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Alternative post-fire emergency measures efficiency for soil erosion control in semi-arid Mediterranean environments.

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Wildfires have historically been a natural alteration in Mediterranean ecosystems. Despite these ecosystems' high resilience, the expected climate change scenarios may lead into more recurrent and severe wildfires, and erosion and degradation processes can be enhanced.

Post-fire restoration measures, seek to minimize wildfire negative impacts on the burned area as well as its ecological rehabilitation. Among these measures, soil stabilization treatments like erosion barriers or mulching are key for erosion and flood control. Nevertheless, its economic viability can be limited, and therefore these treatments must be thoroughly evaluated considering their costs and their efficiency to achieve the objective. Additionally, there is a need to evaluate new techniques, which can be implemented in places where, due to the scarce vegetation, some traditional treatments as log barriers cannot be implemented. This study seeks to evaluate the cost-efficiency of alternative post-fire emergency measures for erosion control in a semi-arid Mediterranean area.

The study area is located in the SE of Spain, more specifically in Hellín (Albacete). Wildfire took place on July 27 of 2020, and severely affected 266 ha of *Pinus halepensis* forest. Soil erosion was measured in 9 different micro-catchments (≈0.5 ha) located in the burned area. Three groups of micro-catchments were created, and a different treatment was randomly applied to each group. The applied treatments were the combination of straw mulch (0.25 kg/m^2) with contour-felled logs (ML), and prefabricated biodegradable barriers (350 m/ha), Easy-Barriers ® (EB). The last three micro-catchments were designated as control and no treatment was applied. At the outlet of each micro-catchment, sediment traps were settled to measure sediment yield. Additionally, rainfall intensity and erodibility were measured with pluviometers installed on the field.

The outcomes of the experiment, show that only the ML treatment resulted in a significant reduction (Kruskal-Wallis H test) of the eroded sediment for the first 15 months after fire. For the studied period, a total mean eroded sediment of 9.61 and 8.41 ton/ha was measured at the control and the EB traps respectively, while at the ML traps this amount was significantly lower (1.43 ton/ha). The difference between the two applied treatments increased as the rainfall events occurred, due to the breaking of the EB and the transport downstream of the sediment they were

retaining. Therefore, the measured sediment yield at the EB traps during the autumn of the second year was higher than in the control ones. According to these results, ML must be considered as an effective treatment to soil stabilization, whereas EB did not perform as expected. That underlines the need to improve the strength and durability of the EB, as their aim is to hold on until the vegetation recovery is sufficient to retain those sediments. As well, the efficiency of the combination of EB with mulch treatments should be studied as the use of EB considerably reduce costs and allows managers not to depend on the availability of material to place contour-felled logs throughout the burned area.