Plant Community Response to Laurel Wilt Disease

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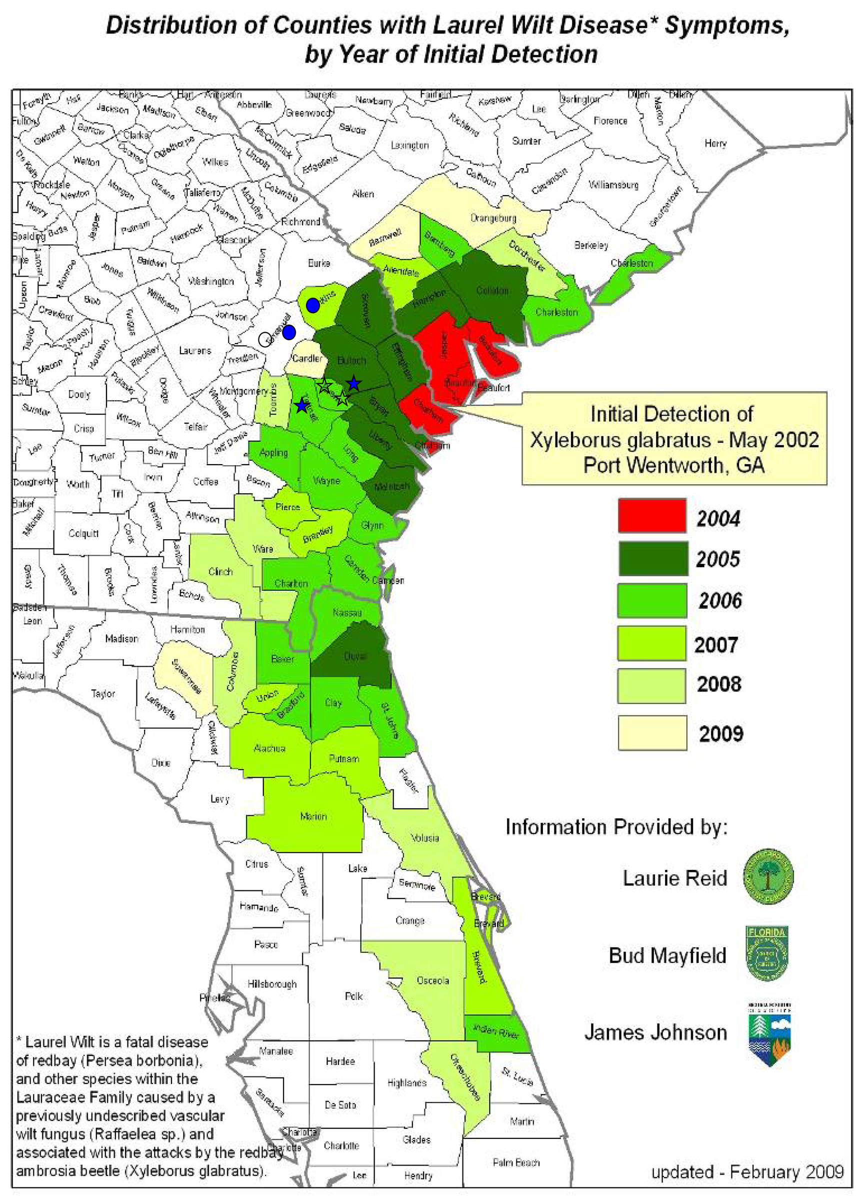
Introduction

Approximately 50,000 nonindigenous species have been introduced into the United States, some intentionally and some accidentally, but many have become invasive and caused major environmental damage, economic losses (Pimentel et al. 2000), and loss of biodiversity (Ruesink et al. 1995; Wilcove 1998). More than 2,000 exotic insects are now established in the continental United States (Pimentel et al. 2000); most are accidental introductions of international trade (Haack 2001). Many introduced insects and their associated diseases have caused widespread forest disturbance or destruction, such as the hemlock wooly adelgid (*Adelges tsugae)*, the American chestnut blight, and Dutch elm disease. The effects of the recently introduced laurel wilt disease on plant communities via the redbay ambrosia beetle that causes mortality of redbay (*Persea borbonia*) have yet to be studied. In our research we hope to determine what changes in forest communities, if any, may result from laurel wilt disease.

The specific objectives of this study were: 1) To compare the size structure of redbay populations in infested and uninfested sites; and 2) To examine the effects of redbay mortality on forest composition and community structure.



○ Control Sampled
● Control Unsampled
☆ Infested Sampled
★ Infested Unsampled

Figure 1. Study site locations.

