Bark Beetle Population Responses to Harvest and Thin Treatments in Decline-Impacted Industrial Loblolly Pine Stands

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Abstract

Annually, bark beetles (Coleoptera: Scolytinae) and Coleoptera: Curculionidae) cause extensive destruction in industrial pine plantations in the southeastern United States. Elevated bark beetle populations induce stress resulting in degraded crown conditions and therefore, contribute to pine mortalities. Stands characterized by pre-disposing factors of decline appear to have greater risk and damage susceptibility to bark beetle outbreaks. Effective silvicultural prescriptions are needed to control beetle populations in order to minimize economic loss. However, consequences of treatments should be well-understood prior to implementation. This study was developed to quantify fluctuations in pathogen-vectoring beetle populations as a response to harvest and thinning disturbances and the interrelatedness of trends among beetle species.

Introduction

Decline-impacted loblolly pine (*Pinus taeda*) stands are characterized by weakened trees and elevated mortality rates. Implementation of common silvicultural disturbances, aimed at reducing density, in these declining stands could result in an additive response: increased population sizes of destructive Scolytinae. Campbell et al. (2008) reported higher numbers of Scolytinae (Coleoptera: Curculionidae) following a burn, thin, thin plus burn, and herbicide plus burn treatment when compared to untreated controls in longleaf pine (*P. palustris*) stands on the Coastal Plain of Alabama. Further, root-feeders are known to vector decline-contributing pathogens (Eckhardt et al. 2004). Increased root-feeder population sizes may also prompt increased pathogen-vectoring activity.

Methods

Study Sites

Nine Forest Health Monitoring (FHM) research plots were established on five industrial loblolly pine timberlands in central regions of Alabama and Georgia (Figure 1). Using this randomized complete block design capture trends will be monitored one year pre- and post- 1) thin, 2) clearcut, and 3) control treatments.

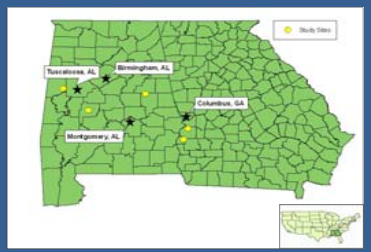


Figure 1. Study site locations.

Beetle Collections

Each FHM center sub-plot (Figure 2) contains one pitfall (PIT), panel (PAN), and flight-intercept (FIT) trap (Figure 3). Traps are collected and baited with 95% ethanol and turpentine bi-weekly. Beetles caught in each trap are then identified and enumerated.

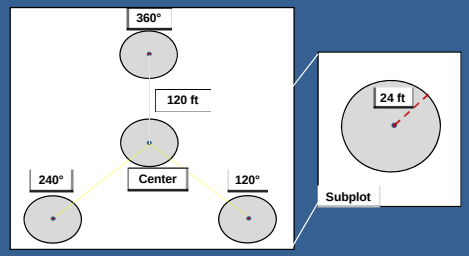


Figure 2. Plot layout.

Figure 3. Trap types used to capture beetles.

Stand Conditions

Prior to treatments, crown conditions will be observed to provide insight into stand health. End of growing season crown density, dieback, and foliar transparency will be documented for *Pinus* spp. within a 24 ft radius.

Results: Preliminary Captures

Following installation of the fifty-four plots in March 2009, six to ten collections have been conducted at each of the sites. Table 1 provides a list of common Scolytinae & Curculionidae caught to date.

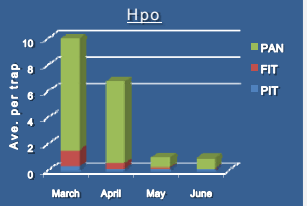
Table 1. Identified captures

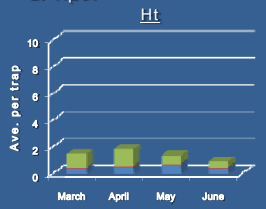
Species	
Dendroctonus terebrans	*Xylosandrus crassiusculus*
Ips avulsus	*Xylosandrus compactus*
Ips grandicollis	*Xyleborus atratus*
Hylastes porculus	*Xylosandrus germanus*
Hylastes salebrosus	*Xylosandrus mutilatus*
Hylastes tenuis	*Gnathotrichus materiarius*
Pachylobius picivorus	*Monarthrum mali*
Hylobius pales	*Orthotomicus caelatus*
Pissodes nemorensis	*Dryoxylon onoharaensum*
Xyleborinus saxesenii	
Xyleborus pubescens	

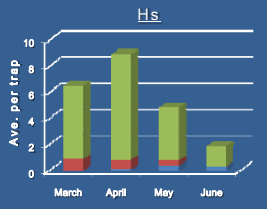
Results: Preliminary Captures (Continued)

Hylastes spp.

- *H. porculus* (Hpo), *H. salebrosus* (Hs), and *H. tenuis* (Ht) illustrate a spring peak.
- Hs appears to peak just following a downturn in Hpo captures.
- Pitfalls captured a greater proportion of Ht than either Hs or Hpo.

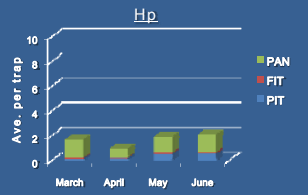


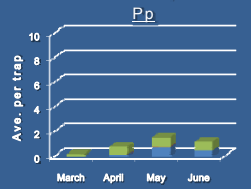




Pitch-eating & regeneration weevils

- The capture rate of *Hylobius pales* (Hp) appears to remain fairly constant, whereas *Pachylobius picivorius* (Pp) captures generally increased with seasonal temperature.





Others

- The capture rate of *Ips* spp. began to peak in June.
- Black turpentine captures have remained very low.

Discussion

- Knowledge of bark beetle trends and population level responses to common silvicultural disturbances proves vital to forest managers in making management decisions.
- Previous studies report increased populations following various silvicultural treatments (Campbell et al., 2008). However, few studies have determined changes in root-feeding, pathogen-vectoring beetles such as *Hylastes* spp. and weevils (*P.picivorus* and *H.pales*) in loblolly pine stands.

Literature Cited

Campbell JW, Hanula JL, Outcalt KW. 2008. Effects of prescribed fire and other plant community restoration treatments on tree mortality, bark beetles, and other saproxylic Coleoptera of longleaf pine, *Pinus palustris* Mill., on the Coastal Plain of Alabama. Forest Ecology and Mgt. 254: 134-144.

Eckhardt LG, Goyer RA, Klepzig KD, Jones JP. 2004. Interactions of *Hylastes* species (Coleoptera: Scolytidae) with *Leptographium* species associatiated with loblolly pine decline. Forest Entomology. 97(2): 468-474.