SELECTING SAMPLING POINTS FOR LARVAE OF WESTERN SPRUCE BUDWORM, *CHORISTONEURA OCCIDENTALIS* (LEPIDOPTERA: TORTRICIDAE), FROM SURVEY RECORDS IN BRITISH COLUMBIA

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RÉSUMÉ

Les chiffres de population de larves de la tordeuse occidentale de l'epinette, *Choristoneura occidentalis* Free., relevés annuellement au moyen d'echantillonnage par battage sur le Douglas taxifolié *(Pseudotsuga menziesii* (Mirb.) Franco) ont été analysés sur une période de 30 ans. Les données provenant des points d'echantillonnage ayant donné le plus fréquemment des comptes élevés at subi une défoliation détectable ont été analysées et comparées aux résultats obtenus pour tous les échantillons. Quand l'objectif de l'échantillonnage était la prévision des populations, les 98 points échantillonnés depuis 1949 pouvaient se réduire à 17, ce qui permettait une diminution sensible du coût de collecte des donneés.

ABSTRACT

Annual counts of larvae of western spruce budworm, *Choristoneura occidentalis* Free., from beating samples of Douglas-fir *(Pseudotsuga menziesii* (Mirb.) Franco) were analyzed over 30 years. Sampling points which most frequently yielded high budworm counts and also had detectable defoliation were analyzed and compared with results from all the samples. When the purpose of sampling was to predict populations, the 98 points sampled since 1949 could be reduced to 17, thus enabling a significant reduction in the cost of data collection.

INTRODUCTION

The western spruce budworm, *Choristoneura occidentalis* Freeman, is an important defoliator which periodically causes damage in forests of Douglas-fir *(Pseudotsuga menziesii* (Mirbel) Franco) in southern British Columbia. Larval feeding results in loss of increment, and deformity or death of trees (Shepherd *et al.* 1977).

Douglas-firs are sampled uniformly each June by the Canadian Forestry Service's Forest Insect and Disease Survey (FIDS), using a three-tree beating method, at a series of established sampling points (Harris *et al.* 1972). Spruce budworm larvae in the samples are counted and the numbers per 3-tree sample are used to help determine population and damage trends.

Limited funds and manpower and pest problems of higher priority, call for periodic reassessment of budworm sampling procedures. Travel and manpower are the most expensive factors in sampling, so that it is important to keep the number of sampling points to a minimum.

Two distinct outbreaks of budworm occurred in southwestern B.C., from Pemberton through Lillooet to Hope, in the period since 1949 for which the FIDS historical data bank contains budworm records. We re-examined these data to determine if criteria could be devised by which we could eliminate samples without significantly changing the estimates of population trends found by using the entire data base.

METHODS

Sampling points were selected from the FIDS data for 1949 to 1978, based on the following criteria:

1. Sampled 5 years or more.
2. Budworm larvae found in at least 30% of the sample years.
3. Numbers of larvae greater than the average for all points in at least 30% of the sample years.
4. Noticeable defoliation within the sampled Universal Transverse Mercator map grid for a total of 5 or more years.
5. Defoliation as in No. 4, but visible in the first year that it was detected anywhere in the surrounding drainage.

Two measures of budworm population numbers were derived from the data. These were the percentage of all samples which contained one or more budworm larvae (percent positive samples) and the average number of larvae per

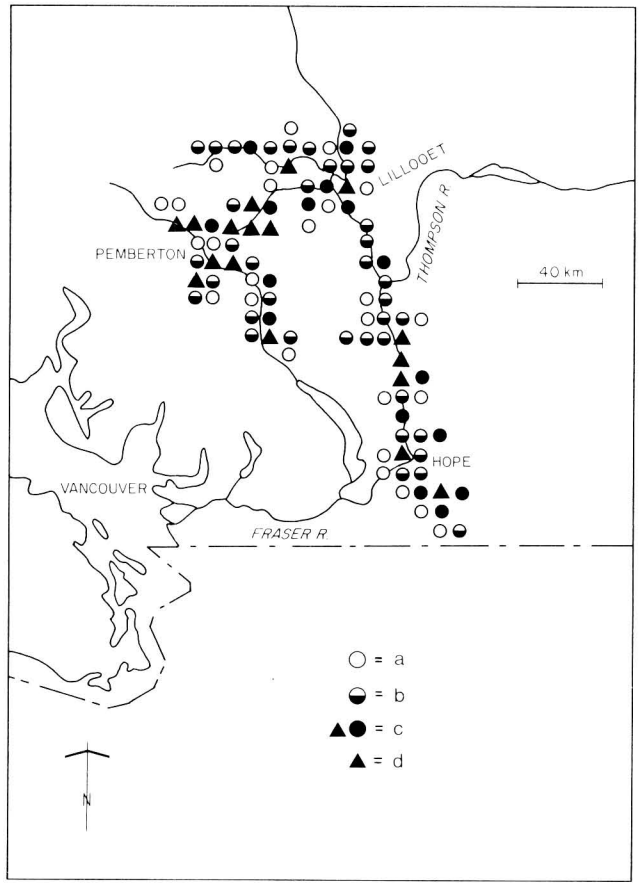

Fig. 1. Location of western spruce budworm beating sample points in southwestern British Columbia, 1949-1978.

