

TITLE: Quantifying the short- and long-term impacts of mountain pine beetle (MPB) outbreaks on forest fuels and other stand attributes in the Intermountain West

LOCATION: Colorado, Idaho, Montana, Utah, Wyoming

DATE: 30 September 2009

DURATION: Year 1 of 3-yr project

FUNDING SOURCE: Fire

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PROJECT OBJECTIVES: To quantify changes in forest fuels and other stand attributes associated with MPB outbreaks in lodgepole pine forests of the Intermountain West. Specifically, to document residual stand structure and composition associated with ground, surface and aerial fuel loads; tree age, size and species diversity; regeneration; fall rates and snag composition over multiple years.

JUSTIFICATION:

- a. **Linkage:** Data from FHM, FIA and FHP-sponsored surveys, among others, have reported significant tree mortality attributed to MPB outbreaks in lodgepole pine forests. For example, >14 million acres were impacted during 2001-2006 (USDA Forest Service 2007).
- b. **Significance:** The scope of this work encompasses areas where the majority of MPB-caused tree mortality has occurred in the U.S. in recent years. To that end, about 8% of U.S. forests are classified at risk (defined as >25% of stand density will die in the next 15 yr) to insect and disease outbreaks, and MPB is ranked most damaging of all agents considered (Krist et al. 2007). The species ranges throughout British Columbia, Alberta, most of the western U.S., into northern Mexico, and colonizes several pine species.
- c. **Biological Impact:** Recent outbreaks have been severe, long-lasting and well-documented. MPB attacks modify stand structure and composition by causing tree mortality, and may impact timber and fiber production, fuel conditions, water quality and quantity, fish and wildlife populations, recreation, grazing capacity, real estate values, biodiversity, carbon storage, endangered species and cultural resources.
- d. **Scientific Basis/Feasibility:** The proposed team includes members of FHP, NFS, PSW and RMRS. We have a strong track record of providing deliverables in a timely manner, including those originating from work previously funded by FHM-EM (e.g., INT-EM-05-10 Steed).
- e. **Priority Issues:** This project will define the short- (initial 3 yr covered by this proposal) and long-term (every third yr thereafter; in-kind) impacts of recent and on-going MPB outbreaks on fuel loads and other stand attributes.

DESCRIPTION:

- a. **Background:** Bark beetles cause extensive tree mortality in coniferous forests of the western U.S. and play an important role in the disturbance ecology of these ecosystems. Recently, elevated populations of bark beetles have been observed in all conifer types heightening public awareness of the issue and triggering concerns about short- and long-term impacts to the forested landscape. Specifically, MPB outbreaks influence

successional pathways, fire behavior and community compositions (Gibson et al. 2009) in dynamic ways. However, little information is available that fully defines these relationships. For example, although it is widely believed by land managers and the public that MPB outbreaks set the stage for severe wildfires, few scientifically and statistically sound studies have been published on this and related topics (Negrón et al. 2008). Page and Jenkins (2007) concluded the net result of MPB outbreaks in northern Utah and central Idaho was a highly altered fuels complex in which litter and fine fuels increase during current outbreaks and live surface fuels and large dead woody fuels dominate postoutbreak stands. A thorough examination of the fate of fuels after MPB outbreaks over a wide geographic area can help shed additional light on these relationships and on whether or not management of aerial or downed (dead) fuels is warranted. With the exception of a few recent studies (e.g., Page and Jenkins 2007, Klutsch et al. 2009), these relationships are poorly defined. Furthermore, resource managers often question whether or not lodgepole pine will remain as the dominant overstory tree in MPB-affected stands.

b. **Methods:** All measurements will be conducted on GPS fixed radius plots randomly distributed among areas of recent or active MPB infestation (i.e., >10% of available stems killed by MPB as previously identified by FHM, FIA and FHP-sponsored surveys). A minimum of 20 plots (1/5th acre; radius = 52.7 ft.) will be established on each of five National Forests ($N = 100$). Adjacent plots will be separated by >0.25 miles.

Elevation, aspect and percent slope will be recorded at plot center. Crown cover will be measured at plot center and at four cardinal points 50 ft. from plot center. Each tree >1 in. dbh will be permanently tagged and the species, dbh, crown position, status (live or dead), and the presence and impact of insect and disease agents will be recorded. For lodgepole pine, the year of MPB attack will be recorded using the criteria of Klutsch et al. (2009). Downed woody debris will be recorded along four modified Brown's planar transects radiating from plot center in each cardinal direction (Brown 1974). Litter, duff and fuel bed depth will be measured at the end of each fuel transect. Presence of fuel ladders, an important component often ignored in similar works, will be carefully analyzed. Volume loss and rate of tree fall will also be recorded. Within each plot, tree regeneration and other flora will be recorded on a 1/100th acre subplot (radius = 11.8 ft.) surrounding plot center.

c. **Products:** Findings will be delivered in a timely manner in both verbal and written formats.

Anticipated products:

- FHM Working Group presentations (three poster presentations as per RFP)
- Bark Beetle Technical Working Group presentation (oral)
- Forest Ecology and Management (research paper)

d. **Schedule of Activities:**

<u>Research Activity</u>	<u>Date</u>
1. Contact Forest/District, liaison	May 2010
2. Select general field sites on each Forest	June-July 2010
3. Establish plots; procure data	June-August 2010
4. Collate data; prepare progress report/poster	Fall 2010
5. Procure data	June-August 2011
6. Collate data; prepare progress report/poster	Fall 2011
7. Presentation at Bark Beetle Technical Working Group	Fall 2011
8. Procure data	June-August 2012
9. Final report/poster; peer-reviewed publication submitted	Fall 2012

COSTS:

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR - 2010				
Administration	Salary	31,575 ¹	70,000	5
	Overhead			
	Travel	16,350 ²	4,500	6
Procurements	Contracting			
	Equipment		8,250	7
	Supplies	2,000		
Total		49,925	82,750	

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR - 2011				
Administration	Salary	26,017 ³	72,100	5
	Overhead			
	Travel	16,350	4,500	6
Procurements	Contracting			
	Equipment		8,250	7
	Supplies	1,000		
Total		43,367	84,850	

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR - 2012				
Administration	Salary	26,780 ⁴	74,263	5
	Overhead			
	Travel	16,350	4,500	6
Procurements	Contracting			
	Equipment		8,250	7
	Supplies	1,000		
Total		44,130	87,013	

¹GS-5 (Step 1; \$1263) for 5 pay periods for each of five locations. All others contributed by FHP, PSW and RMRS.

²\$109/day for 30 days * 5 sites. All others contributed by FHP, PSW and RMRS.

³GS-5 (assume 3% increase from 2010) for 4 pay periods for each of five locations. All others contributed by FHP, PSW and RMRS.

⁴GS-5 (assume 3% increase from 2011) for 4 pay periods for each of five locations. All others contributed by FHP, PSW and RMRS.

⁵PI salaries (cost-to-government) contributed by FHP, PSW and RMRS (assume 3% increase in 2011 and 2012).

⁶Lodging and per diem contributed by FHP, PSW and RMRS.

⁷Vehicles and mileage contributed by FHP, PSW and RMRS.