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Effectiveness of log timber barriers to reduce erosion from terraced swales

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Extreme erosive responses after wildfires and the effectiveness of so-called emergency stabilization measures have been poorly quantified for convergent hillslopes and catchments, especially in comparison with (micro)plots and planar hillslopes. Yet, in Portugal, the barrier-based measures have been preferred in operational emergency stabilization. This recent study assessed the effectiveness of log barriers at reducing post-fire erosion at the swale scale within the framework of the INTERREG-SUDOE project EPyRIS (SOE2/P5/E0811). The study was conducted in Penouços (Aveiro, central Portugal), in an area burned by a wildfire in early September 2020, affecting 2035 ha. Before the first rainfall event after the wildfire occurred, three pairs of swales (0.3-2.7 ha), located in the part of the burned area managed by the Portuguese Nature Conservation and Forests Institute, were instrumented at their outlets with sediment fences. The magnitude of the erosion produced at each micro-catchment after the first post-fire rainfall was the criteria on which it was decided how many barriers needed to be installed and in which swale. In this way, 2, 1 and 4 barriers were installed in swales 2, 4, and 5, respectively, because of their higher sediment delivery, while swales 1, 3, and 6 were left untreated and used as control.

Over the first post-fire year, only swale 4 wasn't producing less sediment than the respective control, swale 3, in absolute terms. Yet, in relative terms, the three swales with the barriers are producing 0-1 % of the sediment yields prior to the barriers' installation. The initial, pre-treatment ratio of the erosion rates of the to-be-treated swale divided by the erosion rates of the paired untreated swale ranged from 6.3 for pair 2/1 to 10.4 for pair 4/3. Over the post-treatment period, the ratios markedly decreased, to 7.5 in the case of pair 4/3 and even well below 1 in the case of pairs 2/1 (0.1) and 5/6 (0.5). To validate these estimates of mitigation effectiveness, the sediments deposited at the upstream side of the barriers were collected at the end of the first post-fire year. The deposited sediments varied widely between the six barriers, from 8.9 to 192 kg, as well as between the three treated swales, from 8.9 to 462 kg. When summing the deposited sediments to the results of the outlets, the total sediment production is 606, 99.6, and 4271 kg/ha on swales 2, 4 and 5, respectively. These indicate that the sediments collected in the outlet of the swales

represent only 24, 66 and 34% of the total sediments redistributed within the micro-catchment.

This poster will present the detailed differences of the sediment production in each paired micro-catchment during the first post-fire year and the efficiency of the barriers as an emergency stabilization measure discussing them in function of terrain characteristics and rainfall regime.