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Supporting Online Material for

Post-Wildfire Logging Hinders Regeneration and Increases Fire Risk

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Abstract

We present data from a study of early conifer regeneration and fuel loads following the 2002 Biscuit Fire, Oregon, USA, with and without postfire logging. Natural conifer regeneration was abundant after high-severity fire. Postfire logging reduced median regeneration density by 71%, significantly increased downed woody fuel loads, and thus short-term fire risk. Postfire logging can be counterproductive to the goals of forest regeneration and fuel reduction.

Materials and Methods

We used a before-after/control-intervention (BACI) design to capitalize on pre- (2004) and post-(2005) treatment data and to account for interannual variation in responses. While the Biscuit Fire area includes a broad range of biophysical conditions, this study focused on stand types relevant to postfire logging: mature mixed-conifer stands that experienced high severity fire (>95% overstory tree mortality). Sampled burn stands were spatially nested within "sites," defined by proximity (500-1000 m) and similar topographic/soil characteristics, and measured before logging. The five sites were separated by >3 km. Stands were sampled using one-hectare plots that included four systematically-placed 75-m transects for downed wood using the planar intercept method (*S1*); conifer seedlings were concurrently sampled in four 75-m x 1-m belt transects. In

each site, logging occurred in some but not all stands; selection was determined largely by land-use designations and socio-political influences rather than ecological boundaries. All stands were re-measured after logging. Unburned mature forest stands with similar stand characteristics and adjacent to the fire area were sampled as a reference only for pre-fire conditions. Nonparametric statistical tools (Wilcoxon signed rank tests, rank sum tests) were used for comparisons. Analyses for effect of logging were carried out using paired tests of pre- and post-treatment data for logged stands only. Time and space effects were assessed by comparing data from unlogged stands through time and against data from logged stands. Logged and unlogged stands were not significantly different prior to treatment ($p>0.10$ by rank sum test), and unlogged stands did not change significantly between years ($p>0.10$ by Wilcoxon signed rank test). Standard errors (SE) for graphical presentation were computed by back-transforming log scale mean SE.

Supporting Text

It has been thought that any pulse of unmerchantable woody materials on the ground resulting from postfire logging would be negligible due to consumption of fine materials in the initial fire (*S2*). However, our measurements show that <10% of woody biomass was consumed in the Biscuit Fire. In addition, a key difference between postfire logging and green tree harvest is that merchantable wood volume is generally lower in fire-killed trees due to burning, desiccation, decay, and lack of "crown sail" to lessen impact during falling. This difference results in comparatively high levels of unmerchantable large woody material left on the ground. Administrative delays in postfire planning can exacerbate decay levels, but in the case of the Biscuit Fire, logging commenced 2 years after fire at which time decay has been found to affect only ~10-15% of merchantable wood volume in this region (*S3*). Thus the difference in merchantability is not solely due to time since fire and is partly intrinsic to any dead-tree harvest.

While our data show postfire logging increased short-term fire risk, it has been suggested that overall removal of woody material by logging reduces longer-term fire risk (*S2*). This hypothesis merits study. An important consideration is that contribution of woody fuel loads to potential fire behavior can be especially important during early stages of forest development, when low-profile vegetation structure renders stands more prone to mortality from fire (*S4*). If postfire logging would achieve longer-term fuels reduction, it would do so in intermediate-aged stands in which susceptibility is lower, while compounding higher risk in young stands.

Supporting References and Notes

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