Evaluating and Monitoring Mountain Pine Beetle Infestation in Fire-Injured Ponderosa and Lodgepole Pine Stands

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Introduction

Mountain pine beetle (MPB), *Dendroctonus ponderosae* Hopkins, and wildfire are two major disturbance agents in the Intermountain West. Previous research suggests several possible outcomes, leaving it unclear if MPB is significant in the post-fire environment[1,3]. The goals of this study are to: 1) determine MPB's role in the post-fire environment; 2) model delayed tree mortality resulting from the combined effects of fire and MPB; and 3) assess the probability of MPB attack on uninjured trees adjacent to fire-injured trees.

Objectives

1. Determine the relationship between the degree of fire injury and MPB colonization.

2. Determine the reproductive success of MPB in fire-injured and uninjured trees.

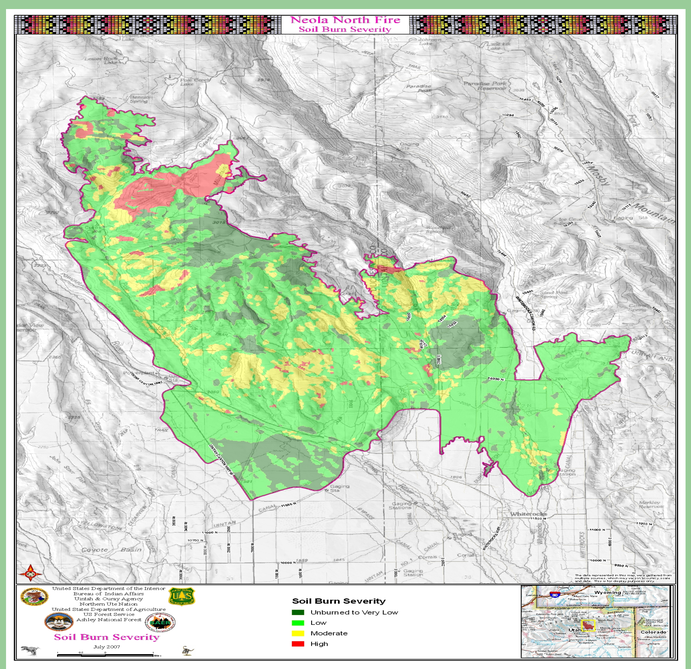
3. Compare the above relationships in ponderosa (PP) and lodgepole (LPP) pines.

4. Determine if healthy, uninjured trees have an increased probability of attack due to close proximity to attacked, fire-injured trees.

5. Develop models to predict delayed mortality and bark beetle attack 3 years following fire.

Study Site

The Neola North Fire of 2007 occurred on the Roosevelt Ranger District of the Ashley National Forest near Neola, UT. This fire burned over 43,000 acres of forest and rangeland on the South Slope of the Uinta Mountains, Northern Utah.



Methods

In 2008, four sites per tree species (PP, LPP) were established with 16, 1/10th acre plots per site. Fire injury was assessed for all trees using a comprehensive rating system[2] that included multiple measures of crown and bole injury. Trees were evaluated for colonization of any bark beetle species. Bark beetle reproductive success in trees infested in 2007 was determined based on the number of bark beetle attacks and the bark beetle emergence data from cages attached to these infested trees. Background MPB population levels were assessed using passive flight traps. Plots will be revisited in 2009 and 2010 to assess tree mortality and bark beetle colonization and reproductive success.

Preliminary Results

Figure 1. MPB emergence from fire injured (low, moderate, high) and uninjured lodgepole pine in 2008.

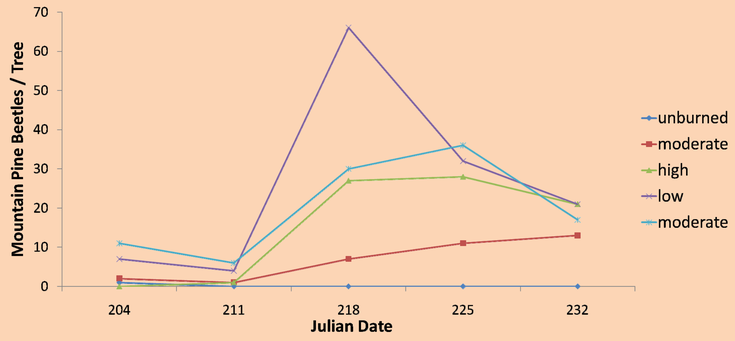


Table 1. Number of trees attacked by any bark beetle species relative to one measure of fire injury (bole char).

	Lodgepole Pine			Ponderosa Pine	
	n = 1176			n = 567	
	Attacked	Not Attacked		Attacked	Not Attacked
Charred	551	218	Charred	245	319
No Char	102	305	No Char	0	3

- Flight trap data shows that MPB was present in all four sites.
- There is evidence MPB reproduction in LPP is most successful in trees with low fire-injury (Fig. 1).
- There is evidence of a strong association between fire-injured LPP and subsequent bark beetle attack (Table 1).
- Other bark beetle species identified in fire-injured trees include: *D. valens, D. murrayanae, Ips* spp., *Pityogenes spp.*

Field Research Planned In 2009/2010

- Monitor trees for bark beetle attack and delayed mortality.
- Assess bark beetle reproductive and colonization success.
- Assess bark beetle attacks in live trees adjoining fire boundary.

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References:

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