Emergence holes

Within-tree and stand-level population estimates based sampling immediately prior to adult emergence in 2003 and again in 2005 allowed evaluation of emerging adult populations and confirmed extremely high populations as well as documenting a population crash in the 2005 cohort (Table 2 & 3).

Slight emergence is May, July with 1:1 sex ratio and male flight peaking in July.

Fig. 1. The Ozark National Forest in Northwest Arkansas (A) is experiencing an oak decline event characterized by the death of thousands of northern red oaks, Quercus rubra L., (B). Trees shown on the map represent white oak (Q. alba L.) and red oak (Q. rubra L.) infestation histories. Over 500 trees growing in the Fly Gap have 50-60% dieback and have moderate and low infestation histories. Class III trees usually have >56% dieback and >10 emergence holes and a high infestation history.

Table 3. Population estimates for the number of red oak borers emerging per acre in stands located on ridge topographic positions from three areas of the Ozark National Forest. Estimates are based on late-stage live larvae (Table 2) found in trees categorized into the three red oak borer infestation classes categorized with data on the number of northern red oaks in each class within 30 x 100 m fixed vegetation plots.

Fig. 2. The rapid estimation procedure is based on crown condition and basal emergence holes. Class I trees are characterized by healthy canopies and <5% basal emergence holes and have a low red oak borer infestation history. Class II trees generally have 5-15% and 5-25% emergence holes. Class III trees usually have 15-45% dieback and >10 emergence holes and a high infestation history.

Fig. 3. Tree dissection involves falling trees, cutting them into 1.5 m sub-samples, transporting sub-samples to the lab, and storing in a cooler until processing. Sub-samples are weighed to determine if they are heavy enough to remove larvae and then stored in a cooler until processing. Sub-samples are then dissected to determine if there are larvae present, and the number of larvae is recorded.

Extensive dissection uses nine sub-samples taken systematically up the trunk of the tree, and data are extrapolated to the whole tree. Statistical analysis revealed that extensive estimates are acceptably accurate and further analyses indicated that seven sub-samples was the optimal number of samples to dissect considering both accuracy and efficiency, Table 1.

Future research includes investigating environmental contributors to tree mortality and interactions of silvicultural treatments on tree health and red oak borer populations, e.g. controlled burns, removal of “brood trees”. Research toward elucidating biological and mortality factors associated with changes in red oak borer populations continues as does development of an interactive reproduction model of spread and efforts continue toward making it available to the public.

References


Ware, V.L., and F.M. Stephen. Facultative intraguild predation of red oak borer larvae (Coleoptera: Cerambycidae). Envir. Entomol. 25: 508-514.