

# Stand Aspect as an Estimator of Tree Susceptibility to Red Oak Borer, *Enaphalodes rufulus* (Haldeman) (Coleoptera: Cerambycidae) Induced Mortality

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## Introduction and Methods

The Ozark-St Francis National Forest in Northern Arkansas is currently experiencing an oak decline event with widespread die-off of Red Oaks (*Quercus* spp.), Figure 1. Red oak borer, *Enaphalodes rufulus* (Haldeman), a native insect normally at low population levels, is being implicated as the major contributing factor in this event, Figure 2.



Figure 2. Red oak borer, a native insect is being implicated as the major contributing factor of oak decline.

Study plots were located within the Ozark-St Francis National Forest to evaluate stand variables associated with tree mortality and red oak borer, *Enaphalodes rufulus* (Haldeman) population densities, Figure 3. Three general areas were located exhibiting high oak mortality attributed to red oak borer, *Enaphalodes rufulus* (Haldeman). Five stands were chosen in each area on north, south, east, west, and ridge aspects. A rapid estimation procedure was used to determine tree level infestation history. This procedure is an indicator of past within-tree infestation levels (Kinney et al, 2004). Class I indicates that the tree has experienced low population levels. Class II indicates intermediate levels and Class III indicates high levels and tree mortality is imminent.

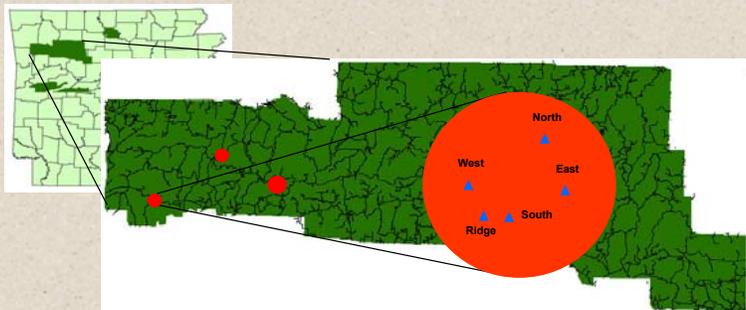
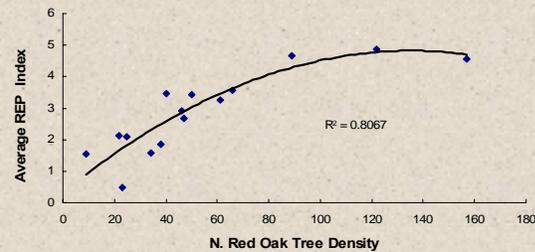
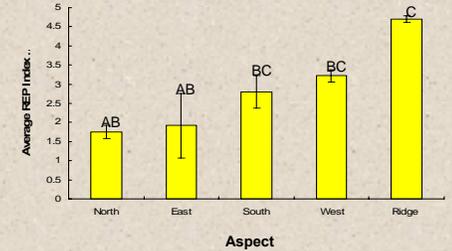
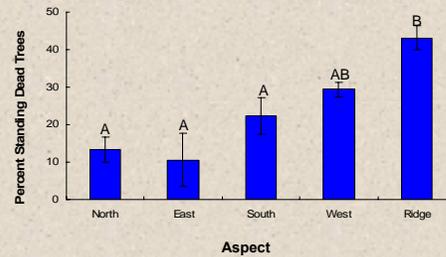


Figure 3. Five field plots were located within three general areas of the Ozark-St. Francis National Forest, Arkansas, U.S.A.

## Results

There were significantly more standing dead trees on Ridges than on North, East and South plots, Figure 4. The average REP index indicates that that plots on ridges have experienced higher population levels of red oak borer than North and East plots, Figure 5. Higher average REP is also associated with high northern red oak density, Figure 6. A comparison of only Class I trees on North plots and Ridges indicate increased red oak borer mean attack rates on ridges, increased live larva density on ridges, and similar mortality, Table 1. Variability around the mean was significantly higher (Levene's test) on ridges with some trees having very high rates of attack, live larva, and low mortality.



## Discussion

Data from this research indicate that ridge plots experience significantly higher tree mortality compared to all other plots and also have a higher incidence of long-term infestation. One explanation for this is that red oak borer outbreaks may occur on ridges first, providing a source area from which red oak borers disperse to adjacent areas. Another explanation is that there may be other stand variables associated with ridges which when coupled with other environmental stressors allow for increased fecundity or survival of red oak borers.

Aspect	Mean Attack Site Density (m <sup>2</sup> ) ±SE	Mean Live Larva Density (m <sup>2</sup> ) ±SE	Mean Mortality (m <sup>2</sup> ) ±SE
Ridge	166 (55.8)	2.79 (1.29)	0.981 (0.00946)
North	71.8 (18.4)	0.340 (0.122)	0.993 (0.00273)

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Reference: Kinney, D.L., M.K. Fierke, D. Crook, F.S. Stephen, In preparation, 2004.