Predicted Fire Behavior in Selected Mountain Pine Beetle–Infested Lodgepole Pine

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Abstract

Using custom fuel models developed for use with Rothermel's surface fire spread model, we predicted and compared fire behavior in lodgepole pine (Pinus contorta Dougl. var. latifolia Engelm.) stands with endemic, current epidemic, and postepidemic mountain pine beetle (Dendroctonus ponderosae Hopkins) populations using standardized sets of wind speeds and fuel moistures. We also compared our fire behavior results with those from standard fuel models. Results indicated that for surface fires both rates of fire spread and fireline intensities were higher in the current epidemic stands than in the endemic stands owing to increases in the amounts of fine surface fuels. In the postepidemic stands, rates of surface fire spread and fireline intensities were higher than in the endemic stands owing to decreased vegetative sheltering and its effect on mid-flame wind speed. Total heat release of surface fires, including postfrontal combustion, was also higher in the postepidemic stands owing to heavy accumulations of large diameter fuels. Crown fires were more likely to initiate in the postepidemic stands owing to greater fireline intensities and lower crown base heights. However, the critical rate of spread needed to sustain an active crown fire was higher in the postepidemic stands owing to decreased aerial fuel continuity. We suggest here that crown fire initiation in the current epidemic stands was also greater because of an abundance of dead aerial fuels; although this relationship is unclear.
Keywords: mountain pine beetle, fuel models, fire behavior, fuels management

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