

Post-fire erosion and sediment yield in a Mediterranean forest catchment in Italy

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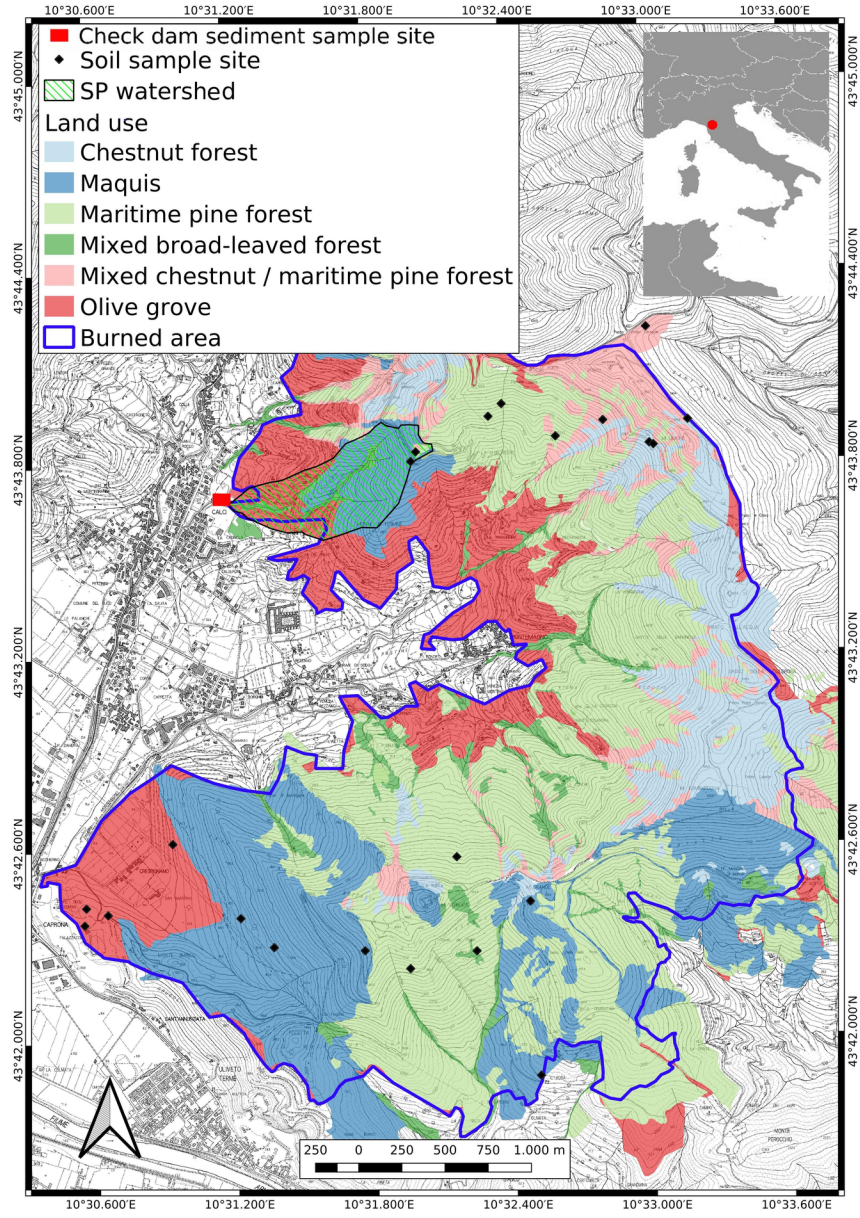
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Abstract

Wildfires are an increasingly alarming phenomenon that affects forests and agro-ecosystems, generating several cascade effects among which soil erosion is one of the most deleterious. A robust body of data-based evidence on post-fire soil erosion and sediment yield at watershed scale is thus required, especially dealing with areas where wildfires are particularly frequent, such as the Mediterranean Basin. This study analyses the impact of the first rains after a large wildfire in terms of soil erosion and sediment yield at watershed scale in a Mediterranean area, the Pisan Mountains, Central Italy. Here about 1,000 ha of olive groves, maquis, maritime pine and chestnut forests burned. Fire severity was mapped by remote sensing and checked by a field survey. Sediment yield was assessed by sampling the earthy material deposited upstream a check dam at the outlet of the watershed. Finally, a hydrological model was developed in HEC-HMS environment for exploring the relationship between the erosion-deposition events observed in the watershed and the rainfall-induced hydrological processes. The first two post-fire rainy events relocated a high amount of sediments, mostly non-organic, perhaps already in the stream before the fire, while the subsequent four rains deposited materials rich in pyrogenic organic matter. Overall, the soil erosion caused by such six main post-fire rains – the larger of which had a return time of one year – was estimated to amount to 7.85 t ha⁻¹, corresponding to 42% of the watershed average annual potential erosion rate in normal conditions. This value is lower than expected and, overall, moderate if compared to other Mediterranean case studies, possibly because of the nature of soils in the studied watershed, i.e. shallow and quite stony, thus poor in fines prone to erosion.

