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Post-fire soil water repellency in highly repellent forest soils in Victoria, Australia

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In this study soil water repellency was monitored seasonally following prescribed burns to better understand the effects of fire severity on soil hydrological properties. The study sites consisted of dry eucalypt forest with clay loam soil. This forest type is common in south-eastern Australia and is frequently burnt by both wildfires and prescribed burns. A feature of the soil at these sites is that it is strongly repellent in the absence of fire. This potentially complicates the relationship between fire and soil water repellency. The sites were burnt by prescribed fires and lighting patterns were used to manipulate the fire behaviour and achieve a range of fire severities. Since soil temperatures during a fire are thought to drive changes in soil water repellency, soil temperatures were measured during the burns using thermocouples and heat-sensitive liquids. Other indicators of fire severity and soil heating were also measured including surface fuel consumption, fire behaviour, fuel moisture and soil moisture. Following the burn, water repellency was measured in situ, using the Critical Surface Tension test at seven depths (between 0 -10 cm) within patches of each fire severity class. These measurements were repeated overtime (in spring and then in autumn) to reveal temporal trends relating to post-fire recovery and seasonal climatic influences. Initial analysis of the data from immediately following the burn shows only small differences in water repellency between the fire severities and between the burnt and unburnt areas. However, during the wet spring period the distinction between the fire severities and between the burnt and unburnt areas was much more obvious for some locations with water repellency persisting more strongly in the burnt areas. These results suggest that for soils with pre-existing water repellency there is a complex relationship between fire and water repellency, where seasonal climatic influences may delay the appearance of fire-related changes to repellency.