

# Evaluation Monitoring Funded Projects Explain Relationships Between Bark Beetles, Fuels and Fire Behavior

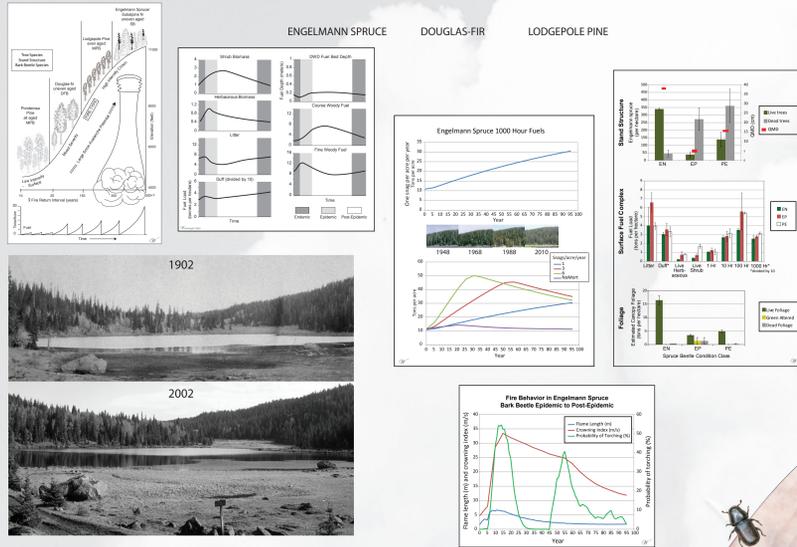
Michael Jenkins<sup>1</sup>, Martin Alexander<sup>2</sup>, Wesley Page<sup>1</sup>, Curtis Gray<sup>1</sup>, Chelsea Toone<sup>1</sup>

U.S. Forest Service Cooperators: Steve Munson, Elizabeth Hebertson, Justin Runyon, Lee Pederson and Danielle Reboletti

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## Bark beetle-induced changes to Intermountain Region conifer forests and potential effects on surface and crown fire behavior

Evaluation Monitoring Projects EM-F-04-02 and EM-F-04-03  
Michael Jenkins, Wesley Page, Arik Jorgensen, Tim Hill

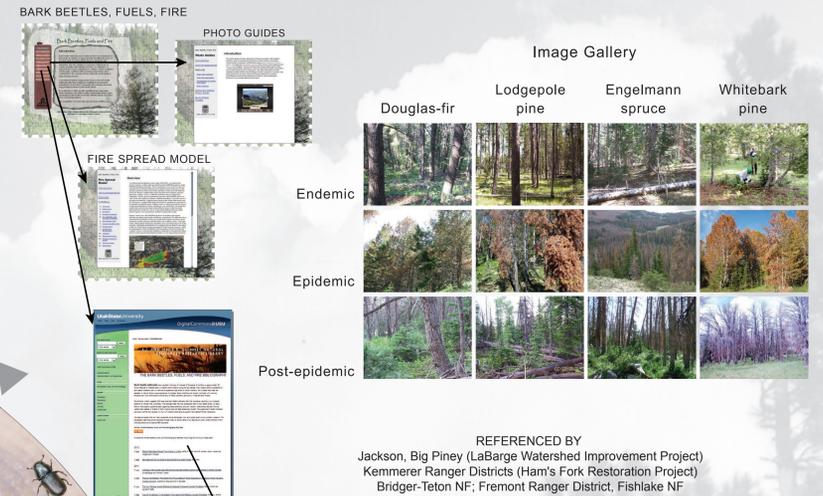


The Forest Disturbance Ecology and Management lab at USU studies the effects of the interaction of selected agents of disturbance on Intermountain forests over long temporal and large spatial scales. Since the early 2000's our work has focused on the influence of bark beetles on fuels complexes and the potential alteration of surface and crown fire regimes.

