

## Western Spruce Budworm

*Choristoneura occidentalis* Freeman

Lepidoptera: Tortricidae

Torgersen, T. R.; Scott, D. W.; Gillespie, A. J. R.; Hosman, K. P. 1994. Relationship between lower-crown sampling and midcrown sampling for *Choristoneura occidentalis* (Lepidoptera: Tortricidae) after treatment with *Bacillus thuringiensis*. Journal of Economic Entomology 87: 1022-1026.

**Objective:** To develop a model predicting mid-crown densities of late-instar *C. occidentalis* based on lower-crown densities.

**Abstract:** Western spruce budworm, *C. occidentalis* Freeman, is an important defoliator of Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco, and true firs (*Abies* spp.) in western North America. Infestations in mature stands cause growth loss, top kill, and occasionally tree mortality. Traditional sampling methods for *C. occidentalis* include sampling midcrown foliage using pole-pruners and beating lower crown foliage over a beatsheet. The beatsheet technique is quicker and less expensive than the use of pole-pruners.

Mid- and lower crown larval densities of *C. occidentalis* were studied on grand-fir, *Abies grandis* (Dougl. ex D. Don) Lindl., and Douglas-fir in Oregon. An equation was developed to estimate the density of late instars found in the midcrown based on larval densities found in the lower crown by beatsheeting. The developed equation is helpful in relating the simpler, quicker lower crown sampling to the more time-consuming mid-crown sampling.

**Sampling Procedure:** Sample when late instars (fourth to sixth instar) are present. Select 25 plots to sample, each containing a cluster of five Douglas-fir or grand fir trees. Trees should be 6-14 m tall. In each plot, sample three lower-crown branches from each of the five trees in the cluster by striking the branch over a beatsheet. Count all *C. occidentalis* larvae in the fourth, fifth, and sixth instar.

Use the following equation to predict the number of fourth to sixth instar per midcrown tip from the number of larvae per 3-tip lower-crown sample in 25 tree clusters of five trees each:

$$Y = 0, \text{ for } X < 0.9764$$

$$Y = -1.0168 + 1.0414X, \text{ for } 0.9764 < X < 22.0$$

where Y = the estimated mean number of late instar larvae per midcrown tip and X = the mean number of larvae per 3-tip lower-crown sample ( $R^2 = 0.932$ , MSE= 4.5189).

**Notes:** The authors do not recommend extrapolating above 22 *C. occidentalis* larvae per sample as that was the upper limit of their data. In addition, their model is based on sampling 25 plots with 5 trees per plot (n = 125 trees). The model is less accurate in predicting the number of late instar *C. occidentalis* per branch tip in the mid-crown if fewer plots or fewer trees per plot are used. The model should not be used to predict midcrown densities in single trees because of inter-tree variation.