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Modelling the effect of fire frequency on runoff and erosion in north-central Portugal using the revised Morgan-Morgan-Finney

Mohammadreza Hosseini (1), João Pedro Nunes (2), Oscar González Pelayo (2), Jan Jacob Keizer (2), Coen Ritsema (1), Violette Geissen (1,3)

(1) SLM Group Wageningen University (WUR), P.O. Box 47, 6700 AA, Wageningen, The Netherlands (mohammadreza.hosseini@wur.nl), (2) CESAM & Department of Environment and Planning, University of Aveiro 3810-193 Aveiro, Portugal, (3) INRES, University of Bonn, Nussallee 13, 53115 Bonn, Germany

Models can be valuable for foreseeing the hydrological effects of fires and to plan and execute post-fire management alternatives. In this study, the revised Morgan–Morgan–Finney (MMF) model was utilized to simulate runoff and soil erosion in recently burned maritime pine plantations with different fire regimes, in a wet Mediterranean area of north-central Portugal. The MMF model was adjusted for burned zones in order to accommodate seasonal patterns in runoff and soil erosion, attributed to changes in soil water repellency and vegetation recovery. The model was then assessed by applying it for a sum of 18 experimental micro-plots (0.25 m^2) at 9 1x-burnt and 9 4x-burnt slopes, using both literature-based and calibrated parameters, with the collected data used to assess the robustness of each parameterization. The estimate of erosion was more exact than that of runoff, with a general Nash-Sutcliffe efficiency of 0.54. Slope angle and the soil's effective hydrological depth (which relies on upon vegetation and additionally crop cover) were found to be the primary parameters enhancing model results, and different hydrological depths were expected to separate between the two differentiating fire regimes. This relative analysis demonstrated that most existing benchmark parameters can be utilized to apply MMF in burnt pine regions with moderate severity to support post-fire management; however it also showed that further endeavours ought to concentrate on mapping soil depth and vegetation cover to enhance these simulations.