EGU22-9699, updated on 19 Aug 2022
https://doi.org/10.5194/egusphere-egu22-9699
EGU General Assembly 2022

Mobilization of black and white ashes by overland flow and their retention by riparian vegetation - preliminary results from a lysimeter experiment

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Wildfires are now widely documented to produce strong to extreme runoff and erosion responses during the so-called window-of-disturbance. However, the role of wildfire ash in post-fire runoff generation and especially the contribution of wildfire ash to post-fire erosion rates are still poorly studied. The same applies for the effectiveness of erosion control measures to reduce ash mobilization by runoff. To address these knowledge gaps, we carried out a lysimeter experiment in which overland flow and the associated transport of sediments and ashes was compared for five treatments. Four treatments involved the application of black ash from a wildfire or white ash from a paper pulp factory, both with and without a simulated riparian strip at the bottom of the slope, while the fifth treatment was the control without ash as well as without the riparian strip. Each of the five treatments was applied to three randomly selected lysimeters. The lysimeters had a surface area of 50 cm by 120 cm, a slope angle of approximately 10 degrees and were topped up with a 2-3cm-thick layer of soil (in fact, sediments from the Mondego river) over a sand and a gravel layer. Overland flow was collected at the bottom of the lysimeters and diverted into a tank using a garden hose. The experiment started on 6 September 2021 with the application of the ash at a rate of 500 g m-2 and ended on 22 October 2021, coinciding with the initial phase of the post-fire window-of-disturbance in the study region. During this 7-week period, overland flow was measured at a total of five occasions following significant rainfall events and, whenever possible, samples collected for laboratory analysis of their concentration of total suspended sediment (TSS) and their organic matter fractions. The preliminary results for the lysimeters without riparian strip suggested that the two types of ashes played contrasting roles in overland flow generation. The average amount of overland flow over the 7-week period was higher for the lysimeters with white ashes than for the control lysimeters (36.0 vs. 31.2 l), while the opposite was true for the lysimeters with black ashes (26.8 l). These differences in overland flow were associated with differences in TSS concentrations that were the opposite, averaging 11.7 and 20.4 g l-1 over the entire study period in the case of the lysimeters with white and black ashes, respectively. The overall TSS concentrations also suggested a marked role for the riparian strips but only in the case of the black ashes, dropping to 15.3 g l-1. In the case of the white ashes, the overall TSS

concentrations were the same with as without the riparian strips.