Remove one 15.4 by 15.4 cm bark sample from the north and south aspect of the bole of an infested ponderosa pine 1.5 to 2.1 m above ground. After a minimum of 10 trees, reference the sequential sampling plan (Fig. 1), and continue sampling until a decision is met. If no decision is reached after 80 samples, consider the population to be the higher of the two levels. Populations are classified as: increasing (emerging beetles will kill more trees than infested currently; ≥ 9 beetles/sample), static (emerging beetles will kill a similar number of trees as infested currently; 5-8 beetles/sample), or decreasing (emerging beetles will kill less trees than infested currently; ≤ 4 beetles/sample).

Two sequential plans are available. One with a precision of 90% (Fig. 1) and the other with a lesser precision of 80% (Fig. 2). The sequential plan with lower precision may be useful in situations where a higher risk of error can be accepted.

Notes: Sampling must be done in early July before beetle flight commences. Trees are easy to find at that time because the foliage on all infested trees is discolored. Borderline cases should always be placed in the higher classifications when sampling is complete.

Figures:

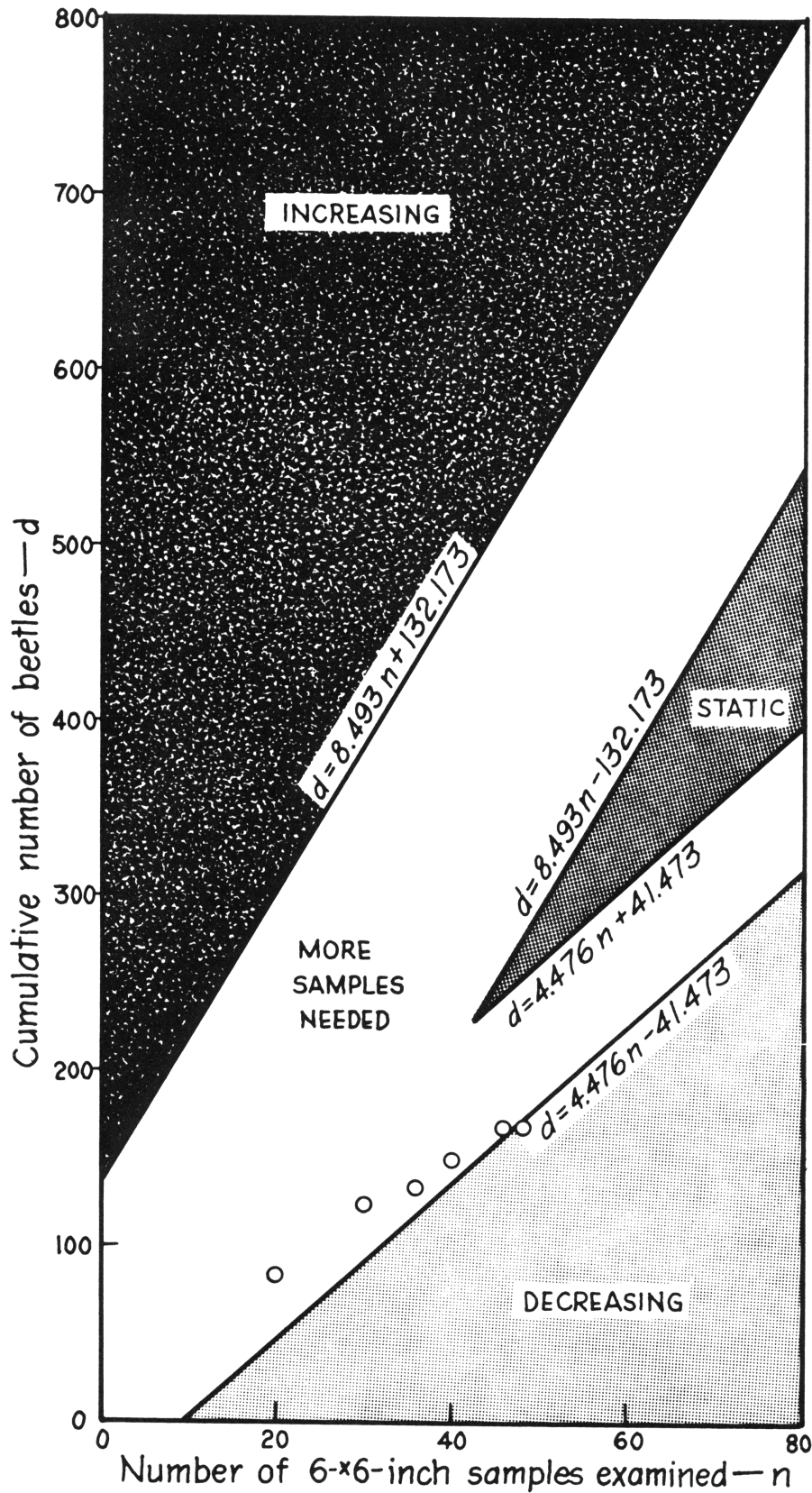


Figure 1.--Sequential graph for sampling Black Hills beetle populations in 6- by 6-inch bark samples (90 percent confidence level). The small o's represent cumulative counts in a hypothetical sampling situation. The 48th sample is below the decision line for decreasing; the infestation prediction is decreasing.

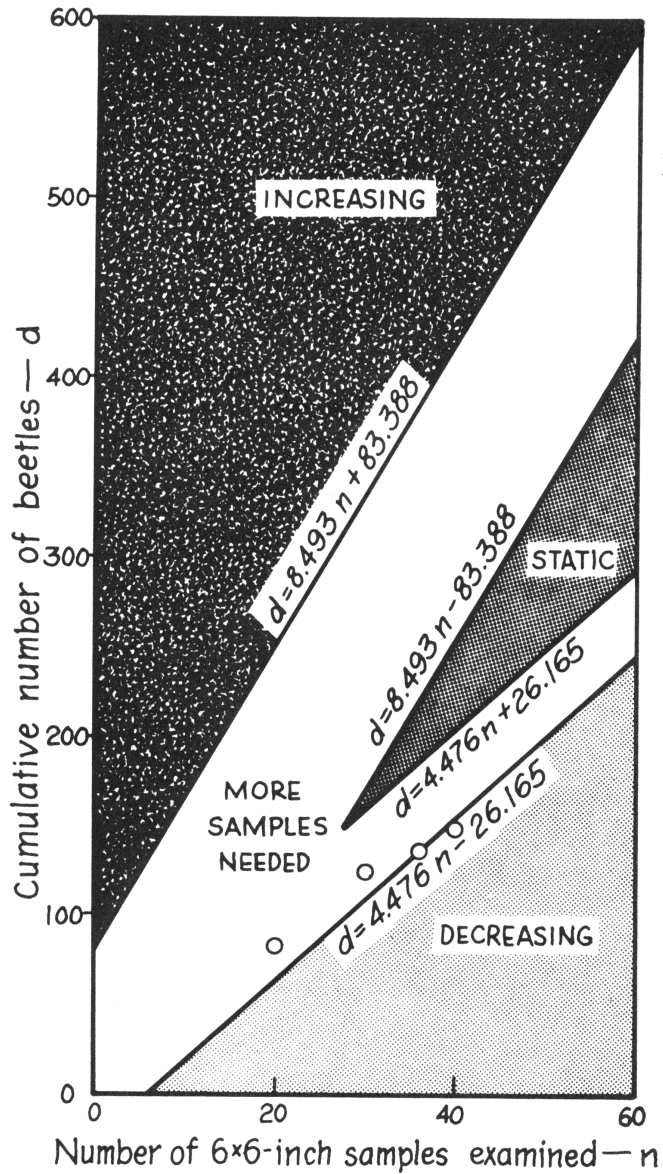


Figure 2.--Sequential graph for sampling Black Hills beetle populations in 6-by 6-inch bark samples (80 percent confidence level). By the use of the same hypothetical situation as in fig. 1, the decision can be made after recording 36 sample counts.