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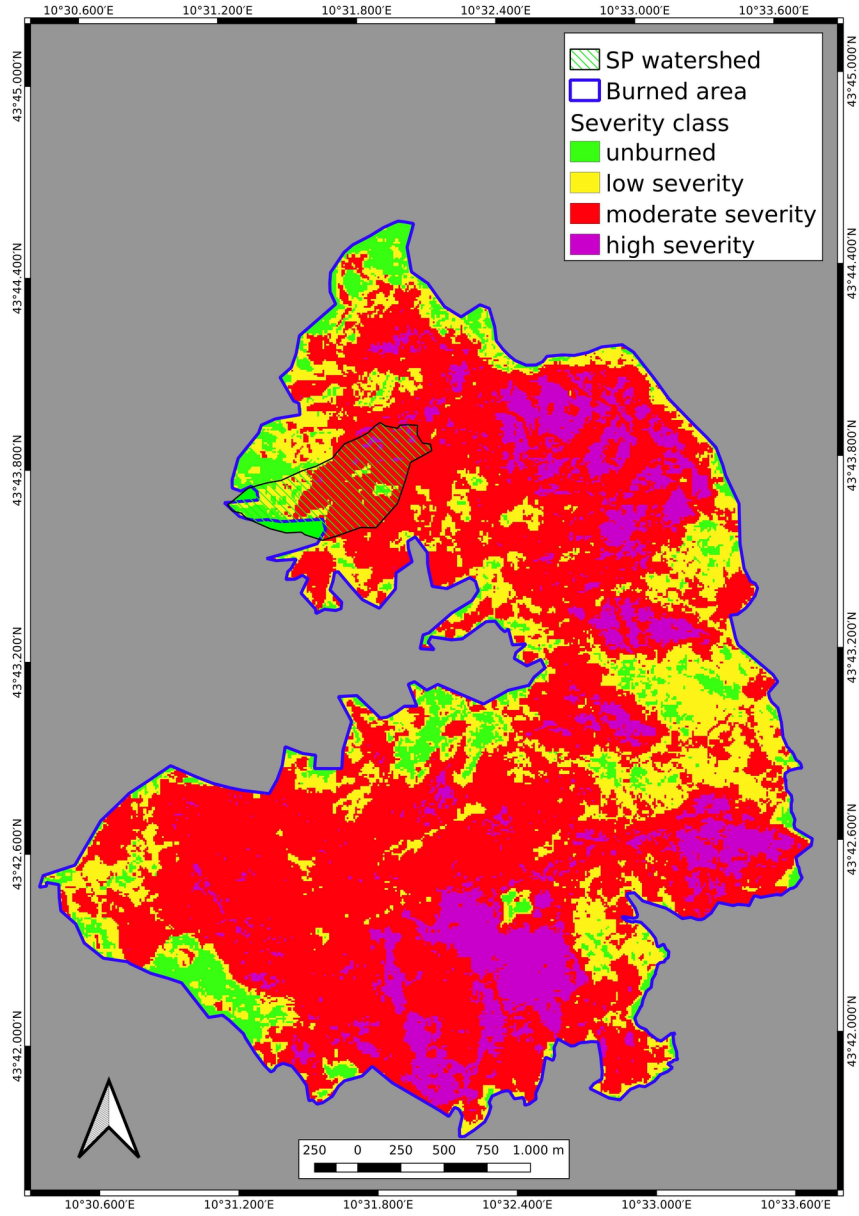
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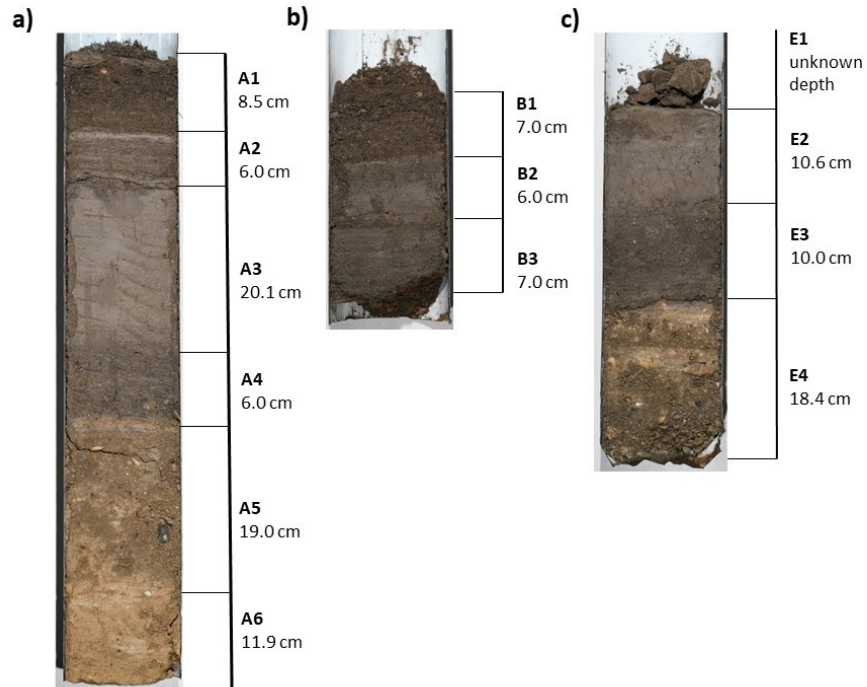
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