THE SPREAD OF GYPSY MOTH IN WISCONSIN: A NEW PARADIGM FOR THE MIDWEST INVASION?

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Abstract

The gypsy moth, *Lymantria dispar* (L.), has been gradually expanding its range in North America since its introduction into Massachusetts approximately 150 years ago. Gypsy moth is a highly polyphagous herbivore that can exploit over 300 species of deciduous and coniferous hosts (Elkinton and Liebhold 1990). The management of gypsy moth can be divided into three components: (1) eradication, which is done in regions located away the expanding population front; (2) suppression, which is done in regions that are generally infested; and (3) management, which is done in transition zone between the uninfested and infested areas and which is currently realized through the Slow-the-Spread program. All three require an understanding of the population boundaries that delimit these areas, and past work has identified methods for generating boundaries based on the monitoring of male moths through pheromone-baited traps (Sharov et al. 1995). In parallel, additional interest is often placed on the prediction of the future boundaries of the population so that the appropriate state and federal agencies, as well as landowners, can prepare adequately for the gypsy moth advance in these newer areas to minimize its impact (Gottschalk 1993, McFadden and McManus 1991).

A model of population boundaries of gypsy moth requires an understanding of the rate of spread, which is more likely than not to be specific to the region of interest. Topography would most likely play a role; for example, hilly regions could limit the dispersal of individuals more so that those regions that are relatively flat. Overwintering temperatures have previously been observed to play a role in spread rates. Liebhold et al. (1992) analyzed historical data on the movement of gypsy moth populations from the initial source of infestation near Boston, Massachusetts. They observed that when the average minimum January temperatures > 7° C, then spread rates were roughly 20.8 km/yr, whereas for the inverse condition (< 7° C), spread rates were only 7.6 km/yr.

Until the invasion of gypsy moth into, first, the upper peninsula of Michigan, and then Wisconsin, this paradigm has generally held to be true. Sharov et al. (1999), for example, observed that temperatures in Michigan were actually inversely related to gypsy moth spread: spread rates were higher in the northern Lower Peninsula than in the southern Lower Peninsula despite the former having the lower minimum January temperatures. They also demonstrated that forest composition played a definite role in the spread of gypsy moth. Higher than previously expected rates of spread (Liebhold et al. 1992) in Midwest poses new challenges to the management of gypsy moth. Tcheslavkaia et al. (2002) contended that these higher rates of spread may be due, in part, to decreased predation on females with the consequence of higher female mating success, which in turn could be furthermore enhanced by increased male moth dispersal. Recent empirical and theoretical evaluations of the range expansion of exotic species (Shigesada et al. 1995), in which the "range of the founder population expands, new colonies created by [dispersers] increase in number to cause an accelerating range expansion...".

In Wisconsin, we have observed (1) higher rates of spread (relative to the rest of the Slow-the-Spread areas); (2) trap catch data that are dominated by a continuum of low—and often single—catches of male moths without clear core populations to treat; and (3) trap catch data appearing as "bulges" that are in different places in different years. In this paper, I will address these issues and present a case for the development of a new paradigm for the management of the spread of gypsy moth in Wisconsin, which may have ramifications for its movement and consequent management in other Midwestern states.

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