Mountain Pine Beetle

Dendroctonus ponderosae Hopkins
Coleoptera: Curculionidae

Wulder, M. A.; Dymond, C. C.; Erickson, B. 2004. Detection and monitoring of the mountain pine beetle. Info. Rpt. BC-X-398. Victoria, B.C.: Natural Resources Canada, Pacific Forestry Centre; 24 p.

Objective: To describe a method of estimating the population trend and overwintering mortality for *D. ponderosae*.

Abstract: Mountain pine beetle, *Dendroctonus ponderosae* Hopkins, is a serious pest of lodgepole pine, *Pinus contorta* Dougl. ex Loud, in western North America. Other hosts include ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.), sugar pine (*Pinus lambertiana* Dougl.), and western white pine (*Pinus monitcola* Dougl. ex D. Don). Generally *D. ponderosae* attacks host pines stressed by mechanical or fire damage, growing on poor sites, attacked by pathogens or other insect pests, or are overmature or overcrowded. Even healthy trees may be attacked and extensive tree mortality may occur during outbreaks of *D. ponderosae*.

Fixed-size bark samples offer a statistically valid means of determining the population trend and overwintering mortality of *D. ponderosae* within a stand (Shore 1985). Typically bark samples are 900 cm^2 and sample plots are <1 ha in size. The number of eggs and larvae, pupae and adults, and galleries present in the sample are used to calculate the average trend ratio within a stand of a given number of sampled trees. Stands can be classified as having an increasing, decreasing, or static population. Trend ratios from the fall and the spring can be used to determine the overwintering mortality of *D. ponderosae* occurring within a stand. Trend ratios should be used only to support the findings of aerial or ground surveys, but not replace them.

Sampling Procedure: Of particular interest are newly infested green trees near red attacked trees. These green attacked trees currently hold brood and will serve as the source of new infestations. Green attack trees should be located through ground surveys by starting near red trees and using a prism or strip cruising technique. These surveys should be done between September and October, and later again the subsequent spring. As potential brood trees are found in stands, remove a fixed size area of bark (ca. 900 cm^2) from each tree. Tally the number of eggs and larvae, pupae and adults, and galleries present in the bark sample. Calculate the average trend ratio (r) for each stand using the following formula:

$$r = \frac{\sum_{t} \left((y + o) / g \right)}{t}$$

where *y* = the number of eggs and larvae, *o* = the number of pupae and adults, *g* = the number of galleries present in each sample, and *t* = the number of sampled trees. If *r* >4.0, then the population is increasing. If *r* <2.6, the population is decreasing. If 4.0 < *r* >2.6, then the population is static. *Use the estimated trend ratio to support data collected in aerial and ground surveys, but not as a definitive infestation estimate for a given population.*

If of interest, determine the percent of overwintering mortality (*r*) in each stand using the following equation:

$$r = \frac{(r\_fall - r\_spring)x100}{r\_fall}$$

where *r* = the average trend ratio, *r*_fall = *r* determined in the fall, and *r*_spring = *r* determined in the spring.

Note: The average trend ratio and percent of overwintering mortality should be used to support the interpretation of aerial and ground surveys of *D. ponderosae* infestations. They should not be used as the primary technique of assessing infestations. Ground crews doing brood survey work should be trained well and their work should be checked periodically for consistency and accuracy.

Reference:

Shore, T. 1985. Forest insect and disease survey, Pacific Region: general instruction manual. Victoria, B.C.: Government of Canada, Canadian Forestry Service, Pacific Forest Research Center; 125 p.