

IMMEDIATE EFFECTS OF PRESCRIBED BURNING, CHOPPING AND CLEARING ON RUNOFF, INFILTRATION AND EROSION IN A SHRUBLAND AREA IN GALICIA (NW SPAIN)

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ABSTRACT

The immediate effects of three different fuel management treatments on runoff, infiltration and erosion were evaluated in a mixed heathland in Galicia (NW Spain). The treatments compared were: prescribed burning, shrub chopping and shrub clearing.

Rainfall simulations were conducted immediately before and after fuel reduction treatments. A rainfall rate of 67 mm h⁻¹ was applied for 30 min to each runoff plot.

Application of treatments significantly affected runoff and infiltration, but the parameter most affected by treatment was soil erosion, especially after prescribed burning. However, sediment yields measured immediately after treatments were low in all the cases, varying from 32 kg ha⁻¹ after shrub clearing to 248 kg ha⁻¹ after prescribed burning. In the rainfall simulation plots subjected to prescribed burning, the maximum temperatures reached at mineral soil surface during burns significantly affected soil losses. The organic layer remaining after treatments and soil moisture contents appeared to be critical variables in controlling runoff and erosion during the first rainfall event following fuel reduction treatments. When the remaining organic layer was removed just after treatments and a new rainfall simulation was carried out, mean infiltration rate tended to decrease and cumulative runoff and sediment yield tended to increase.

The above information could be useful for determining whether fuel management prescriptions are compatible with fire hazard reduction and soil conservation. Copyright © 2008 John Wiley & Sons, Ltd.

KEY WORDS: fuel management; heathland; fire hazard reduction; hydrologic parameters; sediment yields; Spain

INTRODUCTION

Shrub communities cover more than a half of the total territory in Galicia (Ministerio de Medio Ambiente, 2001). In the past decade, more than 22 000 ha of shrubland areas have been affected annually by forest fires in Galicia (Ministerio de Medio Ambiente, 2006). In the summer of 2006 alone, about 2000 fires burnt 38 500 ha of shrubland in the region.

Prescribed burning is frequently used to manage vegetation in shrublands. The most common reasons for use of this technique are to reduce accumulated fuel and alteration of fuel continuity (Biswell, 1989; Pyne *et al.*, 1996; Conard and Weise, 1998; Vega *et al.*, 2000; Baeza *et al.*, 2002). Other fuel management techniques are also being used, for example chopping or shrub clearing, particularly in areas comprised by the urban/wild-land interface. Ultimately, fuel management methods attempt to decrease the intensity of any subsequent wildfires that affect the treated area and reduce negative impacts, especially post-fire soil erosion. Wildfires can induce dramatic changes in the infiltration of forest soils (e.g. Imeson *et al.*, 1992; Pradas *et al.*, 1994; Cerdá, 1998a,b; Martin and Moody, 2001; Cerdá and Lasanta, 2005), but that does not mean that low severity fires will cause a similar effect. Vegetation and

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