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Soil erosion by water following wildfire: a state of the art review

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Over the last 20 years or so, wildfires have reportedly become more frequent and severe globally, and there has been heightened concern about their degradational impacts in the rural areas of regions that previously were rarely mentioned in the literature in relation to wildfire, such as the Mediterranean Basin, Australia and South Africa. The evidence from such areas on the causes, processes and geomorphological consequences of wildfires has added significantly to the literature otherwise dominated by the US experience. This contribution aims to review critically the present state of knowledge, drawing on examples from the literature based on all these locations. It identifies: (a) well established, widely-applicable models of wildfire impacts; (b) the influence of locally or regionally distinctive processes and conditions that cause variations in post-fire soil erosion patterns; and (c) important remaining research gaps and problems.

Wildfire is known typically to produce a sharp peak in erosion, which declines towards pre-fire levels usually within 10 years. Factors such as the timing of post-fire rainfall, soil structure and stability, soil water repellency behaviour, the availability of soil protection from fallen scorched litter, surface stone lag development and vegetation growth and the impact of bioturbation and protection measures (e.g. hydromulching) can combine in different ways to produce distinctive differences compared with the theoretical, standard post-fire erosion curve. Important research gaps include, for example, the 'seriousness' of post-fire erosion rates, which are frequently compared with mature unburnt forest rates. Given the extremely low figures usually recorded for the latter and the fact that periodic disturbance by wildfire has long been characteristic of many forests, scrublands and grasslands showing no sign of progressive reduction in soil thickness or nutrient deficiency, some improved way of assessing the degrada-

tional significance of post-fire soil erosion is needed. In addition, there have been relatively few studies encompassing post-fire sediment yield characteristics at catchment scales, most studies focusing on the typically high losses recorded at point, traverse, plot and, in a few cases, hillslope scales. A better understanding of the wide range, and interaction, of factors that can promote or limit post-fire soil erosion will help to improve our ability to predict and mitigate serious soil losses where they occur.