

Second Instar (Overwintering) Larvae

Three methods are used to evaluate overwintering spruce budworm populations: (1) Soak out procedure, which involves washing foliage with hot sodium hydroxide (Miller and McDougall, 1968; Miller *et al*, 1971; Sanders 1980), (2) Forced emergence--paper cone method (Sanders, 1980), and (3) Forced emergence--enclosed box method (Miller, 1958). Because mean-variance relationships for determining numbers of sample branches are similar for each of the three methods described, a table giving required number of branch samples based on numbers of larvae found is included at the end of this section of overwintering larval survey techniques (Table 8). Likewise, a table predicting infestation level and expected percent defoliation (Table 9) follows.

METHOD 1: Soak-out Procedure

Equipment Needed:

1. **Field:** Extension pole pruners, tape measure, heavy paper sacks to hold branch samples, hand pruners, marking pen.
2. **Lab:** Refrigerator or cool storage space (<50°F), data sheets
 - a. **For washing foliage:** 10-liter plastic pails, 400 ml collecting jars, 2 sets of tags that indicate plot, tree, and branch number (so that washing pail and collecting jar can be tagged),

C).

- b. **For processing the foliage:** large sink or 90 x 150 x 9 cm deep tray, preferably with a corrugated bottom, fitted to a sewer outlet, two interlocking sieves (soil sieves)--top sieve should be about 0.8 mm mesh, bottom sieve 0.25 mm mesh, wire basket made of hardware cloth, 5 mm mesh, with a "false" bottom (wire basket should fit inside a 40 cm x 20 cm tub or container).
- c. **For separating larvae from debris:** 500 ml separating funnel, hexane.
- d. **For vacuum filtering:** 15 cm Buchner funnel, 5000 ml

selected is the predominant species in the stand, whether it be

balsam fir, red/black spruce (they hybridize in New Brunswick) or white spruce. Where fir and spruce are both abundant, fir is selected as the indicator species (L. Hartling, pers. comm.). Though whole-branch samples are taken by workers in some regions, others standardize sampling units as 75-cm branch tips (eg. New Brunswick) and have found that population counts per

75-cm branch tip correlate very well to counts expressed per 10 sq.

b. Processing the foliage: Pour the liquid contents of the pail

Pour the remaining contents of the pail into the wire basket. Rinse the pail and pour the rinse through the sieves. With a flexible hose, wash the foliage thoroughly in the wire basket inside the tub and discard. Pour the contents of the tub through the sieves, being careful not to overflow the sieves

Rinse the tub and pour through the sieves. Wash the contents

larvae could be missed when one is checking under the microscope. Addition of methyl blue helps in detecting the larvae. It is also helpful to have the filter paper gridded to a

3. Overwintering larval survey can be conducted over a 7 month period rather than in the month or a few weeks available during most life stages.
4. Counting overwintering larvae eliminates the problem of distinguishing old and new egg masses.
5. Spruce can be evaluated as easily as fir with the soak-out procedure. By contrast, evaluating populations on spruce by egg-mass sampling is difficult (Muller 1995).

6. The liquid residual from the soak-out process is hazardous waste in most states. The pH of the residue is likely to be 13 or so, and the liquid usually has to be neutralized prior to disposal.

SPRUCE BUDWORM SURVEY

FIR SPRUCE MAP AREA _____
POINT NO. _____

Collectors: _____

Location: _____

Stage: Early larval ___ Late larval ___ Pupal ___ Egg ___ Overwintering larval ___ Adult _____

PRE-SPRAY _____	POST-SPRAY _____	DEVELOPMENT _____	PARASITE _____
<small>No. Units Searched</small>	<small>Total No. of Bud Masses</small>	<small>Total No. of Larvae</small>	<small>Total No. of Parasites</small>

EGG MASS OR OVERWINTERING LARVAL SURVEY