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Characterising fire severity patches to understand how burn patchiness affects runoff connectivity and erosion

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The amount of runoff and erosion generated from burnt hillslopes is spatially variable. There are many factors that could contribute to this variability, including burn patchiness. Wildfires, particularly those burning under milder conditions, and prescribed burns, can create a mosaic of different fire severity patches within a burn area. Those fire severity patches may translate to a mosaic of different soil hydrological properties, influencing runoff and erosion processes at the hillslope scale. A key objective of this study is to quantify the impact of burn patchiness on runoff connectivity and erosion following fire. A primary step towards that overall objective is to ascertain whether or not the hydrological properties of fire severity patches are different. Soil hydrologic properties were measured following an autumn prescribed burn in dry eucalypt forest in south-eastern Australia. Point and plot-scale measurements were done immediately following the burn (in autumn) and then again during the wet spring period. Parameters measured included soil water repellency, saturated hydraulic conductivity, surface cover, runoff ratio and interrill erodibility. Additionally, 120 runoff plots were established in late winter to measure hillslope runoff and erosion. Analysis of the runoff plot data suggest a large difference between burnt and unburnt patches but less difference between fire severity patches. Similar trends emerge at the point and plot-scale for measurements taken during spring with surface cover, saturated hydraulic conductivity and erodibility showing differences between burnt and unburnt areas but not between the different fire severity classes. This initial analysis suggests the arrangement of burnt and unburnt patches is more important to runoff connectivity than the arrangement of different fire severity patches. The data also reveal temporal trends in soil hydrologic properties relating to both post-fire recovery and seasonal climatic influences.