EGU21-12454
https://doi.org/10.5194/egusphere-egu21-12454
EGU General Assembly 2021

Geotubes vs. mulching for post-fire erosion mitigation in eucalypt vs. pine plantations in Central Portugal vs. Galicia

Ana Isabel Machado, Bruna Oliveira, Dalila Serpa, Martha Santos, Fátima Jesus, Adriana Xavier, Behrouz Gholamahmadi, Martinho Martins, Oscar González-Pelayo, Jan Jacob Keizer, and Life-Reforest Consortium
Centre for Environmental and Marine Studies (CESAM), Department of Environment and Planning, University of Aveiro, Aveiro, Portugal (a.i.machado@ua.pt)

Wildfires are well-known to negative affect forest both directly and indirectly, due to fire-enhanced runoff generation and the associated losses of wildfire ash, soil, organic matter and nutrients. In turn, post-fire runoff and erosion can, promote eutrophication and contamination of downstream surface water bodies. A variety of erosion mitigation measures have been tested in recently burnt areas, with especially mulching with straw having been applied in operational post-fire land management in the USA and Galicia. The present work, evaluates the effectiveness of a new erosion mitigation strategy, using geotubes filled with mycotechnosols and straw, and compares it to that of mulching. This was done for the two prevalent forest types in central Portugal and Galicia, i.e. an eucalypt plantation in Central Portugal and a pine plantation in Galicia that both burnt during the summer of 2019. Both study sites were instrumented with 9 bounded erosion plots of 16m^2 with sediment traps at the bottom of the plots, divided over three blocks. The three treatments of doing nothing, mulching and geotubes were applied to one plot per block. In total, 4 geotubes were placed in each plot to create a barrier in the middle of the plot and at the bottom, just before the sediment deposition zone at the plot outlet. Mulching was done with chopped eucalypt bark at the eucalypt site and with pine needles at the pine site, at application rates of roughly 250 g m^{-2}. Eroded sediments were collected on a bi-weekly to monthly basis, depending on occurrence of rain, during the first post-fire hydrological year. The results showed that the erosion rates of the control plots differed about one order of magnitude between the two sites, amounting to an average of 11 Mg ha^{-1} y^{-1} at the pine site as opposed to 1.0 Mg ha^{-1} y^{-1} at the eucalypt site. This discrepancy was probably related to soil type (derived from granite vs. schist) and stoniness. Mulching was somewhat more effective than the geotubes at the pines site, with reduction in average annual erosion rates of 84 and 77%, respectively. The opposite was true at the eucalypt site, with annual erosion reductions of on average 75 and 62%. The use of geotubes would therefore seem a further option for forest and water resources managers to decrease markedly the risks of both elevated and reduced soil (fertility) losses from recently burnt hillslopes and the associated risks for downstream values.