

## Spruce Budmoth

*Zeiraphera canadensis* Mutuura and Freeman  
Lepidoptera: Tortricidae

Turgeon, J. J.; Régnière, J. 1987. Development of sampling techniques for the spruce budmoth, *Zeiraphera canadensis* Mutuura and Freeman (Lepidoptera: Tortricidae). *Canadian Entomologist* 119: 239-249.

**Objectives:** To develop a practical and meaningful sample unit for assessing *Z. canadensis* populations; to determine the required sample size for density estimates with a given level of precision; and to develop a sequential sampling plan for *Z. canadensis*.

**Abstract:** The spruce budmoth, *Zeiraphera canadensis* Mutuura and Freeman, is a serious pest of young white spruce, *Picea glauca* (Moench) Voss, plantations. Larvae feed on newly developing terminal shoots causing multiple leaders, crown deformation, and growth loss.

A 15-cm branch segment, measured distally from the scales of the branch's apical growth and taken from the upper one-third of the crown, was considered an adequate sample unit for density estimates of *Z. canadensis* eggs and larvae. A minimum of 5 and maximum of 100 branch samples was recommended (Fig. 7). Populations of *Z. canadensis* were considered high and thus potentially damaging if more than 5 larvae were found per upper crown branch segment. Control measures were deemed necessary for populations exceeding this threshold level. Populations were considered low, and thus not potentially damaging, if less than 5 larvae were found per upper crown branch segment. The authors stated that to obtain accurate estimates of *Z. canadensis* population levels one need only sample trees less than 4 m in height.

**Sampling Procedure:** Select at least 5 trees randomly within the area of concern. Cut a 15-cm branch segment from the upper third of the crown of each tree (Fig. 1). Sample until the cumulative number of larvae rises above or drops below the decision thresholds (Fig. 7).

*Z. canadensis* eggs: If the population of *Z. canadensis* is still in the egg stage, then cut out the previous years' bud scales (Fig. 1) and place them in a mason jar. Place a lid on the Mason jar, replacing the metal center with an equal size piece of filter paper. Store at room temperature with at least 16 h of light daily. Each day, check all jars, count and remove all *Z. canadensis* larvae. Maintain colony a week after the last larva has been removed (note: larvae may need to be reared on budmoth diet until they can be correctly identified as *Z. canadensis*). This method can be carried out well before *Z. canadensis*

becomes active in the field, providing enough preparation time if control measures are determined to be necessary.

Z. canadensis larvae: If the population of *Z. canadensis* is in the larval stage, and the majority of shoots have not elongated and still have bud scales on their tips, then sample as described at the beginning of this section. Each shoot will need to be dissected by removal of the bud scale covering the tip of each shoot. Feeding *Z. canadensis* or their damage should be readily visible beneath the bud scale.

If the majority of shoots have elongated and most of the bud scales have fallen from the tips of the shoots, then sample as described at the beginning of this section. Shoots with bud scales still attached to the shoot tip will usually contain a larva. However, examine carefully all shoots for presence of this forest pest.

