Western Spruce Budworm

Choristoneura occidentalis Freeman
Lepidoptera: Tortricidae

Mason, R. R.; Wickman, B. E; Paul, H. G. 1989. Sampling western spruce budworm by counting larvae on lower crown branches. Res. Note PNW-486. Portland, OR: *U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station*; 8 p.

Objectives: To develop a nondestructive method of sampling *C. occidentalis* larvae after they have abandoned the buds; and to determine its suitability as an alternative to mid-crown estimates.

Abstract: The western spruce budworm, *Choristoneura occidentalis* Freeman, is an important pest of Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco, true firs, *Abies* spp., Englemann spruce, *Picea englemannii* Parry ex Engelm., and larch, *Larix occidentalis* Nutt., in the western USA and Canada. Infestations in mature stands cause growth loss, top kill, and occasional tree mortality. Douglas-fir that is defoliated severely or top-killed is often subsequently attacked by the Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins.

A technique is described for sampling *C. occidentalis* larvae after bud flush by beating three 45-cm branches in the lower crown. Sample data were collected from 32 plots representing a wide range of budworm densities, and indicated that larvae were less aggregated in the lower crown than at the same density in the mid-crown. In an independent sample of 12 plots, estimates of larval density in the mid-crown were 2.5 times higher than, and correlated positively with, density estimates in the lower crown. Sampling the lower crown is more efficient and cost-effective than sampling the mid-crown, and therefore was recommended for estimating larval densities of *C. occidentalis*. For most situations, 25-50 trees will yield a reliable density estimate. Lower crown larval densities were converted to mid-crown densities by multiplying by a factor of 2.41.

Sampling Procedure: Time samples to occur after bud flush, and to coincide with the predicted peak abundance of third through fifth instar larvae (Beckwith and Kemp 1984, Wickman 1988). Sample Douglas-fir and grand fir, *A. grandis* (Dougl.) Lindl., without preference, except each tree must have foliage that can be reached from the ground. Beat three 45-cm branch tips against a handheld dropcloth to dislodge larvae. Each branch should be rapped 10-12 times, and the total number of larvae recorded for the three branch sample. Determine the mean number of larvae per sample unit for each plot by dividing the sum of all larvae found in the three branch samples by the number of trees sampled.

The number of trees *n* needed for different levels of precision can then be estimated using Fig. 3. Multiply the number of larvae per sample unit by 3.10 to adjust to the number of larvae per square meter (Mason 1987). For most situations, sampling 25-50 trees will yield reliable estimates.

References:

Beckwith, R. C.; Kemp, W. P. 1984. Shoot growth models for Douglas-fir and grand fir. *Forest Science* 30: 743-746.

*Mason, R. R. 1987. Frequency sampling to predict densities in sparse population of the Douglas-fir tussock moth. *Forest Science* 33: 145-156.

Wickman, B. E. 1988. Seasonal variation of degree-day accumulation in relation to phenology of western spruce budworm, Douglas-fir tussock moth, and host trees in northeastern Oregon. Res. Note PNW-482. Portland, OR: *U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station*; 11 p.

Figure:

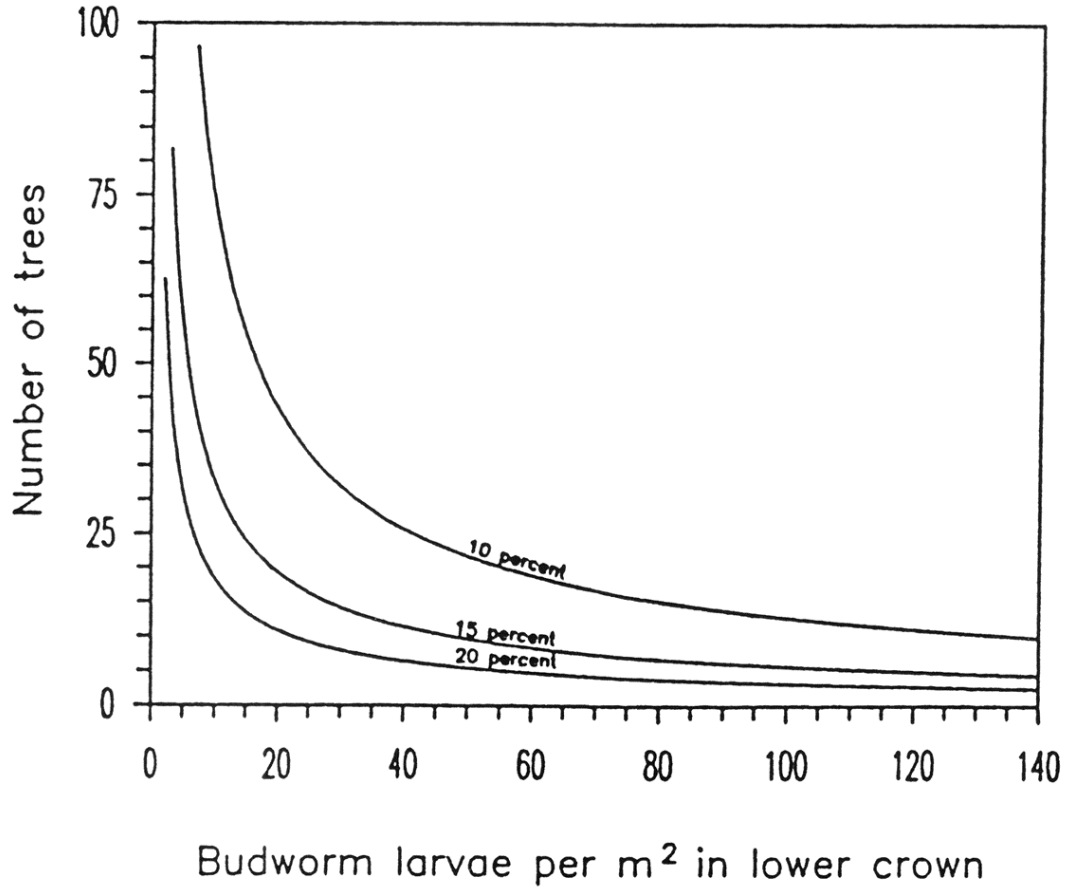

Figure 3—Sample sizes required to estimate larval density on a plot with a standard error of 10, 15, or 20 percent of the mean.