

2002-2003 WINTER MORTALITY OF HEMLOCK WOOLLY ADELGID IN THE NORTHEASTERN UNITED STATES

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Abstract

The hemlock woolly adelgid (HWA), *Adelges tsugae* Annand, is a nonnative pest responsible for extensive mortality and decline of hemlock trees in the eastern United States. Its range currently includes counties in 16 states from the Smoky Mountains to southern Maine. However, to date, infestations have not been reported in any area with minimum temperatures lower than that in USDA plant hardiness zone 5a (minimum low temperature is -26.5 to -28.8° C). Thus, cold winter temperatures may be a factor in reducing this insect's northward rate of spread. We assessed the mortality of selected HWA populations in the Northeast after the winter of 2002-03, the coldest winter in 9 years according to the National Weather Service.

Between 9 March and 24 April 2003, branch tips were examined from 10 HWA-infested eastern hemlocks, *Tsuga canadensis* (L.) Carrière, at each of 36 sites in NH, MA, CT, NY, PA, and NC. Where possible, at least 100 HWA sistens, nymphal stage 2 or older, were examined on each tree at each site (total of at least 1,000 HWA/site). Latitude, longitude, and elevation were recorded

at each site. Highest and lowest daily temperatures for the period November 2002 through March 2003 were obtained from the National Climate Data Center for the weather station closest to each site. Data were analyzed using the Spearman rank correlation test; values of $P < 0.05$ were considered significant.

Adelgid mortality ranged from 11.2% at the NC site to 99.4% at a NH site. The lowest temperature reported was -27.2 ° C at a site in MA where mortality of HWA was 83.2%. At the NH site with 99.4% mortality, a minimum temperature of -24.5° C was recorded. Initial analysis indicates that mortality was positively correlated with degrees of latitude ($r=0.422$, $P=0.010$) even when the outlying NC site was excluded ($r=0.371$, $P=0.028$). There were no significant correlations among percent mortality and plant hardiness zone, elevation, or mean low temperature, but there was a slight negative correlation between percent mortality and the minimum temperature recorded at each site ($r=0.333$, $P=0.047$). Comparative studies are planned for subsequent years.