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RESURRECTED FROM THE ASHES: A HISTORICAL RECONSTRUCTION OF EMERALD ASH BORER DYNAMICS THROUGH DENDROCHRONOLOGICAL ANALYSIS

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ABSTRACT

The invasive emerald ash borer, *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae), was identified in southeastern lower Michigan in July 2002 and was found to be responsible for the death or decline of several million ash (*Fraxinus* spp.) trees. We intensively surveyed southeastern lower Michigan to determine where emerald ash borer-induced decline of ash trees appeared to be most severe. Over an 1,800 square-kilometer geographic area encompassing what was commonly believed to be the epicenter of the known core infestation in Detroit, Michigan, we used tree ring analyses to examine the historical dispersal patterns and spread of emerald ash borer. Two to 4 increment cores and/or cross-sectional samples from emerald ash borer-killed green ash trees were preferentially collected over declining or non-stressed ash trees on at least a 2.4 × 2.4-kilometer sampling grid throughout the heart of the core infestation. Samples were dried, mounted and surfaced in the laboratory prior to measuring annual growth rings to the nearest 0.01 mm using a Velmex measuring system. Skeleton-plots depicting annual relative growth rates for each sample were generated and used to visually crossdate samples to a known master chronology compiled from ash trees surrounding the sample area.

Preliminary crossdating analyses of ash trees in the sample area suggest that emerald ash borer initially became established and began to kill trees in the greater Westland-Garden City vicinity as early as 1996-1997. Analyses indicate that ash mortality radiated farther out from the reconstructed epicenter each year. In related dendrochronological research conducted at several emerald ash borer outlier sites in Michigan, we have found that an area is typically infested for 3 to 4 years before tree mortality occurs. In turn, this would suggest that emerald ash borer was introduced and became established in southeastern lower Michigan in the early to mid-1990s.

Additional analyses are currently in progress to verify the accuracy of the preliminary crossdating analyses. We are also in the process of crossdating samples collected over a 15,000 square-kilometer geographic area encompassing the original seven counties quarantined for emerald ash borer in 2002. The greater dendrochronological reconstruction of emerald ash borer dynamics will reveal: 1) whether or not emerald ash borer initially became established somewhere other than the Westland-Garden City area, 2) temporal and spatial dynamics of early outlier sites within the core infestation, and 3) how emerald ash borer spread historically throughout southeastern lower Michigan.