

Douglas-Fir Cone Gall Midge

Contarinia oregonensis Foote

Diptera: Cecidomyiidae

Miller, G. E. 1986. Damage prediction for *Contarinia oregonensis* Foote (Diptera: Cecidomyiidae) in Douglas-fir seed orchards. *Canadian Entomologist* 118: 1297-1306.

Objective: To develop a sequential sampling plan for classifying infestations based on the relationship between egg-infested conelets in the spring and the number of damaged seeds per cone at harvest.

Abstract: The Douglas-fir cone gall midge, *Contarinia oregonensis* Foote, is a serious pest of Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco, seed in forests and seed orchards of western North America.

Damage by *C. oregonensis* was correlated positively with the number of egg-infested scales per conelet in the spring. Two methods that determine the number of samples required to estimate populations of *C. oregonensis* accurately are presented. The optimum sample size for estimating densities of egg-infested scales in seed orchards was one conelet per tree from each of 154 trees per orchard. Cones were sampled halfway up the cone-bearing portion of the crown. A sequential sampling plan relative to a critical density was also developed for control decision-making. An average of 2.6 egg-infested scales per conelet was determined to cause 10% seed loss assuming 85% insecticide efficacy. If the average number of egg-infested scales ≥ 2.6 , then control was warranted.

Sampling Procedure:

Fixed sample size plan: The optimal number of conelets per tree is determined using procedures presented in the original publication. However, sampling one conelet from each of 154 trees will give estimates with 90% confidence and 10% error. Sampling requires ~17.5 h.

Sequential sampling plan:

Individual trees: Sample cones halfway up the cone-bearing portion of the crown. Dissect, count, and record the number of infested scales, referencing the sequential sampling plan (Fig. 4). Continue sampling until a decision is met or 97 cones are sampled. If the cumulative total of number of egg-infested scales drops below the lower line, control is not warranted. If the cumulative total of egg-infested scales falls above the upper line, control is warranted.

Seed Orchards: Sample one conelet per tree halfway up the cone-bearing portion of the crown. Dissect, count and record the number of infested scales, and reference the sequential sampling plan (Fig. 5). The maximum number of trees to be sampled is 154.

This sequential sampling plan has been used operationally in British Columbia since 1981. During this period most orchards were sampled and decisions reached by the time 100 conelets had been processed with an average processing time of 7-8 h.

Notes: A larger than expected sampling error may be realized. This technique was developed in seed orchards and may require modification for clonal orchards if variation to *C. oregonensis* susceptibility exists among clones.

Figures:

