



## Effects of fuel reduction treatments on a gorse shrubland soil seed bank in the north of Spain: Comparing mastication and prescribed burning



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### ABSTRACT

Fuel reduction treatments are commonly used to decrease the risk of severe wildfire in shrubland areas in the North of Spain. Information about the associated environmental effects is required to help forest managers select the most appropriate treatment. Although the soil seed bank plays an important role in post-disturbance recovery and resilience of frequently disturbed shrubland communities, little is known about how it is affected by fuel reduction treatments. We carried out a combined greenhouse and field study to evaluate the effects of two fuel reduction methods (prescribed burning and mastication) on the size and composition of the soil seed bank in a fire-prone gorse shrubland area in northern Spain. Total seedling density, species richness and similarity index were the variables analyzed. We also determine the effect of the depth of the soil organic cover remaining after mastication on the soil seed bank composition.

In the greenhouse experiment, significantly more seedlings emerged from the samples of the soil seed bank obtained after burning (810.6 seedlings m<sup>-2</sup>) than in those obtained before burning (608.3 seedlings m<sup>-2</sup>) and after mastication (610.1 seedlings m<sup>-2</sup>). This contrasted with the lack of differences observed before and after mastication. Species richness in the soil seed bank was not altered by either prescribed burning or mastication. The observed high degree of similarity between soil seed bank and above-ground vegetation in both pre and post-treated soils was attributed to the dominance of resprouting species.

Post-burning seedling density was not significantly related to any of the soil thermal regime parameters during burning. The depth of the soil organic cover after mastication apparently did not affect the composition of the soil seed bank.

The field study revealed a low rate of seed germination of all species, which along with the rapid recovery of cover by the resprouting woody species in the community, suggests that the soil seed bank makes little contribution to the recovery of shrubland communities after fuel reduction treatments.

There was little opportunity to enhance vegetation recovery through the soil seed bank after prescribed burning and mastication. Mastication seems to be a more conservative technique although low intensity burnings as those conducted in the present study did not stimulate seed germination nor reduce seed bank size. In summary, prescribed burning and mastication can be considered feasible techniques for fuel management in these shrubland areas.

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### 1. Introduction

In the past decade, more than 35% of the wildland burned in Spain was shrubland (MMA, 2010) and 56% of these fires occurred in northern Spain. Under climate change scenarios (higher temperatures and lower summer rainfall), wildfire frequency and the

extent of the area burned are expected to increase in this region (Vega et al., 2009).

Fuel reduction treatments are commonly used to reduce the risk of severe wildfire (Stone et al., 1999; Vega et al., 2000; Baeza et al., 2002). The Spanish Environmental Ministry (Ministerio de Agricultura, Alimentación y Medio Ambiente) is currently carrying out a Forest Fire Prevention Program in different shrubland communities with the goal of reducing the occurrence of human-caused wildfire and recovering the ancestral use of fire in rural areas (Vélez, 2010). Different fuel reduction treatments are implemented within the Program. Prescribed burning is often used because it can be

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