Gypsy Moth

Lymantria dispar (Linnaeus)
Lepidoptera: Lymantriidae

Liebhold, A.; Thorpe, K.; Ghent, J.; Lyons, D. B. 1994. Gypsy moth egg mass sampling for decision-making: a user's guide. NA-TP-04-94. Morgantown, WV: *U.S. Department of Agriculture, Forest Service, Northeastern Area*; 12 p.

Objectives: To provide detailed procedures for estimating *L. dispar* egg mass density and to predict defoliation levels using a density-defoliation relationship.

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. This guide provides detailed information on procedures used for estimating egg density, which is used traditionally in decision-making. A 100-m^2 plot was recommended for determining egg mass densities, which were used to predict the severity of defoliation levels the following year. The relationship between egg mass density and subsequent defoliation for three damage criteria are presented (Fig. 8). The control thresholds for noticeable defoliation, growth loss and tree mortality were 500-750, 700-900, and 1,000-1,400 egg masses per acre, respectively.

Sampling Procedure: There are three methods used widely for estimating egg mass density: fixed and variable radius plots (Wilson and Fontaine 1978), and timed walks (Buss and others 1999). However, fixed radius plots are recommended for use because they provide similar levels of precision as variable radius plots and timed walks, while having reduced sampling cost.

Identify the boundaries of the potential treatment block where egg mass density is to be estimated. Determine the number of samples for the desired level of precision (Fig. 1), and delineate sample points on the map. Establish a 100-m^2 circular plot, and locate and record all of the egg masses present within its boundaries. Use binoculars to sample the taller trees if necessary, and make sure to look for egg masses under rocks, logs, etc. Determine the proportion of new egg masses in the understory. Multiply the number of new egg masses in the plot by 40 to obtain an estimate of egg mass density per acre. The mean density of the entire block is estimated from the mean of the plots within it.

There is a positive relationship between defoliation (*Y*) and egg mass density (*X*) (Fig. 7). Locate the estimated egg mass density on the horizontal axis and read the corresponding predicted defoliation levels off the vertical axis. There

was much variability in this relationship particularly between 100-1000 egg masses per acre where defoliation levels ranged between 0 and 100%. In these situations, it is helpful to determine if the population is increasing using such factors as proximity to the leading edge, egg mass length (>30 mm), and proportion of new egg masses (>75%).

Figure 8 shows the relationship between egg mass density and subsequent defoliation for three damage criteria. The following control thresholds are provided:

Defoliation and damage	Egg density per acre
Noticeable (>30%)	500-750
Growth loss (>40%)	700–900
Tree mortality	1,000–1,400

Note: The procedures described here represent a scientifically based approach to decision-making. However, it is impossible to predict defoliation levels without a certain amount of error.

References:

*Buss, L. J.; McCullough, D. G.; Ramm, C. W. 1999. Comparison of three egg mass survey methods in relation to gypsy moth (Lepidoptera: Lymantriidae) defoliation in Michigan. *Environmental Entomology* 28: 485-495.

*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

Figures:

