

Mountain Pine Beetle

Dendroctonus ponderosae Hopkins

Coleoptera: Scolytidae

Carlson, R. W.; Cole, W. E. 1965. A technique for sampling populations of the mountain pine beetle. Res. Pap. INT-20. Ogden, UT: *U. S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station*; 13 p.

Objective: To determine the most appropriate sample size and location for estimating *D. ponderosae* densities within a tree.

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.

This study was conducted to develop suitable sampling techniques for estimating densities of *D. ponderosae* in lodgepole pine in Utah and Wyoming. The experimental design tested for variation between sample sizes, locations on the tree, and trunk diameters. Six sample units were superimposed in a nested fashion at each point sample, and included: 92.9-cm², 232.3-cm² and 464.5-cm² rectangular; and 92.9-cm² and 232.2-cm² circular. The 92.9-cm² and 232.3-cm² rectangular samples were recommended.

Sampling Procedure: Remove one bark sample either 92.9 or 232.2 cm² from the north and south aspect of the bole of an infested lodgepole pine 30.5 cm above and 30.5 cm below breast height. If more precision is required, then you should collect similar samples at all four aspects. Measure the density of successful attacks, length of egg galleries, and density of larvae, pupae or callow adults. The number of samples (trees) needed for a 20% standard error of the mean (SEM) at the 2/3 probability level was computed for each sample size and variable at breast height (Table 8). If the 92.9-cm² sample is used, the zone can be divided into 6 levels of 10 cm each; three above and three below breast-height producing 24 sample locations (units). If the 232.2-cm² sample is used, the zone can be divided into 4 levels of 15.2 cm each, producing 16 sample locations (units).

Notes: Results contained in this paper may only be applicable to areas that are bioclimatically similar. This sampling plan was developed on trees greater than 15 cm in diameter.

Table:

Table 8. -- The number of trees required to be sampled for a 20-percent SME at 2/3 probability level based upon summed north and south bottom samples (rectangular samples only)

Density	Plot	Sample size			
		1/10 sq.ft.	1/4 sq.ft.	1/2 sq.ft.	Proportional
Attack density	Teton	9.13	3.36	2.42	3.13
	Wasatch	7.76	4.22	3.63	3.08
Gallery density	Teton	6.40	5.71	5.56	4.67
	Wasatch	2.46	2.63	2.20	2.12
Brood density	Teton	8.19	9.93	8.16	7.56
	Wasatch	54.06	66.94	67.84	55.36