# Red Oak Borer
*Enaphalodes rufulus* Haldeman
Coleoptera: Cerambycidae

**Objective:** To develop a systematic sampling procedure that accurately estimates within-tree population densities of *E. rufulus* in northern red oak using a minimal number of samples.

**Abstract:** Red oak borer, *Enaphalodes rufulus* Haldeman, is a serious native pest of red oak, *Quercus rubra* L., and has been recently associated with oak decline, particularly in the Ozark National Forest in Arkansas. This cerambycid can kill stressed trees, such as those affected by oak decline. An accurate method of estimating *E. rufulus* populations through destructive sampling has been developed (Fierke et al. 2005a), but it is labor intensive. A nondestructive, rapid estimation survey procedure has also been developed to classify tree populations of *E. rufulus* during epidemics (Fierke et al. 2005b).

Another sampling plan has been developed based on the minimum number of samples determined necessary for statistical accuracy while substantially reducing the labor requirement of Fierke et al. (2005a). This plan differs from Fierke et al. (2005b) in that it is also useful for non-epidemic population levels. Systematic sampling of seven bolts cut from boles of trees infested with *E. rufulus* produced root mean square errors below the 25% threshold of the measured parameters of current generation galleries and live *E. rufulus*. This plan is recommended as an optimal sampling method to monitor *E. rufulus* densities with acceptable statistical accuracy, but requiring fewer samples and reduced labor.

**Sampling Procedure:** Fell selected northern red oaks. Assess the presence of *E. rufulus* attack and emergence holes along the trunk to determine the height of infestation on each tree. Cut each trunk into seven 0.5-m sample bolts starting at 1.5–2.0 m high and continuing at 20, 40, 50, 60, 80, and 90% of the infested tree bole. Dissect bolts to determine the number of current generation galleries in the phloem and the density of live *E. rufulus* present in the tree. Bolts should be refrigerated at 2°C until dissection.

**Note:** The authors suggest that a more appropriate sampling method might be determined from their data tables for studies needing a higher level of statistical precision or when other population parameters, such as emergence holes in the bark or previous generation galleries in the heartwood, are being assessed. See the original publication for details.

**References:**

# Fierke, M. K.; Kinney, D. L.; Salisbury, V. B.; Crook, D. J.; Stephen, F. M. 2005a. A rapid estimation procedure for within-tree populations of red oak borer (Coleoptera: Cerambycidae). Forest Ecology and Management 215: 163-168.

Fierke, M. K.; Kinney, D. L.; Salisbury, V. B.; Crook, D. J.; Stephen, F. M. 2005b. Development and comparison of intensive and extensive sampling methods and preliminary within-tree population estimates of red oak borer (Coleoptera: Cerambycidae) in the Ozark Mountains of Arkansas. Environmental Entomology 34: 184-192.