Large Larvae (3rd through 6th Instar)*

Objectives:

1. Provide a measure of expected damage.
2. Identify candidate stands for spraying, including "last minute" removal of marginal population spray blocks for initial or second pesticide application.
3. Time direct control properly.
4. Time placement of pheromone traps.

Time of Year: Sampling may be carried out anytime after larvae are established in the buds or new shoots. It is essential that date of collection and budworm

Equipment Needed: Extension pole pruners with basket or clamp attachments, tarpaulin on which to drop branch when clamp attachment is used, tape measure, data sheets.

Note: Use of basket or clamp attachments in sampling branches for

larvae through dropping from foliage when disturbed occur. Losses can rise to 30% for sixth instar larvae (DeBoo, 1974).

Procedure: 1. For intensive sampling programs (e.g. preparation of life tables)

Table 10. Tentative estimates of variance-mean relationships for third-fourth instar larvae per whole mid-crown balsam fir branch tip [Miller, (unpubl.), as presented by Sanders, (1980)].

Table 11. Tentative estimates of variance-mean relationships for third/fourth instar larvae per m^2 of balsam fir branch surface [Miller, (unpubl.), as presented by Sanders, (1980)].

c. **Bud phenology:** Bud phenology as defined by Auger's bud classification system (Figure 2) can be used to derive a bud development index (Table 12). A sample of 25-50 shoots per plot is recommended to accomplish the latter. The index is a useful way to anticipate damage by comparing bud development to that of the insect (Table 13). When the insect is developing faster than the buds/shoots, a lower infestation level is required to cause a specific amount of damage compared to a higher population developing slower than the buds/shoots. Thus, the larval density vs current defoliation relationship produces a different damage curve under these two circumstances.

Table 13. Example of calculation for Auger's bud [illegible]

Table 13. Computation example for spruce budworm development index based on degree days above threshold of 5° C (Dorais and Kettela, 1982).

may also help to establish the general stage of development. For example, small and wandering caterpillars are usually L2s that have recently emerged from overwintering sites. Budworm that are found mining needles and buds or feeding in staminate flowers are usually L2s or L3s, and L4 through

The separation of the insect material from the foliage by the drum technique is done in three steps: (1) beating of the branch sample vigorously against the screen table and the side of the drum (30 strokes in all), (2) brushing down the screen and the inside of the drum to direct larvae into the jar, and (3) removing the jar for examination of contents.

b. **Beating:** For rapid, extensive surveys to provide indices of population density the beating technique has been used

budworm sampling has been agreed upon for eastern Canada. At each sampling location two samples are taken, one from each side of the tree, from 10 trees. Each sample consists of the number of larvae falling onto a cloth tray 3 ft x 3 ft (ca 1 m^2) when the foliage in a volume of 1 yd^2 (ca 1 m^3) above the tray is jarred.

Beating is most suitable for pre-outbreak surveys of large larval populations. Although tree beating samples are used

Table 14 Classification of the number of budworm larvae per branch into

Data Sheets: Data sheets on page 53, used for data about large larvae are similar to those used for 2nd instar larvae.

Comments:

1. Larval sampling becomes more difficult once the insect inhabits expanding buds, staminate flowers, or current year's foliage (Allen *et al*, 1984).

2. Comparison of densities from year to year can be made only if budworm phenology at time of sampling is identical or if appropriate adjustments have been made (Sanders, 1980).

3. [redacted]

SPRUCE BUDWORM SURVEY MAP AREA _____

Collectors: _____

Date: Year: Town: