Spruce Budworm

Choristoneura fumiferana (Clemens)
Lepidoptera: Tortricidae

Allen, D. C.; Dorais, L.; Kettela, E. G. 1984. Survey and detection. In: Schmitt, D. M.; Grimble, D. G.; Searcy, J. L. editors. Spruce budworm handbook: managing the spruce budworm in eastern North America. Agric. Handb. 620. Washington, DC: *U.S. Department of Agriculture, Forest Service*; 21-36.

Objective: To provide a summary of survey and detection, defoliation, impact assessment, and hazard rating methods for *C. fumiferana* populations.

Abstract: The spruce budworm 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 and can last 5-10 years. The Canada-United States Spruce Budworms Program (CANUSA) published a compilation of current research findings related to the spruce budworm. Survey and detection methods, as well as defoliation estimation, for endemic and epidemic populations are presented.

Sampling Procedure:

Sparse populations: Light traps and pheromone traps are commonly used to survey low-density populations and to detect if an outbreak is imminent. Black light traps are often used to obtain a relative estimate of budworm abundance and population trends in specific areas over time. This technique can be used to detect increasing populations well before defoliation becomes evident. To be effective, traps should be placed in areas having the highest budworm hazard.

Traps baited with Fulure (95:5 blend of (E)- and (Z)-11-tetradecendal) are very effective attractants when used in sparse (i.e., less than 1 larva per 45-cm branch tip) populations. Place traps, equipped with a killing agent, in a single five-trap cluster ≥40 m between traps (Table 3.3) in stands of highest hazard. Suspend the pheromone lure below the cover of the trap.

Outbreak populations:

> Egg masses: Egg mass surveys are used most commonly to determine budworm population levels. Intensive surveys use one plot for every 1,000 to 12,000 ha whereas extensive ones use one plot every 15,000 ha or 40 km of road. The size of the sample unit as well as the number of samples collected varies by province and state. Egg mass density is

expressed differently as well (see Tables 3.1 and 3.2 in the original publication). Refer to the original publication for more detail.

Overwintering second instar survey: This method is used most commonly to check results of egg mass surveys, adjust infestation forecasts, and identify stands that are candidates for control. The techniques used are forced emergence rearing and a sodium hydroxide (NaOH) wash. This technique has been described in detail in Sanders (1980). The method of expressing second instar survey data varies by province and state (Table 3.3).

Large larvae: Size as well as number of samples collected varies by province and state. Please refer to original publication and Sanders (1980) for details.

Defoliation assessment: Please refer to Sanders (1980) for details concerning the sampling procedure.

Note: Our review of Sanders (1980) in this publication covers the same techniques mentioned here. Please also refer to the original publication for more information.

Reference:

*Sanders, C. J. 1980. A summary of current techniques used for sampling spruce budworm populations and estimating defoliation in eastern Canada. Rep. O-X-306. *Canadian Forest Service, Great Lakes Forest Research Center*; 34 p.

Table:

Table 3.3 Relationship between number of overwintering spruce budworm larvae per branch and expected infestation level (from Dorais and Kettela 1982).

Geographic region	No. of larvae per whole branch	No. of larvae per 100 ft2 (9.3 m2) of foliage	Forecasted infestation
Maritimes	1-6	---	Low
	7-21	---	Medium
	21-40	---	High
	>40	---	Extreme
Ontario	1-25	---	Low
	26-65	---	Medium
	>66	---	High

Quebec, Newfoundland	---	1-100	Low
	---	101-300	Medium
	---	301-650	High
	---	>651	Extreme
Maine	---	0-175	Low
	---	176-500	Medium
	---	502-1100	High
	---	>1100	Extreme