

UNDERSTANDING PREDATION: IMPLICATIONS TOWARD FOREST MANAGEMENT

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ABSTRACT

It is generally accepted that when gypsy moths rest in the litter survival is low due to predation by ground-foraging generalist predators and that predation can maintain these populations indefinitely. Forest Service research on predators of gypsy moth continues to focus on population dynamics, the mechanisms of predation and forest management implications.

It has been shown that abundance and diversity of small mammals differed considerably among forest stands that varied in potential susceptibility to defoliation by gypsy moth. In particular, stands most susceptible to defoliation had fewer small mammals and, hence, it is hypothesized that predators at these sites had a reduced effect on gypsy moth populations. At Bryant Mountain in Vermont, year to year differences in survivorship of gypsy moth pupae were strongly influenced by predator density particularly *Peromyscus leucopus*. It was also shown that within year differences in survivorship of pupae (when comparative *Peromyscus* densities in both the susceptible and resistant stands were similar) resulted from differences in the vertical stratification of cover which affects the foraging behavior of small mammals and the increased availability of more palatable alternative foods, especially low bush blueberry (*Vaccinium* spp.), which significantly reduces the consumption of arthropods in the diets of small mammals. The interrelationships between predator density, type and spatial distribution of cover and availability of alternative foods offer a number of forest management implications. Forest and wildlife managers should focus more attention on the habitat requirements of small mammals, particularly those that are ground foraging generalists, to insure their impact in maintaining innocuous gypsy moth populations.

Recent visits to the Soviet Union to study gypsy moth predator-prey interrelationships have provided (1) important information regarding the convergent evolution of ecological equivalents to vertebrate predators of the gypsy moth in the U.S., and (2) a better understanding of the role of predators in Soviet forest protection. Species studied included *Apodemus sylvaticus*, *A. flavicollis*, *Clethrionomys glareolus*, and *Dryomys nitedula*.

The objectives in researching the relationship between predator impact potential and forest management implications are twofold. First, to ascertain the possibility and feasibility of habitat manipulation which could enhance the magnitude of predation and, second, to provide sufficient information which would enable forest managers to avoid inadvertent detrimental consequences that would reduce or possibly eliminate predator community impact as a result of applied selected forest management practices thereby encouraging management practices that are compatible with maintaining natural predator communities. Long-term studies, which are designed to access abundance and habitat relationships of small mammal communities on a localized scale, are still needed to give additional insight into the importance of small mammals to the population dynamics of gypsy moth and also to determine their role in future management scenarios which would reduce the susceptibility of northeastern deciduous forests to defoliation by gypsy moth. Specific management implications derived from these and subsequent studies focusing on predator-prey relationships will allow: (1) more accurate classification of forest stand susceptibility; (2) more reliable gypsy moth population forecasting; (3) the development of useful life system models; (4)

more effective integrated pest management; and (5) the evaluation of silvicultural practices on predator-prey interactions and stand susceptibility to defoliation.

LITERATURE CITED

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CHANGES IN VERTICAL DISTRIBUTION OF XYLEM PRODUCTION IN HARDWOODS DEFOLIATED BY GYPSY MOTH

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ABSTRACT

Trees distribute the production of xylem through the bole in an unequal manner. Defoliating insects such as the gypsy moth (*Lymantria dispar*) affect the balance of that distribution. Historical defoliation data were combined with detailed stem analysis of 49 mixed oaks (*Quercus rubra*, *Q. alba*, *Q. prinus*, *Q. coccinea*, *Q. velutina*) and associated species, including red maple (*Acer rubrum*), in southern New England. The cross-sectional area of an annual ring within the branch-free bole was normally greater toward the base despite a greater ring width at the base of the crown. In years of very poor growth due to defoliation or other causes, the cross-sectional area approached uniformity through the branch-free bole. Partial rings and missing rings were evident in the understory red maple, but never in the oaks, despite growth rings as small as 0.1 mm.

In some oak species growth was reduced overall by as much as 50% in years of defoliation, and a continued effect was observed for three years after a defoliation. Assuming one two-year defoliation episode each decade, volume growth of surviving trees was reduced 9.7% overall. Increased growth in neighboring, non-defoliated trees was significant in the year of defoliation and again three years afterward. Compensatory growth in the year following defoliation was found only in red maple. A redistribution upward was detectable in all defoliated trees, but did not affect the overall form of the bole, due to the cumulative nature of stem taper.