Evaluation of the Efficacy of Forest Manipulations Still Needed

Schoennagel and colleagues (2004) provide an important contribution toward explaining how different fire regimes operate in western forests and the implications for forest management. We agree that this variability needs to be recognized in forest restoration efforts in the West, where a model of frequent surface fire is often broadly applied to areas with different natural fire egimes.

However, we do not agree that the fire severity data from the 2002 Rodeo-Chediski fire in Arizona cited by Schoennagel and colleagues indicate that forest manipulations reduced fire severity. There is no analysis of variance in burn severity by treatment or setting in the data cited (Wilmes et al. 2002, displayed in figures 7 and 8 in Schoennagel et al. 2004). It is not clear that the sampling was consistent with statistical requirements for hypothesis testing. Topography, weather, fire suppression activities, and other factors can strongly influence fire severity, yet Wilmes and colleagues (2002) do not explain how these factors vary among sites or were controlled for in sampling.

Burn severity is typically highly variable, and the relative differences in burn severity by treatment are relatively small in the data of Wilmes and colleagues (2002). If burn severity had been sampled consistent with statistical considerations, it is possible that the data might indicate there was no treatment effect. Without adequate sampling design and statistical analysis, it is impossible to reasonably determine what effect treatments had on fire severity in the Rodeo-Chediski fire.

Although evaluating forest manipulations aimed at reducing fire severity in a broad ecological context is outside the scope of the article by Schoennagel and colleagues (2004), that work needs to be done. Mechanized fuel treatments cause collateral damage to ecosystem components, including soils, aquatics, and vegetation; they also have the potential to spread exotic plants and pathogens. The negative ecological impacts of salvage logging—one treatment described in Wilmes and colleagues (2002)—have been identified in considerable detail (Beschta et al. 2004, Lindenmayer et al. 2004). Even if such treatments do reduce fire severity, the ecological cost of those treatments may outweigh any positive effects. In most cases, the negative effects of treatments will cover a substantially greater area than that for which fire severity might be reduced—if, that is, fire should occur. The likelihood that treatments will affect wildfire severity is relatively low, because of the low probability of fire at a specific location and the transient nature of such treatments.

In conclusion, we do not dispute that fire regimes have been altered in southwestern forests, nor do we necessarily dispute that forest manipulations can reduce fire severity in these systems. However, there remain major questions regarding the likely effectiveness and the net ecological effects of such manipulations; these should be answered by rigorous research before large areas of forest are reconfigured. This will require better understanding of the natural role that fires and fuels play in different forests. We commend Schoennagel and colleagues for adding to our understanding on this front.

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Response from Schoennagel and colleagues

We support Rhodes and Odion's call for rigorous studies to evaluate the effects of fuel treatments on fire severity in different forest types. At the time we wrote our article, the Wilmes study provided the best available information from Arizona's Rodeo-Chediski fire. A recent study (Cram et al., in review) provides a replicated study design that controls for several factors in testing for the effects of treatments conducted three years before the Rodeo-Chediski fire on subsequent fire behavior indices. This study supports conclusions by Wilmes and colleagues that recent fuel treatments, especially ones that combine mechanical

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thinning with prescribed fire, reduced the severity of the Rodeo-Chediski fire.

Although these studies indicate that fuel treatments can effectively reduce fire severity in dry, low-elevation ponderosa pine forests, few rigorous studies of treatment effects exist. In the absence of such studies, we urge caution in universal support of fuel treatments and in the extrapolation of results from Arizona to other western forests.

Fuel management approaches embodied in the Healthy Forests Restoration Act represent a large-scale experiment across western forests. The scientific basis for effectively reducing fire risk by thinning remains largely untested. Among the remaining unanswered questions are these: What are effective treatment schedules and can they be maintained logistically and financially, and what effect does opening forest canopies have on tree regeneration—that is, would the problem be exacerbated if long-term commitments cannot be ensured?

We agree that broader ecological considerations must join the goal of reducing fire severity. Ecological integrity must be as important as fire control in managing our forests (Dellasala et al. 2004), especially since fireproofing our forests may elude us.

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