Gypsy Moth

Lymantria dispar (L.)
Lepidoptera: Lymantriidae

Sharov, A. A.; Liebhold, A. M.; Roberts, E. A. 1997. Methods for monitoring the spread of gypsy moth (Lepidoptera: Lymantriidae) populations in the Appalachian Mountains. Journal of Economic Entomology 90: 1259-1266.

Objectives: To compare variability of population boundaries of *L. dispar* in time and space as estimated from pheromone trap data and egg mass counts; to select the least variable threshold for use in monitoring population spread; to evaluate spread rates estimated from male moth trap catches; and to assess the relationship between accuracy and placement of pheromone traps.

Abstract: Gypsy moth, *Lymantria dispar* (L.) is an important defoliator of numerous hardwoods. Defoliation reduces tree growth and vigor, and, in combination with other stress factors, can cause extensive tree mortality. Populations are spreading from an initial accidental introduction at Medford, MA, around 1868, throughout northeastern USA and neighboring Canada. Population spread must be monitored to evaluate control strategies in gypsy moth management, including appropriate placement and timing of control measures, identification of areas for quarantine status, and targeting areas for treatment rather than broadcasting pesticides over widespread areas. Suppression or eradication of detected colonies ahead of the advancing front is an important tool in reducing the rate of spread. A model developed by Sharov and Liebhold (1997) predicts that control of isolated colonies will reduce the annual spread of *L. dispar* by 53%.

Historical pheromone trap data (1988-1995) and egg mass count data (1988-1991) from the Appalachian Mountains in northern Virginia and southern West Virginia were analyzed by the authors. Regression analysis of population boundaries in time and space, as measured by trap data and egg mass counts, was used to calculate spread rates from year to year. Sampling methods used to collect pheromone trap data and egg mass densities are described by Sharov and others (1995, 1996). Thresholds of 1, 3, 10, 30, 100, and 300 male moths per pheromone trap and 1, 3, 10, and 30 egg masses per 0.01 ha were evaluated. Correlograms for male moth trap catches were developed to analyze autocorrelation of spread rates in space, time, and among population thresholds. The effect of intertrap distance on population spread rate was estimated using a modified Tukey jackknife method (refer to original publication for greater detail of statistical analyses).

Sampling Procedure: Pheromone traps: A 2.5-km grid is an appropriate intertrap distance with a relatively high accuracy when estimating annual spread rates (SE = 13-21% of the annual spread rate). Intertrap distances can be maximized to 11-km, but the authors recommend increasing the distance to no more than 8 km in case traps are lost after deployment, thus creating gaps in the data. Increasing the intertrap distance from 2.5 to 7 km raised the mean standard error 3.9 times. Use a threshold of 10 male moths per trap for control decisions. Low trap catches (<3 males) likely result from wind-borne male migrants, while higher trap catches likely reflect reproduction by local colonies.

Egg mass surveys: Use a threshold of 10 egg masses per 0.01 ha, the least variable threshold tested, for control decisions.

Notes: Population boundaries are based on best-cell classification as described by Sharov et al. (1995, 1996). The authors also examined using defoliation maps as a means to estimate spread of *L. dispar*, but found that boundaries were highly variable and did not accurately reflect annual spread. The authors caution that the Appalachian Mountains represent a unique geographical area and their research may not accurately reflect population spread in other regions where gypsy moth is established.

References:

Sharov, A. A., Roberts, E. A.; Liebhold, A. M.; Ravlin, F. W. 1995. Gypsy moth (Lepidoptera: Lymantriidae) spread in the central Appalachians: three methods for species boundary estimation. Environmental Entomology 24: 1529-1538.

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Sharov, A. A.; Liebhold, A. M. 1998. Model of slowing the spread of gypsy moth (Lepidoptera: Lymantriidae) with a barrier zone. Ecological Applications 8: 1170-1179.