Two-Year Cycle Spruce Budworm

Choristoneura biennis Freeman
Lepidoptera: Tortricidae

Harris, J. W. E. 1963. Sampling the egg stages of the two-year-cycle spruce budworm near Babine Lake, British Columbia. *Forestry Chronicle* 39: 199-204.

Objective: To determine the most representative location to estimate egg mass densities of the 2-year cycle spruce budworm, *C. biennis*.

Abstract: The 2-year cycle spruce budworm, *Choristoneura biennis* Freeman, occurs exclusively in high elevation stands of alpine fir, *Abies lasiocarpa* (Hook.), and white spruce, *Picea glauca* (Moench) Voss, in British Columbia. During the first year, the insect develops to the fourth instar, where it overwinters the first year. The second year, the fourth instars resume feeding, pupate, become adults, lay eggs, and their progeny develop until the second instar, where they overwinter to complete the 2-year life cycle. The last three larval instars of *C. biennis* (i.e., fourth, fifth, and sixth) cause most of the defoliation. Periodic outbreaks occur every 30 years and can last 5-10 years. A study was carried out 64-km east of Smithers, British Columbia, Canada, to determine the best location(s) to sample egg masses. All sites were located >900 m in elevation within alpine fir-white spruce stands. Egg mass densities were estimated for locality, tree species, crown side, crown level, stand level, and branch size.

When *C. biennis* densities were high, tree species, locality, and aspect did not explain a significant proportion of the variation in egg mass densities. A significant proportion of the variation in egg mass densities, however, was explained by sample tree, crown level, stand level, and branch size (whole branch or 45-cm tip) in the lower crown. An acceptable estimate of egg densities was obtained by sampling one 45-cm branch tip from the mid-crown portion of as many overstory trees as possible. When *C. biennis* densities were low, locality explained a significant proportion of the variation in egg mass density. Therefore, more localities need to be sampled to obtain representative estimates of *C. biennis* egg mass densities when budworm densities are at low population levels.

Sampling Procedure: Select as many sample trees as feasible from a representative area of the stand. For example, the authors suggest that 230 sample trees would give a sampling error of 10%. Sample trees should be limited to overstory alpine fir or white spruce. Cut a 45-cm branch tip from the mid-crown portion of each sample tree, and calculate the foliated area by multiplying the length of the branch by one-half of its width. Count the number of egg masses on each sample and divide by the area to obtain an estimate of egg density.

Note: Lower crown sampling is acceptable if for some reason it is impossible to sample the mid-crown.