Gypsy Moth

Lymantria dispar (Linnaeus)
Lepidoptera: Lymantriidae

Carter, J. L.; Ravlin, F. W.; Gray, D. R.; Carter, M. R.; Coakley, C. W. 1994. Foliage presence and absence effect on gypsy moth (Lepidoptera: Lymantriidae) egg mass sample counts and the probability of exceeding action thresholds with foliage present. *Journal of Economic Entomology* 87: 1004-1007.

Objectives: To determine if there is a significant difference between egg mass estimates taken when foliage is present (summer) or absent (winter), and to determine the probability of exceeding action thresholds for summer counts based on winter data.

Abstract: The gypsy moth was introduced into Medford, Massachusetts in 1869, and is now a major defoliator of hardwoods throughout the northeastern USA and Canada. Defoliation reduces tree growth and vigor, and in combination with other stress factors can cause excessive tree mortality. Egg mass sampling is the primary method of estimating populations in order to make control decisions. Fixed-and-variable-radius plot samples were taken when foliage was present (summer) and absent (winter) at 136 sites, and their relationship analyzed with nonparametric statistics.

Winter counts were 14–36% higher than summer egg counts. The probability of summer egg mass counts exceeding action thresholds was determined by fitting a logistic curve to empirical data for thresholds of 618 and 1,236 egg masses per hectare. If egg mass samples are taken when foliage is present, then the data needs to be adjusted for differences between summer and winter counts.

Sampling Procedure: Ninety-seven fixed and variable-radius plots (BAF 20) were established on a 50-m grid in two 9-ha study areas in Shenandoah National Park, Virginia. The sampling method is described in detail in Wilson and Fontaine (1978). Summer egg mass sampling began after male moth flight had ceased and continued through September. Winter egg mass samples were taken after leaf abscission through February.

The number of egg masses per hectare was calculated for summer and winter counts for each plot. Summer egg mass counts were grouped into intervals of 200 (excluding zero), and the frequency distribution of winter counts was determined. For each interval, the cumulative frequency in which winter counts were above each of the action thresholds of 618 and 1,236 egg masses per hectare was used to construct a probability curve (Fig. 1).

Winter counts (*W*) were significantly higher than summer counts (*S*) on a per tree basis ($W = 1.18 * S$; $X^2 = 129.03$, df = 79, $P = 0.0003$) and plot basis ($W = 2.28 + 1.23 * S$; $X^2 = 635.48$, df = 136, $P = 0.0001$). Use Fig. 1 to determine the probability that summer counts will exceed an action threshold based on winter counts. For example, given an action threshold of 618 egg masses per hectare and a summer count of 200 egg masses per hectare, there is only a 31% chance that a winter count would exceed the action threshold (Fig. 1). If 600 egg masses were counted per hectare, there is a 93.0% chance that a winter count would exceed the action threshold.

Note: The authors suggest there is error in sampling and predation of egg masses, which can result in lower winter counts even though greater visibility of egg masses occurs when foliage is absent.

Reference:

*Wilson, R. W. Jr.; Fontaine, G. A. 1978. Gypsy moth egg mass sampling with fixed-and-variable-radius plots. Agric. Handb. 523. Washington, DC: *U.S. Department of Agriculture*; 46 p.

Figure:

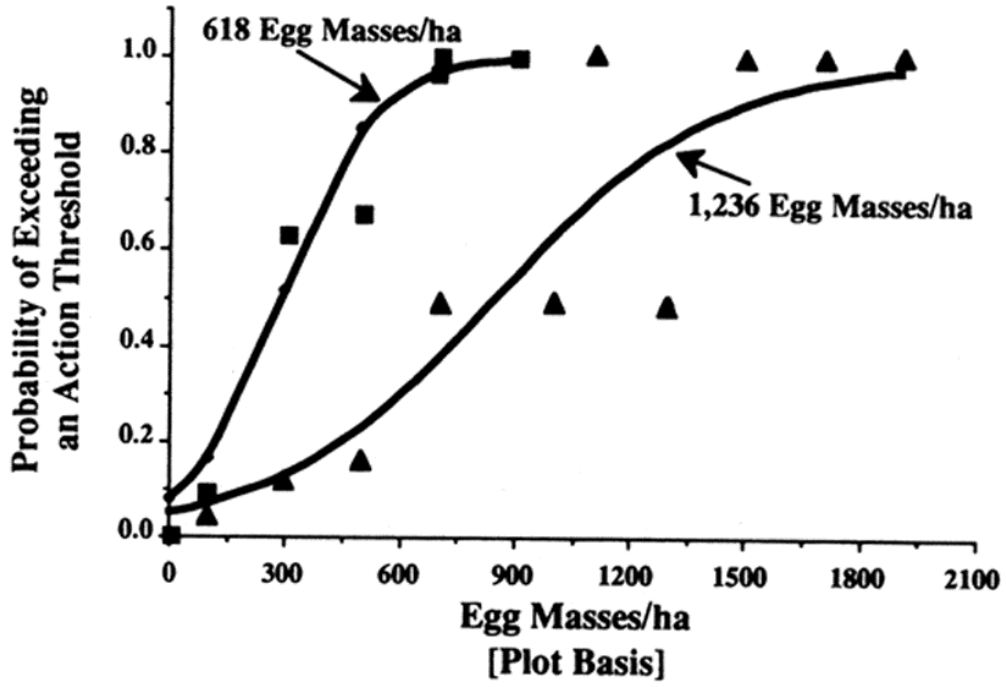

Fig. 1. Probability of a summer egg mass per hectare count for a plot exceeding the action thresholds of 618 egg masses per hectare (■) or 1,236 egg masses per hectare (▲). Observed probabilities of a summer egg mass count exceeding an action threshold are included for both action thresholds. Logistic curve equation for action threshold of 618 egg masses per hectare is $\{1 + \exp[-0.00846*(X - 296.21)]\}^{-1/1.02}$ and 1,236 egg masses per ha is $\{1 + \exp[-0.00344*(X - 843.55)]\}^{-1/0.992}$ where X is a summer egg mass count.