Gypsy Moth

Lymantria dispar (Linnaeus)
Lepidoptera: Lymantriidae

Fleischer, S. J.; Ravlin, F. W.; Reardon, R. C. 1991. Implementation of sequential sampling plans for gypsy moth (Lepidoptera: Lymantriidae) egg masses in eastern hardwood forests. *Journal of Economic Entomology* 84: 1100-1107.

Objective: To develop a sequential sampling plan for rapid classification of *L. dispar* populations.

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. Sample units (timed walks and fixed-radius plots) used for determining egg mass density were evaluated for use in area-wide integrated pest management (IPM) programs. Sequential sampling plans based on fixed-radius plots (Table 3; Fig. 4) were validated within 131 1-km cells. The sequential plans gave the same pest management decisions as fixed-sample size plans in 79-84% of the cells, recommended additional samples in 7-19% of the cells, and gave incorrect decisions in 2-3% of cells.

Sampling Procedure: Due to the instability of the regression coefficients relating timed walks to fixed-plot data, 100-m^2 plots were used. Take a minimum of 4 and maximum of 10 plots in which you locate and record the number of egg masses found on all trees, rocks, and in the understory. Use binoculars to examine taller objects, if necessary. Continue sampling until a decision is met for one of the three management thresholds (Table 3; Fig. 4).

The sequential plans used fewer samples and yielded correct decisions in 74-96% of the 1-km cells tested. Incorrect decisions did not occur in any cells below a treatment threshold using plan 3 or in any cells above treatment threshold using plan 5 (Table 3).

Notes: Area-wide IPM programs have a wide range of thresholds, acceptable errors, and resources allocated for sampling efforts. No single plan can be expected to be useful throughout a large project. The plans presented in Table 3 are a conservative pest management decision-making tool based on meetings with managers of southern Appalachian hardwood forests.

Figure and Table:

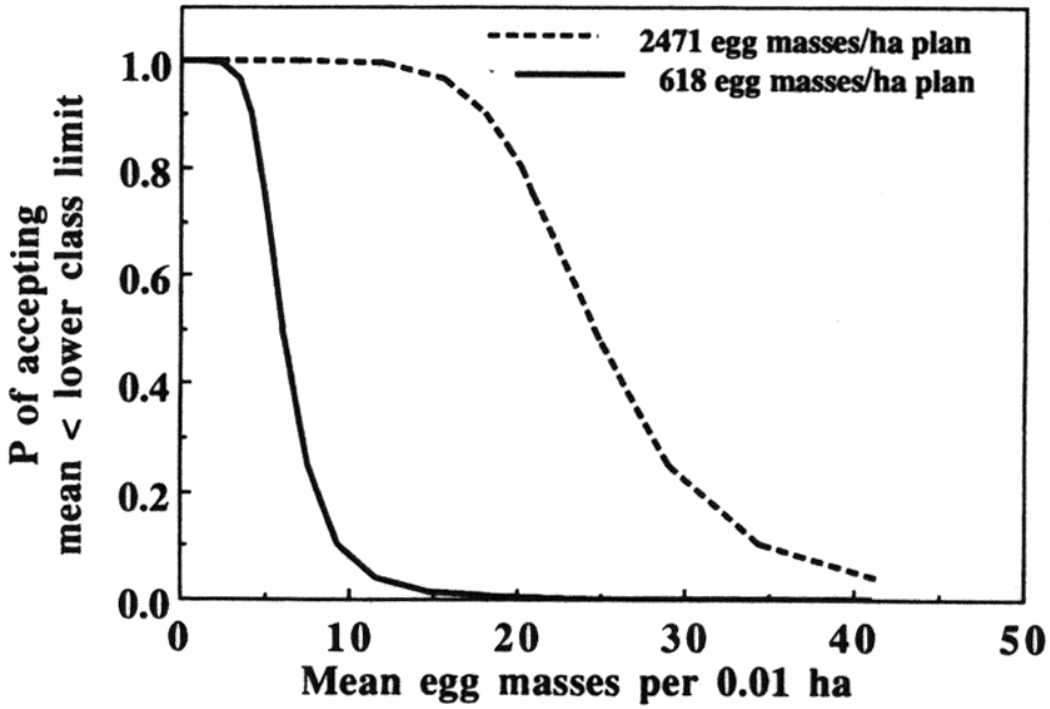

Fig. 4. Operating characteristic curves for two sequential sampling plans (plans 3 and 5 of Table 3) of 0.01-ha fixed-radius plot samples.

Table 3. Sequential sample plan parameters using a negative binomial distribution with k_c = 1.1 for 0.01 ha fixed-radius plot sample units developed interactively with field managers using a computer spreadsheet for use in a large area IPM project.

Plan no.	α	β	Density threshold (egg masses/0.01 ha)	Lower limit (egg masses/ 0.01 ha)	Upper limit (egg masses/ 0.01 ha)	*n* range	Stop line[a]	
							Intercept	Slope
1[b]	0.25	0.25	49	0.3	0.7	4-10	1.843	0.464
2	0.25	0.25	49-124	0.3	1.5	4-10	1.109	0.688
3	0.25	0.25	618	5	7.5	4-10	17.722	6.095
4	0.25	0.25	1236	10	15	4-10	32.706	12.178
5	0.25	0.25	2471	21	29	4-10	79.461	24.580
6	0.05	0.05	25	0.2	0.3	21-50	1.279	0.246

[a]The positive value of the intercept gives the upper stop line and the negative value gives the lower stop line.

[b]Plan 1 was not used alone but in combination with plans 3, 4, or 5 to make plans that classify populations into three categories.