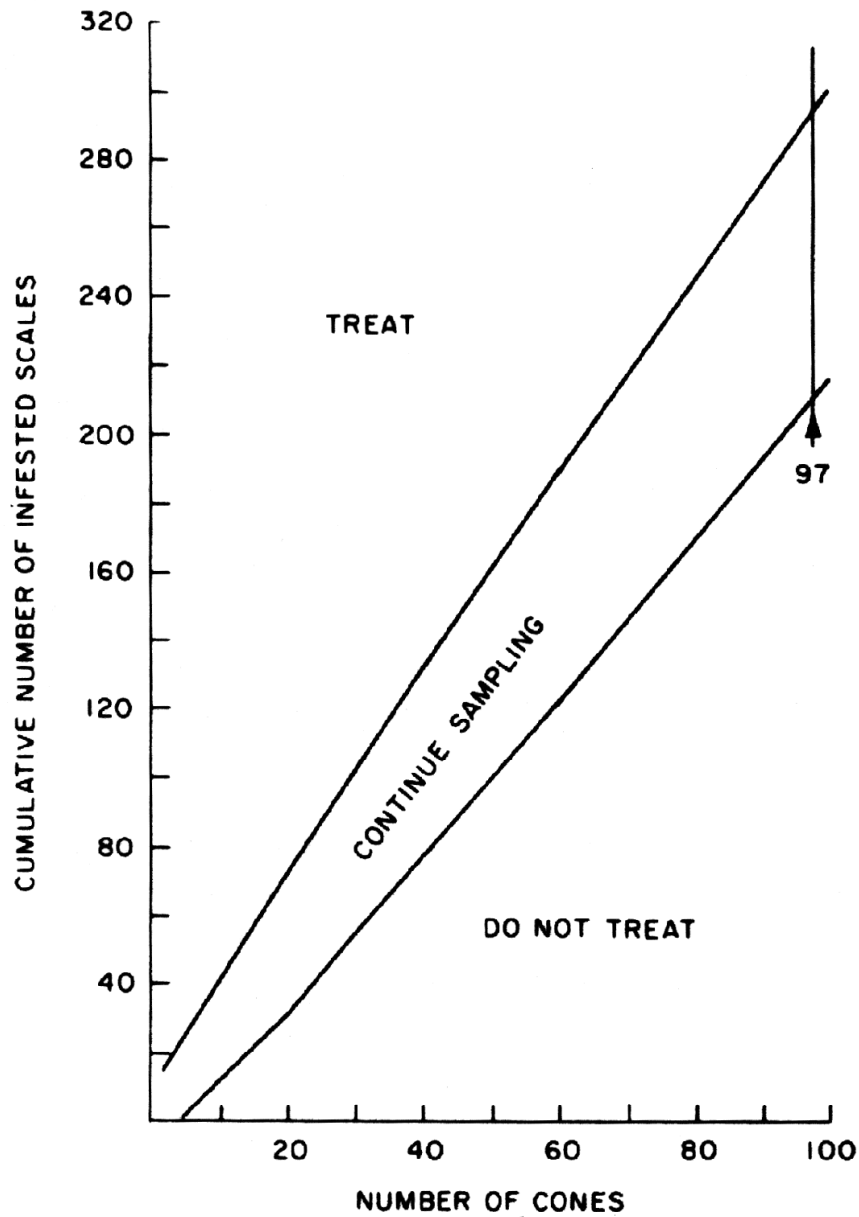


Fig. 4. Sequential sampling graph for individual trees with 10% sampling error and 90% confidence using a critical density equivalent to 10% seed loss. Conelets should be collected from the midpoint of the conelet-bearing region.

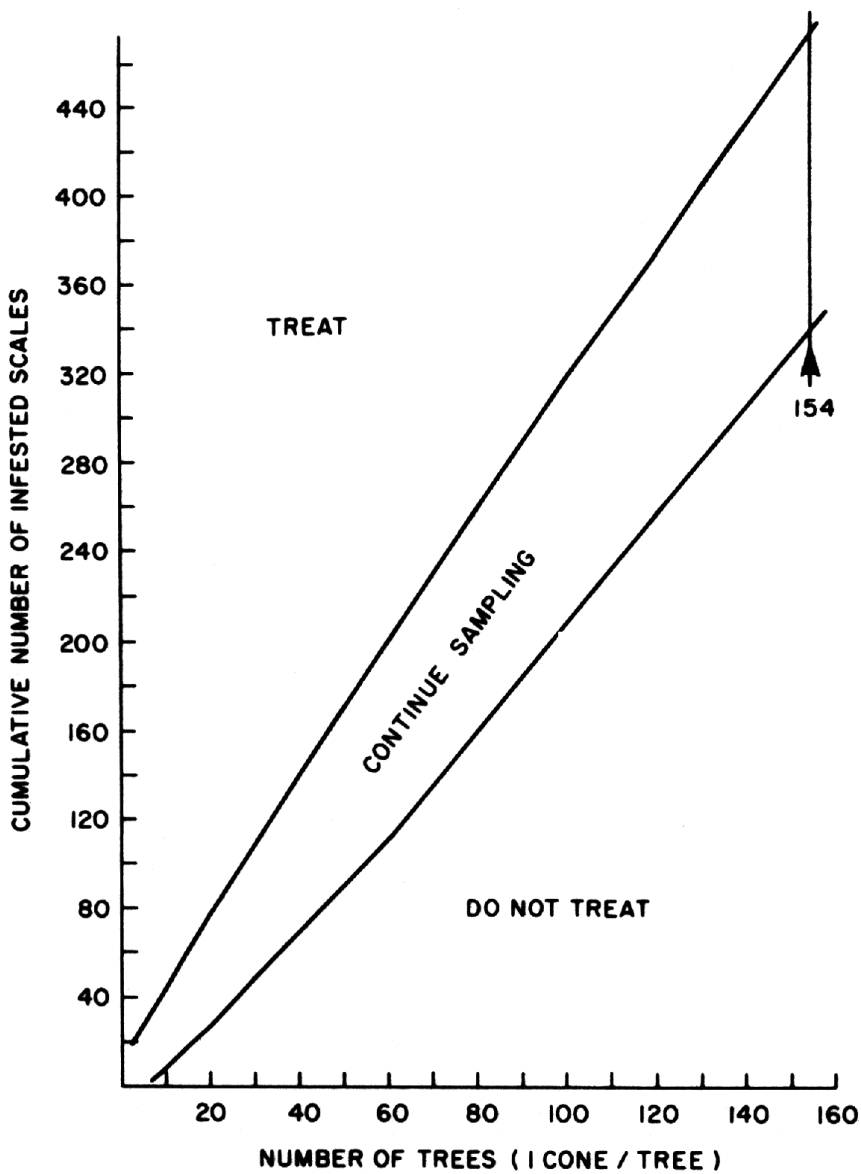


Fig. 5. Sequential sampling graph for an orchard taking one conelet per tree, at the midpoint of the conelet bearing region, with 10% sampling error and 90% confidence using a critical density equivalent to 10% seed loss (2.6 egg-infested scales per conelet).

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