Western Spruce Budworm

Choristoneura occidentalis Freeman
Lepidoptera: Tortricidae

Buffam, P. E.; Carolin, Jr., V. M. 1966. Determining trends in western spruce budworm egg populations. Journal of Economic Entomology 59: 1442-1444.

Objective: To develop a method of analyzing population trends of *C. occidentalis* in the Pacific Northwest using egg mass surveys from a single year.

Abstract: Western spruce budworm, *Choristoneura occidentalis* Freeman, is a widely distributed and destructive defoliator of conifers in western North America. Larvae feed on needles, buds, staminate flowers, and developing conelets. Repeated defoliation may result in topkill, further reducing cone production for years after outbreaks subside. Young seedlings attacked by *C. occidentalis* often die, reducing stand densities and retarding forest regeneration. Periodic outbreaks occur irregularly and can last for decades. Severely defoliated Douglas-fir [*Pseudotsugae menziesii* (Mirb.) Franco] may be susceptible to subsequent attack by Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins, and the fir engraver beetle, *Scolytus ventralis* LeConte.

Population trends of *C. occidentalis* can be predicted when egg mass densities on foliage are categorized as either new or old. New egg masses are those deposited during the current year while old egg masses are those laid the previous year, or two years ago in some cases. Old egg masses represent the new egg masses laid the previous year so that population estimates can be made for both the current year and the previous year using the same sample branch samples. The difference between the number of new and old egg masses, compared using a standard *t* test, can be used to determine if populations are declining, increasing, or remain static when significant at the 5% level of probability. A large number of 1- or 2-year old egg masses present in the sample may exaggerate the rate of decline detected by this method. However, the technique is still useful in detecting a decline in the population regardless of rate. This method was tested using data collected from white fir, *Abies concolor* (Gord. & Glend.) Lindl. ex Hildebr., stands in the Pacific northwestern USA over 4 consecutive years.

Sampling Procedure: Sample egg masses after the oviposition period has ended, generally by late August in the Pacific Northwest. A minimum of 4 plots should be sampled in areas of 6,070–16,187 ha, and at least 1 plot per 4,047 ha for even larger areas. Each plot should contain five co-dominant trees of a single host species.

Sample 2 mid-crown branches from the same or adjacent whorls from each tree within a plot for a total of 10 branches per plot. Branches should be taken from opposite sides of the tree. Strip and discard the twigs from the left side of the first branch and the right side of the second branch. Calculate the area of the foliated area of the two half-branch sample by multiplying the measurements of the total

length and the width at mid-length on the foliated side (Morris 1955). Closely examine each sample for *C. occidentalis* egg masses. Separate all egg masses present into new and old age categories. Characteristically new egg masses appear shiny with visible emergence holes if the larvae have eclosed. New eggs with larvae that failed to eclose are greenish turning to yellowish. Old egg masses appear milky, have an eroded surface, and are brownish if the larvae failed to eclose. Old egg masses may be present on foliage for more than a year. Tally the number of old and new egg masses and compare these numbers using a student's t test. If the differences between densities of old and new egg masses within a given year are significant at the 5% level of probability, a positive difference indicates a building population while a negative difference indicates a population in decline. Differences close to zero would indicate a static population trend.

Notes: Workers must be able to distinguish between old and new egg masses. Branches should be re-examined at least partially by a second worker to check that egg masses are counted and categorized by age correctly. The authors calculated the density of egg masses per 1,000 in^2 of foliage, but density data based on branch area are not necessary if examining the population trend within a single sampling season. Egg mass density can be expressed as egg masses per m^2 if population trends will be compared over multiple years.

This 1966 paper was published before Freeman (1967) separated western spruce budworm, *Choristoneura occidentalis*, from the closely related spruce budworm, *Choristoneura fumiferana*.

References:

Freeman, T. N. 1967. On coniferophagous species of *Choristoneura* (Lepidoptera: Torticidae) in North America. I. Some new forms of *Choristoneura* allied to *C. fumiferana*. Canadian Entomologist 99: 449-455.

Morris, R. F. 1955. The development of sampling techniques for forest insect defoliators, with particular reference to the spruce budworm. Canadian Journal of Zoology 33: 225-294.