

PROGRESS REPORT (INT-EM-F-13-02)

TITLE: Effects of Spruce Beetle (SB) Outbreaks on Fuels, Carbon and Stand Structure and Composition in Utah and Western Wyoming

LOCATION: Utah and Wyoming

DATE: 13 September 2013

DURATION: Year 1 of 3-yr project

FUNDING SOURCE: Fire

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PROJECT OBJECTIVES: To quantify changes in forest fuels, carbon and other stand attributes associated with SB outbreaks in spruce-fir forests. Specifically, to document residual stand structure and composition associated with ground, surface and aerial fuel loads; stand age, tree size and species diversity; regeneration; invasive plants; and snag demography over multiple years.

JUSTIFICATION:

a. **Linkage to FHM program:** Data from FHM, FIA and FHP-sponsored surveys, among others, have reported significant tree mortality attributed to SB outbreaks in the western U.S. For example, >173,000 ha were impacted in 2011, similar to levels in 2010 (Mann 2012). In the Intermountain Region, substantial levels of SB-caused tree mortality were mapped on the Uinta-Wasatch-Cache, Fishlake and Bridger-Teton national forests in 2011 and 2012. Landscape level impacts occurred on the Manti-LaSal and Dixie national forests in central and southern Utah during 1990-2005.

b. **Significance/Impact of forest health issue:** SB is the most significant mortality agent of mature spruce in the U.S. (Holsten et al. 1999). The scope of this work encompasses areas where much of the SB-caused tree mortality has occurred in the continental U.S. since 1990 prompting questions about associated impacts to forests. Given recent experiences with mountain pine beetle in the Intermountain West, citizens and state and federal agencies alike are concerned about increases in hazardous fuels in spruce-fir forests due to SB outbreaks and the potential for extreme fire behavior to occur (Jorgensen and Jenkins 2011), especially in light of reduced snowpacks (Pederson et al. 2011) that have historically regulated the length of the fire return interval (i.e., typically >100 years) in these systems. Wildfire activity in forests impacted by SB occurred in Utah in 2012. Furthermore, SB outbreaks are expected to increase in extent and severity throughout the Intermountain as a result of climate change (Bentz et al. 2010). SB outbreaks modify stand structure and composition by causing tree mortality, and may impact timber and fiber production, fuel conditions, fire risk and severity, water quality and quantity, fish and wildlife populations, recreation, grazing capacity, real estate values, human safety, biodiversity, carbon pools, aesthetics, endangered species and cultural resources.

c. **Scientific basis:** All methods are commonly recognized in the scientific literature and informed by previous work associated with FHM-EM. Our team has a strong track record of providing deliverables in a timely manner, including those originating from work previously funded by FHM-EM.

d. **Cost/economic efficiency:** The costs associated with this work are reduced through cost-sharing with FHP, PSW, OSU, and RMRS.

e. **Priority issues:** Several Fire Plan EM priorities are addressed: (1) climate change – effects, (2) fire risk and fuel loading, and (3) invasive species (i.e., plants). Base EM priorities are addressed as well.

DESCRIPTION:

a. **Background:** SB causes extensive tree mortality in high-elevation forests and plays an important role in the disturbance ecology of these ecosystems. However, limited information is available that fully defines these impacts (Hansen et al. 2010, DeRose et al. 2011, DeRose and Long 2007, 2012). A thorough examination of impacts to fuels, carbon and stand structure and composition will inform proper management in these systems.

b. **Methods:** All measurements were conducted on GPS fixed-radius plots (N = 40, to date) randomly distributed among areas recently (1990-present) impacted by SB (i.e., >30% of available stems killed as previously identified by FHM, FIA and FHP-sponsored surveys and subsequent ground reconnaissance). Adjacent plots are separated by >100 m. Each tree ≥ 7.62 cm dbh (at 1.37 m in height) is permanently tagged and the species, dbh, height, height to the base of the live crown, crown width, crown position, status (live or dead), and presence and impact of insect and disease agents was recorded.

Downed woody debris was recorded along three modified Brown's planar transects radiating from plot center (Brown 1974). Litter, duff and fuel bed depth were measured at the beginning and middle of each fuel transect. At the beginning of each transect, tree regeneration was also recorded on a 0.004-ha subplot. Other flora were categorized and an average height was quantified in a 1-m² subplot at the beginning of each transect. Invasive plants were surveyed on the entire plot. These data will be collected every other year. Volume loss and rate of tree fall will also be determined. Carbon pools will be calculated based on Pearson et al. (2007).

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

- FHM Working Group presentations (three poster presentations as per RFP)
- Bark Beetle Technical Working Group presentations (informal updates to colleagues)
- Western Forest Insect Work Conference (presentation)
- Forest Ecology and Management (scientific/managerial publication)

d. Schedule of Activities:

<u>Research Activity</u>	<u>Date</u>
1. Contact Forest/District, liaison	Completed
2. Select general field sites on each Forest	Completed
3. Establish plots; procure data	Completed
4. Collate data; prepare progress report/poster	Ongoing
5. Procure data	June-August 2014

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| 6. Collate data; prepare progress report/poster | Fall 2014 |
| 7. Presentation at Bark Beetle Technical Working Group | Fall 2014 |
| 8. Procure data | June-August 2015 |
| 9. Final report/poster` | Fall 2015 |
| 10. Peer-reviewed publication submitted | Spring 2016 |

e. **Progress/Accomplishments:** Overall, study is progressing as originally anticipated.

FY2013: Initial plot establishment* and data collection on each National Forest conducted as follows:

- Bridger-Teton National Forest (8 plots): August, 2013
- Dixie National Forest (8 plots): September, 2013
- Fishlake National Forest (8 plots): June, 2013
- Manti-La Sal National Forest (8 plots): July/August, 2013
- Uinta-Wasatch-Cache National Forest (8 plots): July/August, 2013

*The original methods specified that a minimum of 30 plots would be established in FY13.

COSTS:

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR - 2013				
Administration	Salary	9,500 ¹	70,000	⁵
	Overhead			
	Travel	8,400 ²	2,500	⁶
Procurements	Contracting			
	Equipment	2,000 ³		
	Supplies	1,000		
Total		20,900	72,500	

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR - 2014				
Administration	Salary	9,700 ¹	71,400	⁵
	Overhead			
	Travel	4,900 ⁴	2,500	⁶
Procurements	Contracting			
	Equipment	2,000		
	Supplies			
Total		16,600	73,900	

	Item	Requested FHM EM	Other-Source	Source

		Funding	Funding	
YEAR - 2015				
Administration	Salary	9,900 ¹	72,828	⁵
	Overhead			
	Travel	7,000 ²	2,500	⁶
Procurements	Contracting			
	Equipment	2,000		
	Supplies			
Total		18,900	75,328	

¹Two summer student interns (Sacramento-Yolo pay scale; assume 2% increase in subsequent years).

²\$140/d X 60 d. All others contributed.

³Lease of vehicle for 3 months.

⁴\$140/d X 35 d. All others contributed.

⁵PI salaries (12.5%, cost-to-government) contributed by FHP, PSW, OSU and RMRS (assume 2% increase in subsequent years).

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