Douglas-fir Tussock Moth

Orgyia pseudotsugata (McDonnough)
Lepidoptera: Lymantriidae

Daterman, G. E.; Wenz, J. M.; Sheehan, K. A. 2004. Early warning system for Douglas-fir tussock moth outbreaks in the western United States. Western Journal of Applied Forestry 19: 232-241.

Objective: To monitor increasing densities of *O. pseudotsugata* using a system of pheromone-baited traps in sentinel plots throughout the western USA.

Abstract: Douglas-fir tussock moth, *Orgyia pseudotsugata* (McDonnough), is a periodic defoliator of Douglas-fir, *Pseudotsuga menziesii* (Mirb.), and true firs, *Abies* spp., in western North America. Outbreaks occur quite unexpectedly every 7–10 years and usually persist for 3–4 years. Defoliation by *O. pseudotsugata* can be severe and cause widespread tree mortality during the first year of an outbreak. Surviving trees may exhibit growth loss, top-kill, and tree deformity.

Beginning in 1979, an Early Warning System established in the western USA has allowed the timely detection of increasing populations of *O. pseudotsugata* with pheromone-baited traps. Trapping in sentinel plots can detect increasing populations of *O. pseudotsugata* 1–3 years before defoliation is visible to aerial surveys. Each sentinel plot of host trees contains a line of 5 pheromone traps spaced at 22.9 m intervals. Traps are deployed annually from approximately late July to early November. Catches of ≥25 moths in each trap within a sentinel plot indicate increasing populations of *O. pseudotsugata* with the potential to produce visible defoliation within 1–3 years. Given the variation occurring among traps within plots and among plots, land managers can use the operational threshold of an average of 17 moths in each of the 5 traps installed in a sentinel plot. Populations exceeding this threshold require follow-up ground surveying for egg masses or larvae to delineate the infested area and confirm population levels. Based on trap catches from this early warning system, land managers can decide whether chemical control measures are necessary for *O. pseudotsugata* in the following spring with sufficient time to plan control operations over the winter months.

Sampling Procedure: Establish at least one sentinel plot per 1,214 ha. Plots should be spaced evenly throughout the area of concern and should reflect any previous defoliation. Consider establishing additional plots in areas with greater value or where management objectives may include applying control measures very quickly when populations exceed the threshold.

Traps consist of a 1.9-liter milk carton modified to a delta trap with an interior coated with an adhesive. Suspend a pellet of synthetic pheromone above the adhesive on a long pin. Refer to Daterman et al. (1979) for additional details regarding the pheromone traps used in the early warning system. Install traps each

year in sentinel plots between late July and mid-August. Remove traps between mid-October and early November. Tally the number of moths in each trap.

Catches of ≥25 moths per trap signal increasing populations of *O. pseudotsugata* with the potential to produce visible defoliation in the next 1–3 years. However, mean moth catches will naturally vary among traps within a plot, among plots, and across regions. Operationally, land managers should consider control measures when trap catches average 17 moths per trap within a sentinel plot to account for a variation of ±30% trap catch. When *O. pseudotsugata* populations exceed this threshold, use ground surveys to pinpoint the location of the infestation and confirm rising populations by sampling egg masses or larvae. Survey egg masses, pupae, and/or cocoons in the fall of the year rising populations are detected or young larvae in the following spring. Surveys should be conducted in the 1- to 2-km area surrounding the plot where increasing populations were detected as pheromone traps may attract *O. pseudotsugata* migrating from other areas. Additional sentinel plots can be established in areas where rising populations are detected to confirm the population increase, but ground surveys are strongly encouraged so that control measures can be implemented as soon as possible if needed. Waiting until the end of the second year of rising populations to make management decisions may cost land managers the benefit of early warning in those cases where defoliation occurs within 1 year of initial warning.

Reference:

Daterman, G. E.; Livingston, R. L.; Wenz, J. M.; Sower, L. L. 1979. How to use pheromone traps to determine outbreak potential. Douglas-fir Tussock Moth Handb. No. 546. Washington, D.C.: U.S. Department of Agriculture, Forest Service; 11 p.