

## STAND AND LANDSCAPE LEVEL ANALYSIS OF HEMLOCK WOOLLY ADELGID OUTBREAKS IN SOUTHERN NEW ENGLAND

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### ABSTRACT

Hemlock woolly adelgid (HWA) (*Adelges tsugae*), an introduced aphid-like insect from Asia, is expanding across the northeastern United States through the range of *Tsuga canadensis* (eastern hemlock) and has the potential to severely reduce or eliminate this important late-successional species. As part of a large project investigating stand to landscape forest dynamics resulting from HWA, we examined the initial community response of eight *T. canadensis* stands in south-central Connecticut for three years following various levels of infestation. We assessed mortality patterns in *T. canadensis*, evaluated subsequent changes in stand environment, and related these and stand composition to patterns of regeneration, understory response, and community reorganization. The dominant vegetative response following crown thinning and tree mortality was a prolific establishment of *Betula lenta* (black birch).

At the landscape level, we have mapped the distribution of *T. canadensis* prior to HWA infestation in a 5900 km<sup>2</sup> transect through southern New England to characterize the temporal and spatial patterns of damage generated by HWA since the time of its arrival. Data from over 125 stands has been used to describe forest structure and composition and predict potential replacement species. Eighty percent of the stands contained HWA and over 70% had experienced *T. canadensis* mortality. The spatial pattern of HWA-induced damage currently exhibits a distinct south to north trend in decreasing damage and mortality consistent with HWA migration patterns.

We have recently initiated a project examining the timing, magnitude, and duration of nitrogen cycling changes associated with HWA infestation in a subset of *T. canadensis* forests varying in HWA density. All data from this multi-faceted project is being incorporated into a GIS analysis of the landscape-level, biological, edaphic, and historical factors that control the spread of mortality and stress observed in *T. canadensis*.