
Predicting post-fire soil erosion and its mitigation in Maritime Pine stands

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Wildfires have become a recurrent threat for many Mediterranean forest ecosystems. The characteristics of the Mediterranean climate, with its warm and dry summers and mild and wet winters, make this region prone to wildfire occurrence as well as to post-fire soil erosion. This threat is expected to be aggravated in the future due to climate change and inadequate land management practices.

The wide recognition of wildfires as a driver for runoff and erosion in burnt forest areas has created a strong demand for model-based tools for predicting the post-fire hydrological and erosion responses and, in particular, for predicting the effectiveness of post-fire management measures to mitigate these responses.

In this presentation, we will analyse how well hydrological and erosion modelling results can be transferred between burnt areas and treatments. To this end, we used data from two field experiments in north-central Portugal. The Colmeal experiment was carried out in two Maritime Pine stands following a 2008 wildfire, and tested the effectiveness of spontaneous needle cast and hydromulching. The Colmeal measurement and modelling results were published in Prats et al. (2016) and Vieira et al. (2018). The Loriga experiment was started only recently, in the framework of the EPYRIS SUDOE project, following a wildfire on 24 August 2018, and aims to assess the effectiveness of mulching with pine needles and with pine chips in a former Maritime Pine stand. Both mulch treatments explicitly targeted minimal application rates (1.3 and 2.6 Mg ha⁻¹).

In a nutshell, the Colmeal experiment showed that hydromulching was more effective than spontaneous needle cast to reduce overland flow generation but similarly effective to reduce erosion. The overall runoff coefficient decreased from 43 % under untreated conditions to 10 and 23 %, respectively, while soil losses dropped from 3.7 Mg ha⁻¹ y⁻¹ under untreated conditions to 0.5 and 0.4 Mg ha⁻¹ y⁻¹. The runoff and erosion rates of all three treatments could be predicted with reasonable accuracy by all three selected models (RUSLE, MMF, PESERA), in spite of their different natures and complexities.

The insights gained in the application of the three models to the Colmeal data set will now be applied to the initial data from the Loriga experiment, in particular to assess the importance of local factors in the models' performance.