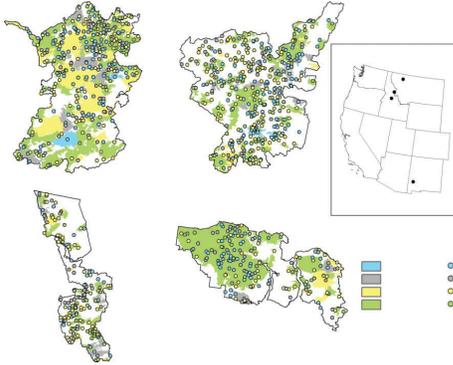




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Wildland Fire Limits Subsequent Fire Occurrence



Keywords: age-dependence, failure time analysis, fire as a fuel treatment, fire history, hazard analysis, ignition, self-limiting, self-regulation, survival analysis, wilderness.

Background & Management Issues: Several aspects of wildland fire are moderated by site- and landscape-level vegetation changes. An evaluation of fire occurrence in relation to previous wildland fire perimeters would allow for a more complete understanding of the self-regulation property, as well as providing useful insights as US federal agencies strive to restore wildland fire as a natural disturbance process. Specific quantitative information on this feedback may assist land managers in evaluating short- and long-term benefits and costs when deciding how to best manage the complexities of any particular wildland fire event caused by previous fire, thereby creating a dynamic where one fire exerts a regulatory control on subsequent fire. For example, wildland fire has been shown to regulate size and severity of subsequent fire. However, it has the potential to influence other properties of subsequent fire. The focus of our study monitored the extent to which a previous wildland fire inhibits new fires from igniting and spreading within its perimeter.

Project Description: Taking place in the four large wilderness study areas in the Western United States (US), we evaluated whether or not wildland fire regulated the ignition and spread (hereafter occurrence) of subsequent fire. Our findings expand upon our understanding of the regulating capacity of wildland fire and the importance of wildland fire in creating and maintaining resilience to future fire events. However, wildland fire has the potential to influence other properties of subsequent fire. One of those properties – the extent to which a previous wildland fire inhibits new fires from igniting and spreading within its perimeter – is the focus of our study.

Project Objective: This study was designed and conducted to:

- ✓ Determine whether or not wildland fire regulates subsequent fire occurrence. That is, we explicitly evaluate whether or not fires are less likely to ignite within the perimeters of previous burns.
- ✓ If a regulating effect is detected, quantify the longevity of the effect; that is, quantify the number of years wildland fire reduces subsequent fire occurrence.
- ✓ If a regulating effect is detected, quantify the strength of this effect as time since fire increases. In this study a fire occurrence is defined as an ignition that results in a fire ≥ 20 ha. We expected that wildland fire indeed limits subsequent fire occurrence. We also expected that the longevity of the effect would vary by study area due to differences in fire regime and other ecosystem characteristics (e.g. productivity).
- ✓ Finally, we expected that the strength of this negative feedback would be strong immediately (for the first few years) after the initial fire but would decrease with time as biomass re-accumulated.

Results:

Results clearly indicate that wildland fire indeed regulates subsequent occurrence of fire in all study areas. Furthermore, the strength of this effect is strong immediately after fire and generally weakens as fire intervals increase. More broadly, however, multiple lines of evidence indicate that feedbacks associated with wildland fire regulate several aspects of subsequent fire. That is, wildland fire regulates subsequent fire severity (Miller et al. 2012; Parks et al. 2014a), fire size (Collins et al. 2009; Parks et al. 2015), and, as explored in this study, fire occurrence (Krawchuk et al. 2006). The additive effect of the latter two feedbacks results in an overall reduction in fire activity or area burned in subsequent years (He´on et al. 2014; Parisien et al. 2014). When these feedback mechanisms are interrupted by human activities such as fire suppression, the result is larger and more severe fire in future years (Calkin et al. 2015).

Such differences likely reflect differences in productivity and fire regime characteristics among study areas and ecosystems (Cleveland et al. 1999; Rollins et al. 2002). In GAL, for example, the relatively short longevity of the effect is consistent with the dominant vegetation (ponderosa pine forest with a grassy surface fuel understory) and fire regime (primarily low severity surface fires) (Swetnam and Dieterich 1985). In this ecosystem, overstory trees have low fire mortality and fine fuels such as grasses and surface litter (i.e. pine needles) recover quickly after fire, thereby quickly resetting the stage for the occurrence of subsequent wildland fire. In FCW, SBW, and CCE, however, fire conducive conditions are less frequent, and as such, when fire does occur, it tends to be of higher severity (i.e. higher tree mortality) and is less influenced by fine fuels than it is by downed wood and ladder and canopy fuels that develop during the relatively long fire free intervals (Schoennagel et al. 2004).

Management Implications:

- ❖ Wildland fire limits subsequent fire occurrence for nine years in the warm/dry study area in the Southwestern US and over 20 years in the cooler/wetter study areas in the Northern Rocky Mountains.
- ❖ Wildland fire can act as an effective 'fuel treatment', and under suitable fuels and weather conditions, may have substantial long-term benefits resulting from a wildland fire that is managed for resource benefits as opposed to one that is suppressed.

Publications / Products:

- ❖ Parks, S. A., Miller, C., Holsinger, L. M., Baggett, L. S., & Bird, B. J. (2016). Wildland fire limits subsequent fire occurrence. *International Journal of Wildland Fire*, 25(2), 182-190.

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