## Bark Beetles Fuels Fire Website

Evaluation Monitoring Project EM-F-07-09 and Special Technology and Development Project STDP R4-INT-F-07-05  
Michael Jenkins, Wesley Page, Arik Jorgensen, Tim Hill, Chelsea Toone, Wanda Lindquist

<http://www.usu.edu/forestry/disturbance/bark-beetles-fuels-fire/>



BARK BEETLES, FUELS, FIRE

PHOTO GUIDES

FIRE SPREAD MODEL

Image Gallery

Douglas-fir Lodgepole pine Engelmann spruce Whitebark pine

Endemic Epidemic Post-epidemic

REFERENCED BY  
Jackson, Big Piney (LaBarge Watershed Improvement Project)  
Kemmerer Ranger Districts (Ham's Fork Restoration Project)  
Bridger-Teton NF; Fremont Ranger District, Fishlake NF

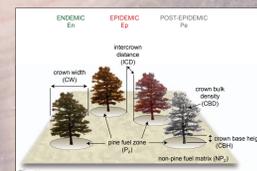
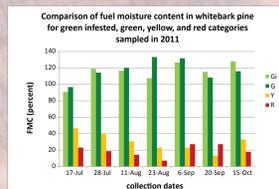
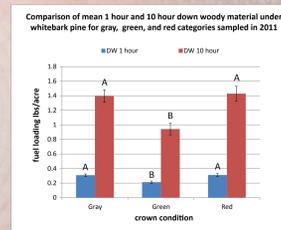
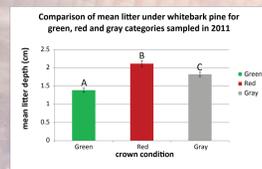
## Fuel and fire behavior in bark beetle-affected five needle pines

Evaluation Monitoring Project EM-F-10-02  
Michael Jenkins, Chelsea Toone

The objective of this study is to 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. We have collected data from 156 plots near LaBarge, Wyoming at elevations between 9000 and 10000 feet. Data compare litter and fine fuels beneath green, red and gray whitebark pine crown condition classes.

### RESULTS

Significant differences were detected in litter, duff, and one and ten hour timelag woody fuels when comparing Green, Red and Gray whitebark pine crown classes

