

Spruce Beetle

Dendroctonus rufipennis (Kirby)

Coleoptera: Curculionidae

Hansen, E. M.; Bentz, B. J.; Munson, A. S.; Vandygriff, J. C.; Turner, D. L. 2006. Evaluation of funnel traps for estimating tree mortality and associated population phase of spruce beetle in Utah. *Canadian Journal of Forest Research* 36: 2574-2584.

Objective: To relate trap capture of *D. rufipennis* to tree mortality within a given area and predict the size of a local population.

Abstract: Spruce beetle, *Dendroctonus rufipennis* (Kirby), is a serious pest of spruce trees (*Picea* spp.) in North America. Englemann spruce (*Picea engelmannii* Parry ex Engelm.), white spruce [*Picea glauca* (Moench) Voss] and Sitka spruce (*Picea sitchensis* Carr.) are commonly attacked. Large-diameter, mature trees are preferred hosts. The life cycle of *D. rufipennis* typically takes two years to complete, but can be accelerated if summers are long, hot, and dry. Outbreaks of *D. rufipennis* may last 2-5 years and can produce high levels of mortality in mature spruce trees.

Researchers in Utah related captures of *D. rufipennis* in Lindgren funnel traps (Lindgren 1983) to population phase and a relative measure of tree mortality for the current and subsequent year in Englemann spruce. Populations of *D. rufipennis* could be separated into endemic (<2 mass-attacked trees per ha) or epidemic (≥ 2 mass-attacked trees per ha) phases based on total trap capture. Capture of ≈ 842 beetles from a single trap over a flight period is considered a threshold delineating the endemic and epidemic phases of *D. rufipennis* for the current and subsequent year relative to trap use. The epidemic phase is further indicated by the presence of spillover attacks on susceptible host trees within 10 m of the funnel traps. Total trap capture was not useful in predicting the number of trees that were attacked, nor could suboutbreak populations *D. rufipennis* be distinguished using this technique. Land managers can use the population phase of *D. rufipennis* and associated level of tree mortality predicted by total trap capture as an aid in making management decisions.

Sampling Procedure: Bait each 16 unit Lindgren funnel trap with a two-component lure consisting of racemic frontalin and +5/-95 α -pinene (PheroTech, Inc., Delta, B.C.). Load frontalin and α -pinene separately in 400 μ L and a 1.8 mL centrifuge tubes, respectively. Release rates for frontalin and α -pinene should be 2.8 and 1.3 mg per day at 20°C, respectively. Include an insecticidal strip in each trap to kill any beetles attracted to the trap.

Multiple funnel traps should be installed in stands of Englemann spruce, with >800 m between traps to avoid inter-trap bias. Hang traps so the trap cup is 1.5 m above ground and >0.25 m from any bole. Service traps weekly during the operational period. Traps should remain in place throughout the entire flight period of *D.*

rufipennis, approximately late May through mid-August. Replace α -pinene lures in mid-summer.

Total trap capture of under ≈ 842 beetles per trap indicates that the population is in an endemic phase, whereas a trap capture of ≈ 842 beetles or more indicates that the population is in an epidemic phase. The relative density of mass-attacked trees and the predicted level of tree mortality associated with endemic and epidemic populations of *D. rufipennis* are provided below:

Total trap capture over flight period	Population phase	Associated density of mass-attacked trees	Predicted host tree mortality
>842 beetles per trap	Endemic	<2 mass-attacked trees per ha	Few, if any, trees within 10 ha infested in current or subsequent year
<842 beetles per trap	Epidemic	≥ 2 mass-attacked trees per ha	Substantial tree mortality within a 10 ha area in the subsequent year, if not the current year

At the end of the flight period, examine susceptible host trees within 10 m of the funnel trap for evidence of mass-attack by *D. rufipennis*. Spillover attacks within 10 m of the funnel trap are a further indication of an epidemic population phase.

Note: Not all populations of *D. rufipennis* may respond in similar ways to the combination of lures and trap type used in this study. The recommendation made from this study should be used with caution until verified in other regions.

Reference:

Lindgren, B. S. 1983. A multiple funnel trap for scolytid beetles (Coleoptera). Canadian Entomologist 115: 299-302.