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Measuring runoff connectivity following a patchy forest fire

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A range of different fire severities and unburnt areas often occur within a burnt forest. This patchiness may contribute to variability in runoff and erosion because the potential for runoff and erosion is likely to be different for each fire severity class and the amount of runoff reaching a stream is likely to depend on the spatial arrangement of fire severity patches. This study tests those ideas with field measurements of runoff connectivity in a burnt eucalypt forest in Victoria, Australia. Runoff plots (with a 10 cm wide mouth) were deployed in groups of 20 along transects beneath six different spatial arrangements of fire severity patches on the same burnt hillslope. The runoff plots were unbounded with slope lengths of 100 m above them. Rather than limiting the contributing area for each runoff plot (as is the case for closed plots) this design enables all the runoff reaching a particular point to be collected, providing insights into the extent of runoff connectivity at that point. The runoff and erosion collected by each plot was monitored for individual rainfall events over an eight-month period. During that time there was a wide range of rainfall intensities (up to 80 mm per hour) and totals (up to 170 mm over 48 hours). Initial analysis of the data shows a strong contrast between different patch arrangements for both runoff volume and sediment concentration, suggesting that patch arrangement is having a strong effect on runoff connectivity. Unburnt patches appear to be highly successful at intercepting runoff from burnt areas further upslope. Rainfall intensity appears to be a key factor driving differences in connectivity for similar depth rainfall events.