TITLE: Fuel and Fire Behavior in High Elevation Five Needle Pines Affected by Mountain Pine Beetle

LOCATION: Rocky Mountain and Basin and Range Provinces

DATE: September 30, 2009

DURATION: Year 1 of 3 year project **FUNDING SOURCE:** Fire Plan

PROJECT LEADER: Michael Jenkins, Department Wildland Resources, Utah State University, Logan, Utah 84322-5230

COOPERATORS: Steve Munson and Elizabeth Hebertson, USDA Forest Service, Forest Health Protection, Ogden Field Office, Ogden, Utah; Kelly McCloskey, Ecologist, Grand Teton National Park

FHP SPONSOR CONTACT: Lee Peterson, USDA Forest Service, Forest Health Protection, Coeur d'Alene Field Office, Coeur d'Alene, Idaho

PROJECT OBJECTIVES: This study will characterize and model fuels and fire behavior in mountain pine beetle (MPB) affected stands of high-elevation, five-needle pines, including whitebark, limber, foxtail, Rocky Mountain bristlecone, and Great Basin bristlecone.

JUSTIFICATION: Recent EM and STDP funded research by the Project Leader, collaborators and students, has significantly enhanced our understanding of bark beetle, fuel and fire interactions (Jenkins et al. 2008), in Douglas-fir, (Hill and Jenkins, *in prep*.), lodgepole pine (Page and Jenkins 2007a and b) and Engelmann spruce (Jorgensen and Jenkins 2009, *in review*). Important unanswered questions remain on how excessive bark beetle-caused tree mortality influences fuels and potential fire behavior in the ecologically important high-elevation, five-needle pines (Gibson et al. 2008).

a. **Linkage:** An analysis of FHM Detection Monitoring data (ADS data) shows increased tree mortality in high-elevation, five-needle pine ecosystems due to MPB. Fuels and fire behavior have been characterized using FIA down woody materials (DWM) indicator; a subsample of forest inventory plots that contain measures of biomass and coarse woody debris. The data are sampled to determine regional-scale estimation of fuel complexes and, as such, do not adequately capture all the parameters required for building stand level custom fuel models necessary for accurately predicting fire behavior (Page and Jenkins 2007b). Additionally, re-measurements of FIA plot data are inadequate for determining fuel and fire behavior changes during the course of a MPB outbreak.

b. **Significance:** High-elevation, five-needle pines are rapidly declining throughout western North America due to warming temperatures, invasive species, especially white pine blister rust, and reduction of naturally occurring fires. However, MPB is regarded as the most serious short-term threat (Gibson et al. 2008). We propose to investigate MPB, fuel and fire relationships over a large regional scale of ecosystems containing high-elevation, five-needle pine species.

c. **Biological Impact:** The loss of high-elevation, five-needle pines due to a combination of white pine blister, MPB, increasing temperatures and altered fire regimes can detrimentally impact valuable resources including food for wildlife, watershed and soil protection, and aesthetics and recreation.

d. **Scientific Basis/Feasibility:** It is very likely the project will be successfully completed because the methods and data analysis were thoroughly developed during previous work in other conifer/bark beetle/fuel/fire systems.

e. **Priority Issues:** This project will address fire risk and fuel loading, ecological impacts of fires in sensitive and valuable ecosystems and invasive species (white pine blister rust).

DESCRIPTION:

a. **Background:** MPB has been caused extensive mortality of high-elevation, five-needle pines across western North America since 1998 (Gibson et al. 2008). Information is lacking on MPB, fuel and fire interactions in high-elevation, five-needle pine ecosystems. The work proposed here is especially relevant since white pine blister rust causes additional tree mortality and predisposes infected trees to MPB attacks. MPB attacks larger diameter trees while white pine blister rust kills smaller diameter trees. This damage may result in changes to ladder fuels when compared to MPB infested stands alone. .

b. **Methods:** Specific stands within the general study areas will be selected by identifying locations with endemic and outbreak MPB populations. Fuels data will be collected using the methods adapted for bark beetle fuels interactions by Page and Jenkins (2007a). .

c. **Products:** This work will result in the production peer reviewed manuscripts.

d. **Schedule of Activities:** 2010: plot location a data collection, 2011: data collection, 2012: data analysis and manuscript preparation.

COSTS: **Each year for FY 2010-2012**

	FHM EM Item	EM Funding	Other Source Funding	Source
Administration	Salary	24,000	15,000	USU, FHP
	Overhead	3,600	2,595	
	Travel	3,500		
Procurements	Contracting			
	Equipment	500		
	Supplies	500	1,000	
Year Totals		32,100	18,595	

LITERATURE CITED:

Gibson, K, K Skov, S Kegley, C Jorgensen, S Smith and J Witcosky. 2008. Mountain impacts in high elevation five needle pines: current trends and challenges. USDA FS, FHP, R1-08-020, 32 pp.

Jenkins, MJ, EG Hebertson, WG Page, and CA Jorgensen. 2008. Bark beetles, fuels, fires and implications for forest management in the Intermountain West. *Forest Ecology and Management* **254**(2008): 16-34.

Jorgensen, CA and MJ Jenkins. Spruce beetle induced changes to selected Engelmann spruce fuel complexes within the Intermountain region. *Forest Science (In review).*

Jorgensen, CA and MJ Jenkins. Predicted fire behavior in selected spruce beetle infested Engelmann spruce stands. *Forest Science (In review).*

Page WG and MJ Jenkins. 2007a. Mountain pine beetle induced changes to selected lodgepole pine fuel complexes within the Intermountain Region. *Forest Science* **53**(4): 507-518.

Page WG and MJ Jenkins. 2007b. Predicted fire behavior in selected mountain pine beetle infested lodgepole pine stands *Forest Science* **53**(6): 662-674.