

## EFFECTS OF WILDFIRE, SALVAGE LOGGING AND SLASH TREATMENTS ON SOIL DEGRADATION

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## ABSTRACT

The effect of wildfire and the subsequent harvesting on soil degradation was evaluated in a burned *Pinus pinaster* stand in Galicia (NW Spain). During the first year following a fire of moderate intensity, burned trees were not harvested and soil erosion losses, measured by sediment collection at the bottom of bordered plots, were very low. An apparently limited impact of fire on soil and reduced rainfall erosivity for this period could be responsible for that result.

Salvage logging took place 13 months after fire. Three post-fire alternatives were compared: no harvesting (standing burned trees), harvesting + windrowed slash and harvesting + slash chopping. Soil losses were even lower during the 14 months after these treatments than for the previous pre-harvesting period. Again, low mineral soil exposition and rainfall erosivity seemed to contribute to that result.

Changes in soil bulk density and soil shear strength after clearcutting and slash manipulation were small and not enough to trigger sediment yield significantly.

Harvesting and logging operations apparently increased soil inhomogeneities. This degree of variability was more adequately assessed by using micro-plot fences instead of plot fences. The percentage of soil disturbed by machinery was the variable most related with the observed minor soil losses after harvesting, at micro-plot level. This study indicated that the combined effect of wildfire and clearcutting caused only an acceleration of soil erosion when significant exposition of mineral soil occurred after these perturbations. However, these results must be taken with caution because rain erosivity during the study was low. To delay post-fire clearcutting until several months after the fire could reduce the impact of this forestry operation on burned soils, taking advantage of the natural mulch created by scorched leaves fall, although other issues must be taken into account. Copyright © 2007 John Wiley & Sons, Ltd.

KEY WORDS: soil erosion; wildfire; *Pinus pinaster*; forest harvesting; slash management

## INTRODUCTION

*Pinus pinaster* Ait, is the conifer that occupies the largest forest area in the Iberian Peninsula, and has also been the most affected by wildfires in the recent years. From 2000 to 2005, about 12 850 ha of *P. pinaster* have been annually destroyed by fire in Spain. The awareness of an increasing risk of wildfires is rising for that area in the prospect of global climate change (Iglesias *et al.*, 2005).

Erosion rates typically increase after wildfire (e.g. Robichaud and Brown, 1999; Benavides-Solorio and MacDonald, 2001; Johansen *et al.*, 2001; Martin and Moody, 2001; Meyer *et al.*, 2001; Benavides-Solorio and MacDonald, 2005) through the reduction or elimination of vegetation cover and ground cover, exposing mineral soil to raindrop impact and reducing its infiltration capacity. Fire can also alter soil structure, affecting bulk density

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