Adults

Two methods of evaluating adult budworm populations include light and pheromone traps.

Objective:

1. Detect the presence of the budworm.
2. Provide a reliable means to predict larval density.
3. Indicate population trend when operated for a number of years in the same location.
4. Indicate moth invasions by the incidence of unusually high catches on particular nights during a single season.
5. Monitor changes in sparse populations where other sampling methods are impractical.

Time of Year: Light and pheromone traps must be in place during the entire flight period (eg., late June through July). In Quebec, the BioSIM model (Regniere and Cooke, in press) is used to plan th timing for installation and removal of traps.

Equipment Needed:

1. **Light Trapping:** Commercial or hand-made black light trap, killing agent, cardboard containers with cotton dividers for moth storage (if sorting is to be done by lab personnel), data sheets.
2. **Pheromone Trapping:** Multi-pher pheromone trap, lure, cardboard containers with cotton dividers for moth storage, markers, data sheets.

Procedure: **Light Traps:** Catches of female spruce budworm in light traps hung in the forest canopy, coupled with the density of resident females (determined by pupae sampling), can be used as a crude predictor of egg-mass densities over a fairly wide range of population densities (Miller *et al*, 1979). This method saves considerable time over conventional egg-mass sampling (Sanders, 1980).

No firm protocol for light trapping spruce budworm moths exists at present; improvisation on light trap size, design, and placement seems to vary from region to region. Sanders (1980) comments that information on effects of factors such as wavelength and energy

output of light sources, trap design, different responses of the two sexes, trap location (eg., within or above canopy, in clearings, etc), mating and oviposition status and age, and climate is necessary before light trap catches can be used as accurate indicators.

Pheromone Traps: Many northeastern states follow a protocol and use traps provided by the USFS. Multi-Pher traps are baited with a synthetic pheromone (95:5 blend of (E)- and (Z)-11-tetradecenal). The pheromone is imbedded in either a laminated flake or hollow fiber and suspended immediately below the cover inside the trap. Moths that enter trap are killed by vapors released from Vapona (resin impregnated with dichlorvos) which is placed in the bottom of the trap.

1. Identify pheromone trapping areas. The minimum sized stand for a pheromone survey is usually 50 acres and plots should be at least 70% fir.

2. Three pheromone traps are deployed at each site. In some states (eg., VT), traps are arranged in a triangular pattern with 40 m between each trap. In other states (eg., N.H.), one trap is placed in the center of the plots and two traps are placed in a line on either side of the center tree at a distance of 100 feet. Trees holding pheromone traps should be permanently marked. Traps height is 5-7 feet.

3. Traps are hung in mid-July and retrieved at the end of August. Traps are brought back from the field, emptied, and spruce budworm moths are counted. Moth counts can also be made by weight (Allen *et al*, 1986).

Data Sheets: A typical data sheet follows.

Comments:

1. Light trap catches can predict budworm outbreaks while there is still time to plan control tactics or perform silvicultural manipulations to lessen budworm damage.

2. Light traps are relatively inexpensive to make.

3.A major drawback to light traps is that several species of insects are

attracted to the light and trapped along with the spruce budworm, so that sorting collections and counting budworm can take a lot of time.

4. For light traps, more information is needed on factors such as (a) different wavelengths and energy output, (b) different trap designs, (c) different responses by the two sexes, (d) trap location, (e) mating and oviposition status and age of adult, and (f) climate. Some of these factors have been examined by Jobin and Coulombe (1992).

5. Pheromone traps are easier to handle and relatively lower in cost than light traps, and they are more specific than light traps, eliminating the need for extensive sorting of trap catches.

6. Pheromone trapping provide ample lead time to plan management activities other than direct control (eg., revised harvesting schedules).

7. Pheromone traps are sensitive to low-level populations (eg., densities of <1.0 late-instar larvae per 18 in branch tip) and minor fluctuations in them.

8. Pheromone traps are relatively easy to handle and transport.

9. Pheromone and light traps avoid the use of inconsistent sampling units such as surface area of branches.

SPRUCE BUDWORM SURVEY MAP AREA _____

FIR SPRUCE POINT NO._____

Collectors:_____

_____

Date: _____ Year: _____ Town: _____-

_____

Location:_____

_____

Stage: Early larval___ Late larval___ Pupal___ Egg___Overwintering larval___ Adult_____

County	Town	Location	Trap #	# of SBW Adults	# of Other Moths
			1 2 3		
			1 2 3		
			1 2 3		
			1 2 3		
			1 2 3		
			1 2 3		
			1 2 3		
			1 2 3		