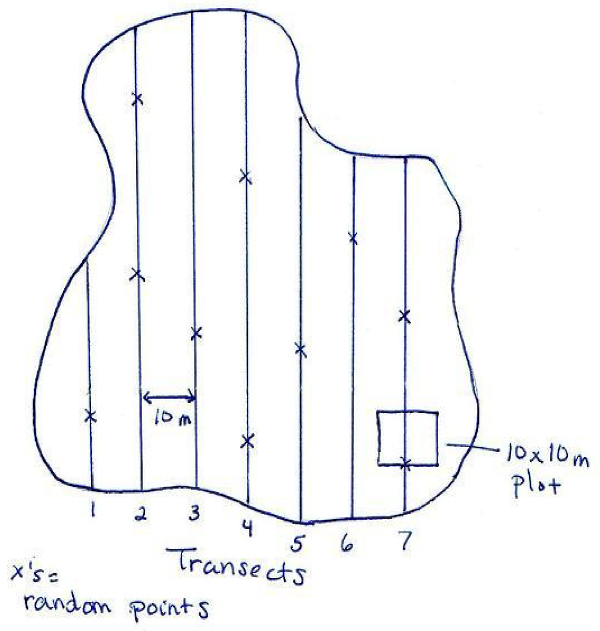


Figure 2. Example of study area with random transects.

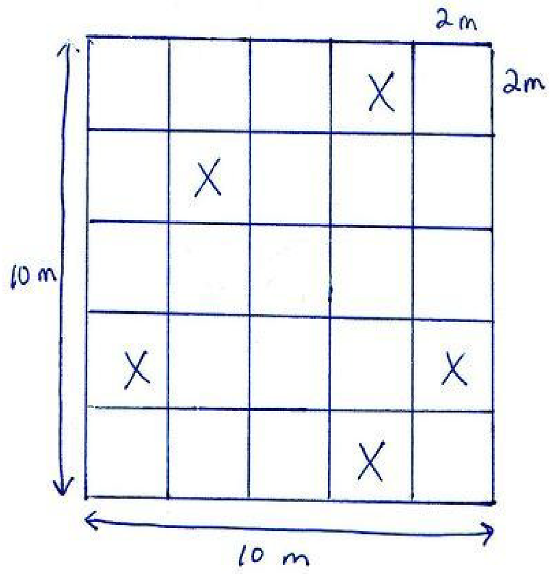


Figure 3. Plot design, with random subplots marked with an x.

Methods

During March 2008 - summer 2009, we sampled five infested sites and three uninfested control sites in five counties (Figure 1). Three - 11 transects at least 10 m apart were run through the study location with 7-15 points randomly selected for plot location per site (Figure 2). We sampled 10x10 m tree layer plots, subdivided into 2x2 m plots, with 4-5 selected randomly for sampling the shrub layer (Figure 3). Herb layer sampling was in 1x1 m plots nested within shrub plots. Redbay population structure, forest composition, and community structure were determined in all plots. For all live and dead redbay, stem diameter at ground height (DGH), height of tree, and crown area was measured.

In tree plots all species were identified and DGH was measured. In shrub plots, all species between 1-3 cm DBH were identified, stem diameters and heights were recorded. In the herb plots, tree species < 1 m tall were identified and their height and stem diameters were measured. Height and crown area of shrub species were measured. Percent cover of each species, including grasses and forbs, and woody debris and litter cover were recorded.

Results/Conclusions

- The average species richness in control and infested sites was similar, with the highest species richness found in the herb layer (Figure 4). Redbay mortality has not yet affected species richness
- Among the living trees (>3 cm), the average DGH was 2.1 times higher in the control site. There were no dead trees in the control site (Figure 5). This shows that LWD is killing larger trees.
- The average DGH of live redbay shrubs at control and infested plots was similar, but the average DGH of dead shrubs at infested sites was 3.2 times higher than in the control (Figure 6). This shows larger trees are more susceptible to LWD.
- The average % live redbay per plot was the same in shrubs at control and infested sites, but was 37 times higher in the control site for trees (Figure 7). This shows the severe impact LWD is having on redbay.
- The proportion of live redbay within each size class at the shrub layer was similar for all size classes in the control site, however, in the infested sites the proportion of live redbay already began to decrease at 1-1.5 cm size class. Only 8% of redbay is living at the largest size class (20-30 cm) in infested plots (Figure 8). This shows redbay begins to be affected by LWD at 1-1.5 cm DGH.
- The average density of live redbay was highest for both control and infested sites at the smallest size classes. The infested sites have higher density of redbay at various size classes than the control site (Figure 9). This shows significant regeneration of redbay in open canopy gaps.
- Research is ongoing and final conclusions will be made at the project completion. From preliminary data it is evident LWD is impacting redbay individuals as small as 1.5 cm DGH and is causing severe mortality of redbay with a significant amount of regeneration occurring.

