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Mitigation of post-fire erosion from terraced micro-catchments using timber barriers

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Recently burnt areas across the world have been documented to produce strong to extreme erosion responses but these responses are much better quantified for (micro-)plots and planar hillslopes than for convergent hillslopes and catchments. The same applies, mutatis mutandis, for the effectiveness of so-called emergency stabilization measures to reduce the risks of such strong to extreme responses. The only prior study in Portugal on the mitigation of post-fire erosion beyond the planar slope scale (i.e. swales of 500-800 m2) tested mulching with eucalypt logging residues. It found the treatment to be highly effective during the first two post-fire hydrological years in the sense that soil losses were, average, 88 and 77% smaller at the three mulched swales than at the 3 untreated swales. This in spite the mulch had been applied at reduced rate (2.4 Mg ha-1) compared to preceding, plot-scale studies in the region (>8 Mg ha-1). Against this background, the present study decided to test the effectiveness of log barriers to reduce post-fire erosion beyond the planar slope scale, in particular to provide evidence supporting the post-fire land management strategy that is being developed by the INTERREG-SUDOE project EPyRIS (SOE2/P5/E0811). The study area is located in the Aveiro District of central Portugal and burnt during early September 2020. In the part of the burnt area that is being managed by the Portuguese Nature Conservation and Forests Institute (ICNF), three pairs of neighbouring micro-catchments of 0.3-0.8 ha and, in one exceptional case (due to run-on from a forest track), 2.7 ha were instrumented with sediment fences at their outlets before the occurrence of the first significant rainfall event after the wildfire. The barriers, however, could not be installed until after the subtropical storm ALPHA that hit continental Portugal on 18-19 September, also due to some delay in the contracting of a company that would have prior experience in implementing post-fire emergency stabilization measures. The sediment yields produced by this first post-fire rainfall event were used to select which of each pair of micro-catchments to be treated, i.e. the one producing most erosion. Furthermore, the initial sediment yields of the three to-be-treated micro-catchments were used to decide the number of barriers per catchment, ranging from one to three. Both these aspects of the experimental design imply that the quantification of (cost-)effectiveness will less straightforward than in case of a randomized design. In compensation, the upslope part of each barrier was covered with geotextile immediately after construction to estimate the barrier's capacity to induce sediment deposition and, at the scale of the entire micro-catchment, its effectiveness to reduce post-fire sediment yields, even if sediment deposition will only be

measured at the end of each hydrological. This envisaged poster will present the differences in sediment yields between the paired, treated and untreated micro-catchments during the first post-fire autumn-winter period, and discuss them in function of terrain characteristics of the micro-catchments, RS-based fire severity, rainfall regime and changes in surface cover as derived from RGB imagery acquired with a low-cost drone.