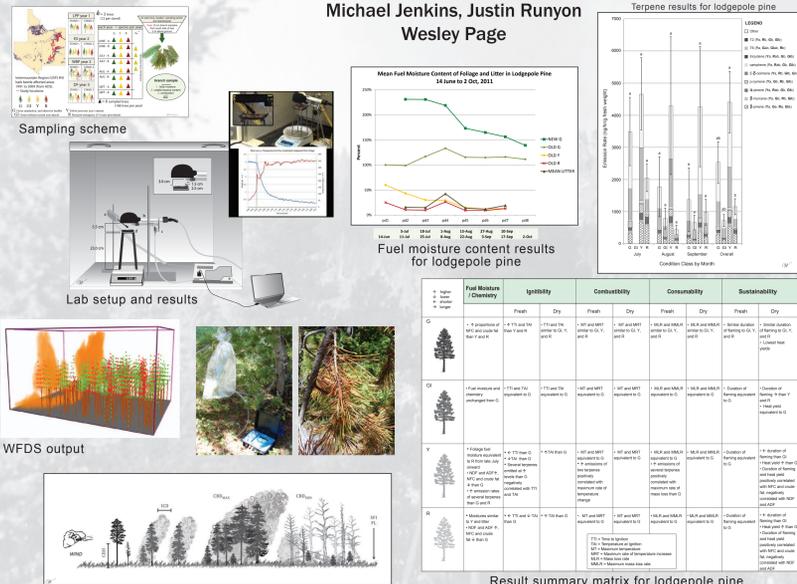


### Publications

- Jenkins, M.J., Page, W.G., Hebertson, E.G., Alexander, M.E., 2012. Fuels and fire behavior dynamics in bark-beetle attacked forests in Western North America and implications for fire management. *Forest Ecology and Management*, in press.
- Jenkins, M.J., 2011. Fuel and fire behavior in high-elevation five-needle pines affected by mountain pine beetle. In: Keane, R.E. (Ed.), *The Future of High-Elevation Five-Needle White Pines in Western North America*. USDA Forest Service, Rocky Mountain Research Station, Proceedings RMRS-P-63, pp. 198-205.
- Jenkins, M.J., Hebertson, E., Page, W.G., Lindquist, W.E., 2011. A tool to estimate the impact of bark beetle activity on fuels and fire behavior. *Fire Management Today* 71(3), 36-41.
- Jorgensen, C.A., Jenkins, M.J., 2011. Fuel complex alterations associated with spruce beetle-induced tree mortality in Intermountain spruce-fir forests, USA. *For. Sci.* 57, 232-240.
- Jenkins, M.J., 2010. The Influence of bark beetles on fuels and fires in western North American conifer forests. In: Viegas, D.X. (Ed.) *VII International Conference on Forest Fire Research*, Coimbra, Portugal.
- Jenkins, M.J., Hebertson, E., Page, W.G., Jorgensen, C.A., 2008. Bark beetles, fuels, fires and implications for forest management in the Intermountain West. *For. Ecol. Manage.* 254, 16-34.
- Page, W.G., Jenkins, M.J., 2007a. Mountain pine beetle-induced changes to selected lodgepole pine fuel complexes within the Intermountain Region. *For. Sci.* 53, 507-518.
- Page, W.G., Jenkins, M.J., 2007b. Predicted fire behavior in selected mountain pine beetle-infested lodgepole pine. *For. Sci.* 53, 662-674.

## The Influence of fuel moisture and monoterpenes on the flammability of conifer fuels

Joint Fire Science Program Project 11-1-7-16  
Michael Jenkins, Justin Runyon, Wesley Page



Sampling scheme

Lab setup and results

WFDS output

Fuel moisture content results for lodgepole pine

Terpene results for lodgepole pine

Fuel Moisture Chemistry	Ignitability		Combustibility		Consumability		Sustainability	
	Fresh	Dry	Fresh	Dry	Fresh	Dry	Fresh	Dry
G	High	Low	High	Low	High	Low	High	Low
Y	High	Low	High	Low	High	Low	High	Low
R	High	Low	High	Low	High	Low	High	Low

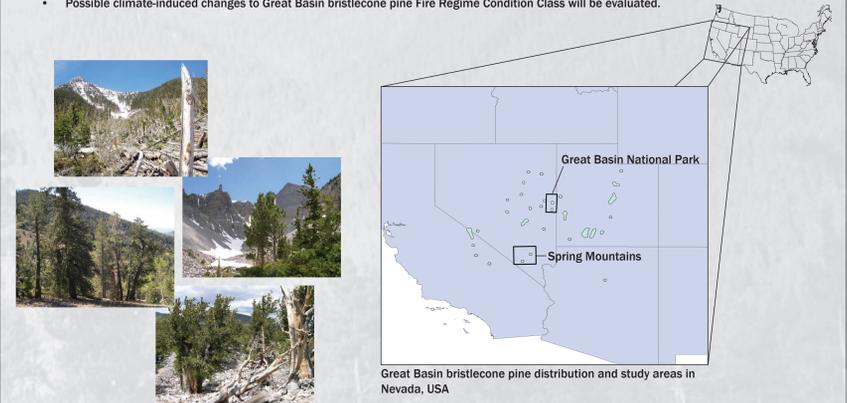
Result summary matrix for lodgepole pine

## Monitoring the impact of climate change on the frequency and severity of fires in Great Basin bristlecone pine sky island ecosystems

Evaluation Monitoring; Monitoring on the Margin  
Michael Jenkins, Curtis Gray

The objective of this research is to establish the combined threat of warming temperatures on Great Basin bristlecone pine mortality and consequent fuels accumulation effects of alteration of the fire regime.

- A GIS landscape forest cover map will be developed to estimate Great Basin bristlecone pine habitat extent and degree of fragmentation.
- A downscaled global climate model will simulate potential responses to climate change
- Stand data will monitor physiological changes to needle chemistry that may indicate a climate-induced change in plant condition at the margins of pine distribution. Data will be upscaled to examine correlations with the remotely sensed data.
- Fires will be simulated across a mixture of hypothetical and real 3-D landscapes with various proportions of climate-affected tree condition classes.
- Possible climate-induced changes to Great Basin bristlecone pine Fire Regime Condition Class will be evaluated.



Background Image: 1961 Sleeping Child Fire burns in mountain pine beetle-affected lodgepole pine on the Bitterroot NF, Montana.  
Photo by Ernest Peterson, USDA Forest Service

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