

# Stand Characteristics and Fuel Loads of Dwarf Mistletoe and Mountain Pine Beetle in Colorado's Northern Front Range Ponderosa Pine

Jennifer G. Klutsch<sup>^</sup>, Russell D. Beam<sup>^</sup>, William R. Jacobi<sup>^</sup>, & José F. Negrón<sup>\*</sup>

<sup>^</sup>Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, Colorado, USA

<sup>\*</sup>Rocky Mountain Research Station, USDA Forest Service, Fort Collins, Colorado, USA

## Introduction:

Pathogens, insects and fire play an important role in forest ecosystems. With the current conditions of dense stands, rising temperatures and persistent drought, insect and disease factors are increasing their role with fire behavior. Specifically, bark beetle and dwarf mistletoe infestations are suspected to change fuel complexes within post-settlement fire suppressed stands. However, there is little quantitative data examining this phenomena. Colorado's Front Range ponderosa pine (*Pinus ponderosa* var. *scopulorum*) have experienced both southwestern dwarf mistletoe (*Arceuthobium vaginatum* subsp. *Cryptopodum*) infestations and mountain pine beetle (*Dendroctonus ponderosae*) outbreaks. This study will attempt to quantify the possible fuel load and stand structural changes over time within mountain pine beetle and dwarf mistletoe infested ponderosa pine stands.



## Ongoing Research and Analysis:

**Extension of Research Area:** We will continue to establish extent transects along with fuel and tree plots but extend research area to include the Boulder Ranger District. By measuring both fuel and stand characteristics of dwarf mistletoe and mountain pine beetle infested and uninfested stands of ponderosa pine in the Northern Front Range, we will be able to look at the possible relationship between disturbance agents and fire hazards.

**Assumptions:** We want to determine if certain commonly held ideas about fire hazards created by dwarf mistletoe and mountain pine beetle are actualized in forest stands. For example:

- The distance from ground level to the bottom of the live crown in dwarf mistletoe infested trees should have a large effect on a fire escalating from the understory to the crown.
- The falling and decomposition rate of mountain pine beetle killed ponderosa pine has a definite effect on ground fuel levels, which is consequent to crown fire establishment.

## Objectives / Methods:

1. Determine the frequency and distribution of dwarf mistletoe and mountain pine beetle disturbances in ponderosa pine forests within the Canyon Lakes and Boulder Ranger Districts, Roosevelt National Forest.
  - Randomly selected ponderosa pine polygons from the USDA Forest Service Common Vegetative Unit (CVU) for Roosevelt National Forest.
  - Surveyed the presence/absence and intensity of dwarf mistletoe (DM), mountain pine beetle (MPB), and *Ips* spp. in 0.04 hectare (0.1 acre) circular plots placed every 50m along a 1500m long extent transect.
2. Determine forest stand structure in DM and MPB infestations as it relates to fire hazard.
  - Circular stand structure plots, with an area of 0.04 hectare, were established in infested and uninfested stands along extent transects (Fig. 1).
  - Measured stand structural components: diameter at breast height (dbh), percent crown, tree height, height to bottom of crown, basal sapwood area, stem basal area, crown class, Hawksworth Dwarf Mistletoe Rating (DMR), MPB attack status, damage agents, tree health and decay status, log status, slope position and configuration, percent slope, aspect, and elevation.
3. Associate surface and vertical fuel levels to infestation severities of DM and years since tree mortality caused by MPB.
  - Fuel plots were established in the same 0.04 hectare circular plot as the stand structure plots using a modified Brown's planar transect (Fig. 1) that measured downed woody debris of 1, 10, 100, & 1000 hour fuel classes, depth of duff, height of vegetative ground cover, and tree regeneration.

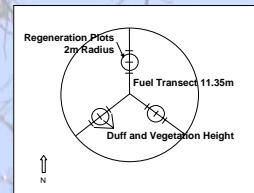
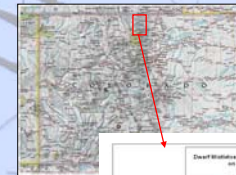


Figure 1. Fuel and Tree Plot



## Research Progress:

### Extent Transect Survey

31 total 1500m transects  
875 total 0.04ha plots  
28 Barren, without tree cover  
286 Closed stand structure  
561 Open stand structure

### Fuel and Tree Plots

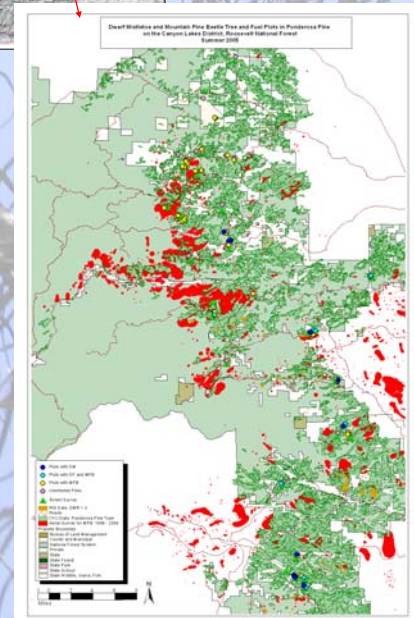
91 total 0.04ha plots established  
31 plots with MPB  
10 plots with DM  
15 plots with both DM and MPB  
35 uninfested plots

	Hectares Surveyed	Total # of PIPO	# PIPO/ha	% PIPO with DM	% PIPO with MPB	% Stand type with DM and MPB	% of DM plots with MPB	% MPB plots with DM
Closed Stand Structure	11.6	2555	220.7	14.56	5.68	19.13	35.71	45.45
Open Stand Structure	22.7	3139	138.3	23.00	9.05	11.47	48.04	52.69

Table 1. Extent Transect Survey Results for Ponderosa Pine in the Canyon Lakes Ranger District.

Tree Species	% Composition	
	Closed Stand Structure n=1555	Open Stand Structure n=1592
Ponderosa Pine	48.04	55.53
Rocky Mountain Juniper	3.15	9.74
Limber Pine	9.52	2.89
Douglas Fir	24.89	19.28
Trembling Aspen	11.96	11.37
Lodgepole Pine	2.38	1.07
Blue Spruce	0.06	0.13

Table 2. Percent Species Composition from Fuel and Tree Plots for Closed and Open Stand Structures.



### Acknowledgements:

We would like to thank the following for all their help and support: Monique E. Rocca, Rudy M. King, Robin M. Reich, Canyon Lakes and Boulder Ranger Districts, Roosevelt National Forest. Funding provided by the USDA Forest Service, Rocky Mountain Research Station.

### Contact Information:

Russell.Beam@Colostate.edu, Jennifer.Klutsch@Colostate.edu, William.Jacobi@Colostate.edu, jnegron@fs.fed.us