**Figures:**

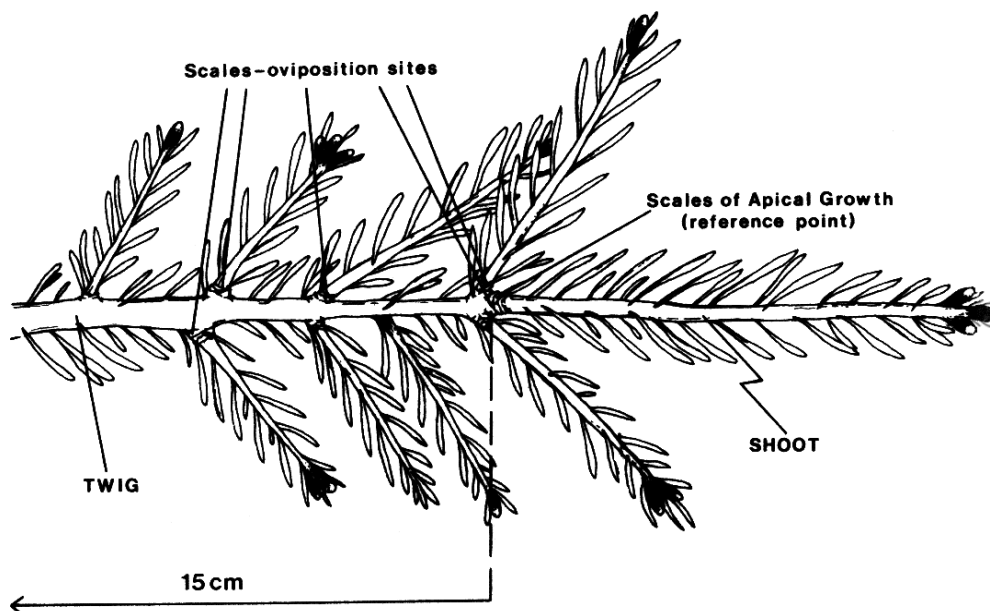


Fig. 1. Illustration of a white spruce branch (late July), showing the terms defined and the measurement method described in the text.

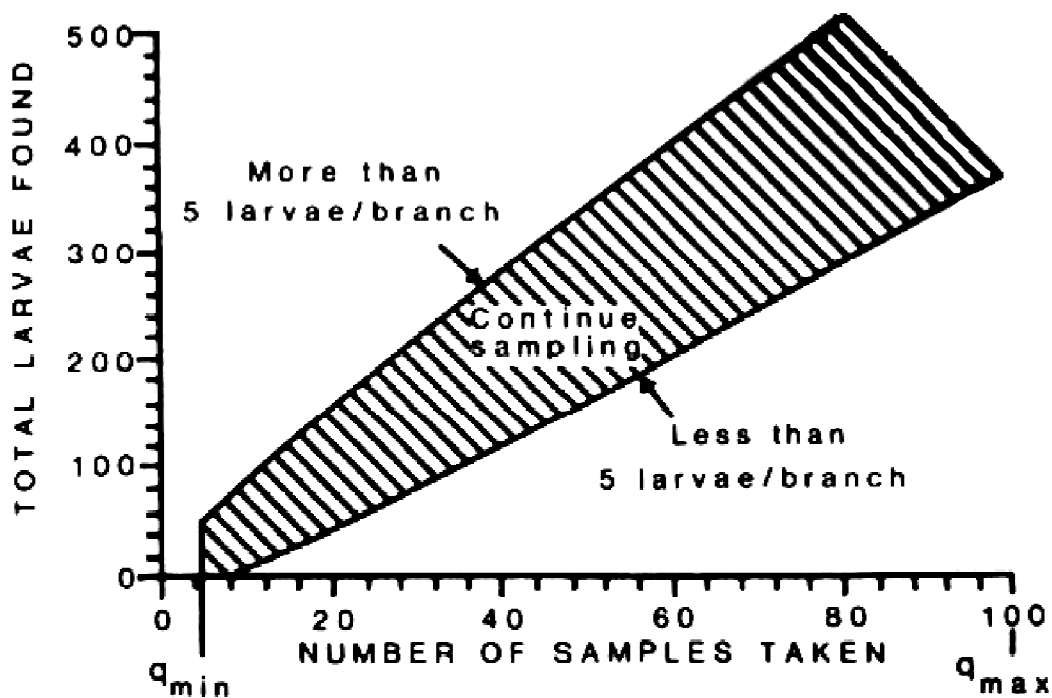


fig. 7. Sequential sampling plan for larvae of *Z. canadensis* in the upper third of crown of white spruce based on a critical level of five larvae per 15-cm branch segment. Minimum sample size: 5; maximum: 100 (equation [7]).

Figures 1 and 7 reprinted with permission from the Canadian Entomologist, January 15, 2001.