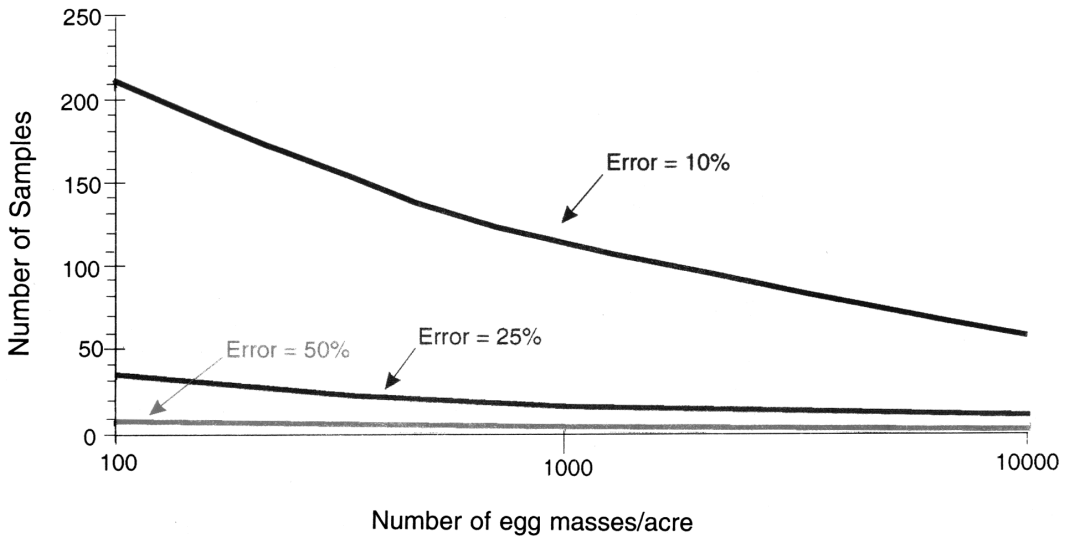

Figure 1. *Minimum number of fixed radius samples (plots) necessary to achieve various levels of precision at different densities. Error is expressed as a percentage of estimated density.*

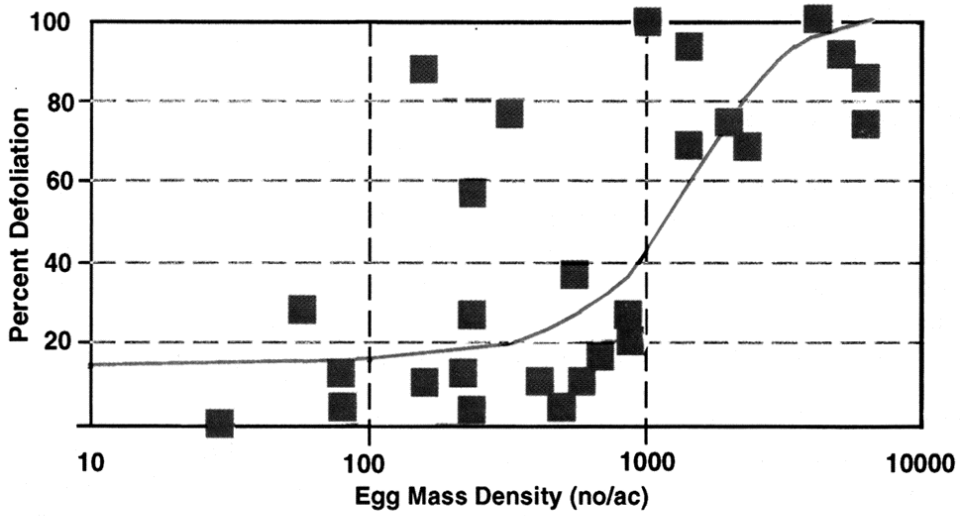

Figure 7. *Relationship between egg mass density and defoliation at several locations.*

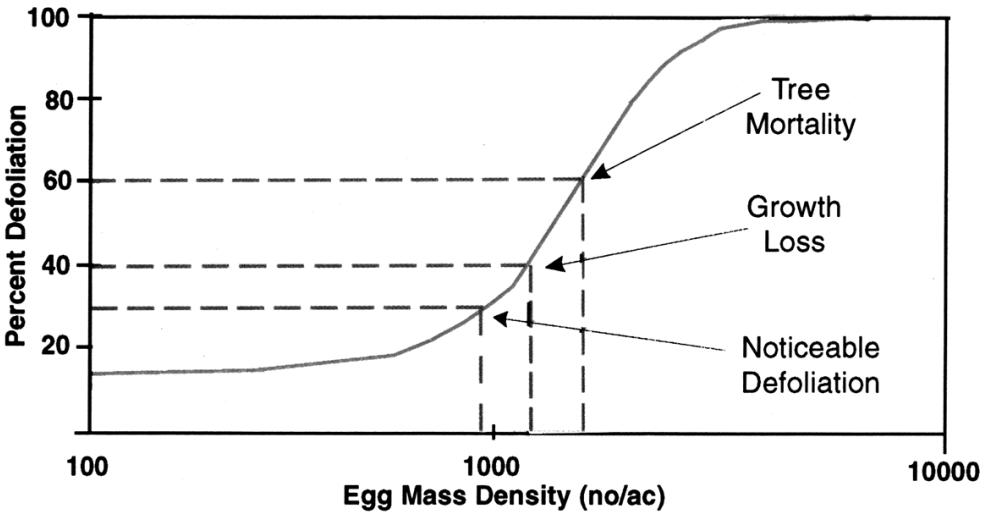

Figure 8. *Relationship between defoliation and egg mass density thresholds for three damage criteria.*