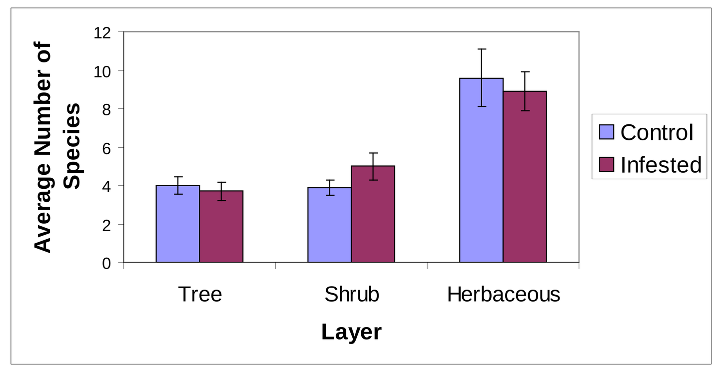


Figure 4. Average species richness in each sampling layer: tree = 10x10m, shrub = 2x2m, herbaceous = 1x1m. Two infested sites are compared to one control site.

Figure 5. Average DGH of live and dead redbay at the tree layer. Two infested sites are compared to one control site. Dead = had mortality of the entire primary stem. Redbay >3 cm DBH were trees.

Figure 6. Average DGH of live and dead redbay at the shrub layer. Two infested sites are compared to one control site.

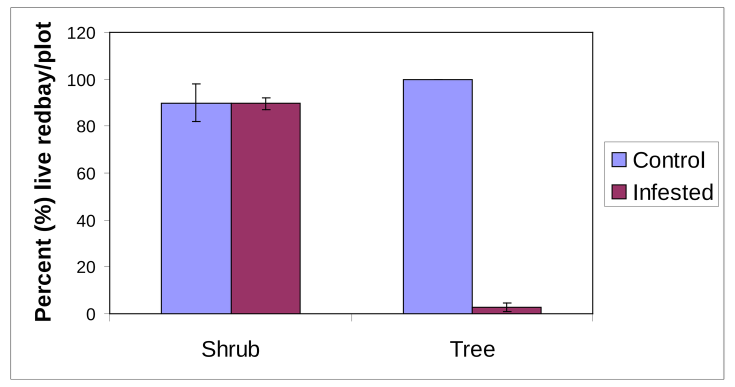


Figure 7. Average percent live redbay per plot at the tree and shrub layers. Two infested sites are compared to one control site.

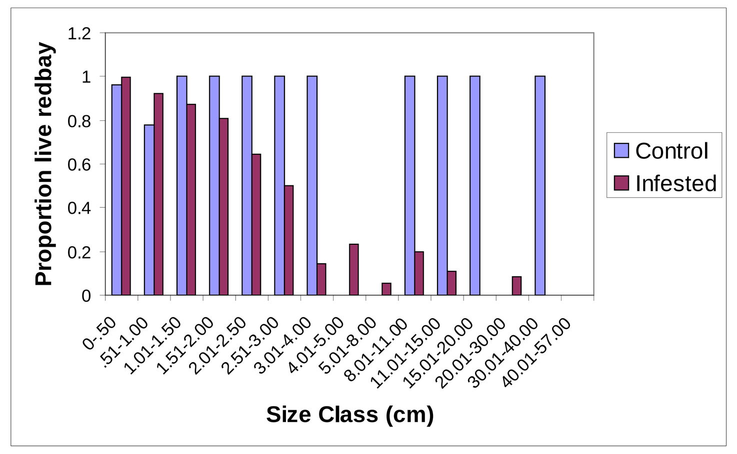


Figure 8. Average proportion live redbay within each size class at the shrub layer. Two infested sites are compared to one control site.

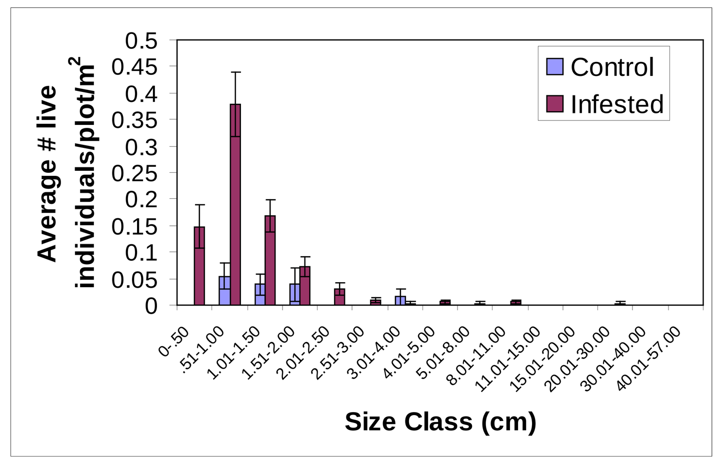


Figure 9. Average number of individuals redbay/plot/m^2 by size class for shrubs. Two infested sites are compared to one control site.

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