Western Spruce Budworm
Choristoneura occidentalis Freeman
Lepidoptera: Tortricidae

Objective: To compare observations with binoculars to cut-branch estimates for classifying defoliation levels.

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. Englem., 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.

Defoliation caused by *C. occidentalis* was estimated on 91 Douglas-fir trees with binoculars and by examination of cut-branches. Binocular estimates of defoliation (Y) were related positively to cut-branch estimates of defoliation of current-year foliage (X) ($Y = -13.3+1.09X$, $R^2 = 0.67$) and of all age classes of foliage (X) ($Y = -7.1+0.942X$, $R^2 = 0.78$). Twelve and 7.5% defoliation of the current year's foliage and foliage of all ages, respectively, was detected by the cut-branch method before any defoliation was detected using binoculars. When trees were assigned into broad defoliation classes of light (1-25%), moderate (26-65%) and severe (66-100%), as used in forest insect surveys in British Columbia, the results agreed 89% of the time for current-year foliage and 68% for foliage of all ages. The binocular method was recommended as a quick and useful means of classifying stands into broad defoliation classes, but was not suitable if a high degree of precision was needed.

Sampling Procedure: For binocular estimations, scan the upper half of each tree crown using 7 by 50 mm binoculars, and separate defoliation estimates to the nearest 5%. For the cut-branch technique, cut two 50-cm branches from opposite aspects of the upper half of each tree crown. Assign each shoot a defoliation class based on increments of ten percentage points (0, 1-10, 11-20, 21-30, etc.). Average the defoliation estimates of both branches to yield a single estimate for each tree.