a. Sampling points (26) with less than 5 years' records.
b. Sampling points (39) with records of 5 or more years but not meeting criteria in "c" or "d".
c. Sampling points (33) with
   1/ 5 or more years' records,
   2/ larvae found in at least 30% of the years,
   3/ numbers of larvae greater than the average in at least 30% of the sample years,
   4/ 5 or more years of defoliation.
d. Sampling points (17) meeting criteria 1-4 above but with criterion 5; *i.e.*, initial defoliation in the drainage occurring at the sampled UTM grid.

sample (Harris 1976). These figures were calculated for all samples, for samples meeting criteria 1-4, and for those meeting 1-5.

RESULTS AND DISCUSSION

There were 98 points where western spruce budworm larvae were found on Douglas-fir at least once since 1949 in the area studied (Fig. 1). Of these, 26 had been examined for less than 5 years (criterion 1) and were discarded because we considered that they could not be properly assessed. Thirty-three of the remaining 72 points met criteria 1-4. Although the average annual larval counts from the 33 points were higher than the counts from all 98 points, the year-to-year rate of change was similar; i.e., the trends (Fig. 2) coincided closely, except for amplitude. Further limiting the sampling points to those where defoliation was detected in the first year (criterion 5) reduced the 33 points to 17. These 17 are particularly useful sampling points since they provide a record in which population increases coincide with and may even precede visible damage. The trends in average larval counts from the 17 points were still similar to those based on all 98 points.

All the 98 FIDS sampling points studied were

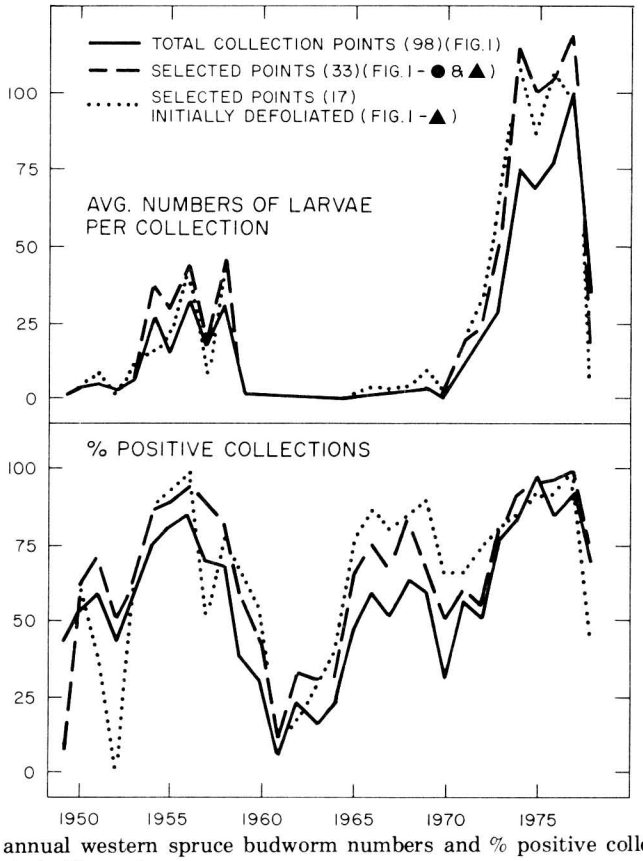

Fig. 2. Average annual western spruce budworm numbers and % positive collections at beating sample points in Figure 1.

originally chosen because they possessed characteristics typical of the stands they represented. At that time there were few historical records to draw upon regarding insect activity. Until we know more about favorable site factors new points must be selected as before, and evaluated as survey data accumulates.

This technique of sample point selection cannot be used to evaluate infrequently sampled areas. Also, data from points selected by this technique cannot be used for studying site preferences or other factors affecting abundance because of the exclusion of many sites. Information about the characteristics of points retained or discarded, however, may help in the future selection of sampling points.

Most FIDS sampling points provide information on several insect species, so all species should be considered when decisions are made to preserve or discard any sampling point. Separate samples, however, may be necessary for optimum sampling of certain species. In the present study of western spruce budworm, no other insects occurred in significant numbers in samples taken during the 30 years studied.

ACKNOWLEDGEMENTS

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