MANAGING POST-FIRE SOIL EROSION IN THE SOUTHERN MOUNT LOFTY RANGES

Rowena Helen Morris

Bachelor Science (Hons) Geomorphology (University of Sydney)
Graduate Diploma Education (University of Adelaide)
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Abstract

Post-fire soil erosion is a great concern to land managers due to the potential adverse effects on water quality, the alteration to soil profiles and the detrimental impacts on human communities. To reduce the potential adverse effects of post-fire erosion mitigation actions have been instigated following severe wildfires. Various programs of prescribed burning have been initiated to reduce the risk of wildfires. In order to predict and manage post-fire erosion a clear understanding is needed of the influential environmental variables, associated processes and whether mitigation actions will be effective. In the Southern Mount Lofty Ranges there is a paucity of post-fire erosion data from which to generate evidence-based predictive models and management recommendations.

This thesis has the overarching goal of developing evidence-based options for managing post-fire sediment movement in the Southern Mount Lofty Ranges. Evidence-based management of sediment movement from both prescribed fire and wildfire can reduce potential erosion and hence protect regional natural services such as soil profile formation, soil mineral health, the regulation of water quality and maintenance of local landscape character. A case study of the Southern Mount Lofty Ranges is used to produce evidence-based options for managing post-fire erosion in relation to a wildfire at Mount Bold and ten prescribed burns conducted within the Southern Mount Lofty Ranges. Field techniques included visual erosion assessments, erosion pins, terrestrial laser scanning, digital close range photogrammetry and sediment traps. Experiments were designed to incorporate the spatial differences within the topography. Regression modelling was used to analyse environmental variables that influence post-fire sediment movement.

Erosion assessments indicated that after prescribed burning sediment movement occurred in 52% of the burnt areas compared to only 4% in the unburnt areas, however magnitude of movement was only minor. Fire severity was the most influential variable in generating sediment movement after prescribed burning. In contrast slope steepness was the most influential environmental variable in relation to the magnitude of erosion after the 2007 wildfire at Mount Bold. After a 1 in 5 year rainfall event hay-bale sediment barriers will reduce but not prevent post-fire charcoal-rich sediment and debris reaching water reservoirs.
Managing soil erosion in the post-fire landscape requires an appreciation of the influencing environmental variables and the available mitigation options. This thesis highlights the importance of recognising the spatial variability of the topography when managing post-fire erosion. A suite of environmental variables including fire severity, rainfall, aspect, bioturbation, slope length, slope angle and cross-slope curvature need consideration when predicting the occurrence of sediment movement following prescribed fire. Mitigation actions to minimise the adverse effects of post-fire erosion need to take account of rainfall intensity, fire severity and topographical influences. Management of post-fire soil erosion in the Southern Mount Lofty Ranges also needs a recognition of the potential influence on regional natural services including soil profile formation, regulating water quality and maintaining local landscape character.
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Declaration

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