Spruce Budworm
Choristoneura fumiferana (Clemens)
Lepidoptera: Tortricidae

Objectives: To describe guidelines for the use of pheromone traps in monitoring low densities of *C. fumiferana*; to predict subsequent larval densities based on trap catch of male moths.

Abstract: Spruce budworm, *Choristoneura fumiferana* (Clemens), is the most destructive defoliator of balsam fir, *Abies balsamea* (L.) Mill., and white spruce, *Picea glauca* (Moench) Voss, in eastern North America. The last three larval instars cause most of the defoliation. Periodic outbreaks occur every 30 years, while epidemics can last 5–10 years.

Pheromone traps are extremely useful in monitoring adult populations of *C. fumiferana*, especially when populations are low. Rising trap catches can indicate a potential outbreak. Furthermore, trap catch of adult males can be used to predict subsequent larval densities using the equation $Log10(y+1) = -1.454 + 1.440(x+1)$, where x = moth catch and y = larvae per 10 m^2 foliage ($r^2 = 0.48$). Using this formula, a trap catch of 100 moths corresponds to subsequent larval densities of 25 larvae per 10 m^2 foliage, or approximately 3 larvae per branch. Land managers should consider initiating larval sampling at this threshold, but continue monitoring adult populations using pheromone traps below this threshold.

Sampling Procedure: Use Multi-pher (le Groupe Biocontrôle, Ste-Foy, Québec) or Uni-traps (International Pheromone Systems, Wirral, U.K.) baited with the recommended lures for the current year. Traps should include a killing agent to immobilize male moths attracted to the lure.

Deploy traps before the adult flight period and leave in place until the flight period has ended. Traps should be placed in mature forest consisting of at least 50% white spruce and/or balsam fir of at least 10 ha in area. The recommended trap layout consists of three traps in a triangle evenly spaced at least 40 m apart and at least 40 m from the edge of the stand. Hang traps on dead branches at eye level at least 50 cm from the trunk.

Collect traps after the flight period has ended and count the number of moths. Use the following equation to estimate the density of the subsequent larval population:

$$Log10(y+1) = -1.454 + 1.440(x+1)$$

where x = moth catch and y = larvae per 10 m^2 foliage. A trap catch of 100 moths corresponds to subsequent larval densities of 25 larvae per 10 m^2 foliage, or approximately 3 larvae per branch. Larval sampling at this density becomes practical, so managers can use this threshold as a guideline of when to begin sampling second instar *C. fumiferana*. Continue monitoring adult populations with pheromone traps below this threshold.

Notes: The formula given in the original publication is incorrect. The correct formula, $Log10(y+1) = -1.454 + 1.440(x+1)$ (D. B. Lyons, NRC Canadian Forest Service, Great Lakes Forestry Centre, Ontario, pers. comm.), is provided in this summary.

Traps can be reused over several years, but the plastic will absorb some of the pheromone. As the pheromone of one insect pest may be an inhibitor for another species, traps should always be reserved for the same species. These recommendations are based on research conducted in mature mixed stands in the Great Lakes region. These recommendations may not accurately reflect other forest types in different locations and should be used with caution until validated for other regions.