

DEFOLIATION AND MORTALITY PATTERNS IN FORESTS SILVICULTURALLY MANAGED FOR GYPSY MOTH

Kurt W. Gottschalk and Rose-Marie Muzika¹

Abstract: Mixed hardwood forests of the Appalachian region support one of the most diverse communities of woody plants in North America, but the composition and relative dominance of the forest changes substantially with slight changes in physiography, soil type, or microclimate. Composition of oak and other species highly preferred by the gypsy moth determines the susceptibility of forests to defoliation. As composition of these species increases, the susceptibility increases. Silvicultural treatments were developed to minimize the effects of gypsy moth defoliation on forests. A research study was conducted to determine the effectiveness of two preoutbreak silvicultural treatments that are applied in different susceptibility stands. Presalvage thinning is designed to reduce the mortality that occurs in stands by taking out the trees with highest estimated probabilities of mortality and increasing the growth and vigor of the residual trees. It is applied in high or very highly susceptible stands (>50 percent oak). Sanitation thinning is designed to reduce the defoliation level (and subsequent mortality) in medium susceptibility stands (20 to 50 percent oak). This reduction is obtained by decreasing oaks and other susceptible species to 20 percent of the stand basal area and increasing vigor of the residual trees. Four replications of each treatment were established in 1989-90, with a paired untreated control stand for every treated stand.

Defoliation and mortality patterns over a five-year period appear to be stand dependent. While the general trend indicates that heavy defoliation of susceptible species occurred in 1990 and 1991, only six of the 16 stands sustained heavy defoliation. Defoliation patterns were nearly identical for both thinned and unthinned stands in a pair, although the thinned stands averaged slightly lower defoliation across all species. Mortality, expressed as percent of original basal area, was greater in the unthinned stands versus the thinned stands of each pair of the six stands that were defoliated. Mortality in stands that were presalvage thinned was 33.8 percent and 63.5 percent as opposed to 69.0 percent and 68.1 percent in the unthinned counterparts. The sanitation thinning mortality was 29.8 percent versus 41.4 percent for the unthinned stands. The majority of the defoliation and mortality occurred in oak and other susceptible species; very little occurred in resistant and immune species. These results represent worst case tests of the silvicultural treatments, as the treatments were completed in April 1990 and defoliation began in May 1990, so the stands had no time to adjust to the treatments and for the residual trees to increase in vigor. The results are encouraging in that they do show potential for silvicultural treatments to minimize gypsy moth effects on forest stands.

¹Project Leader and Research Ecologist, Northeastern Forest Experiment Station, USDA Forest Service, 180 Canfield Street, Morgantown, WV 26505-3101.