

Response of maritime pine (*Pinus pinaster* Ait.) recruitment to fire severity and post-fire management in a coastal burned area in Galicia (NW Spain)

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Abstract The short-term effects of fire severity and post-fire management on maritime pine recruitment were evaluated in a mature serotinous pine stand in a coastal area of Galicia (NW Spain) burned by a wildfire occurred in the summer of 2001. Two levels of fire severity estimated by the levels of tree crown damage—scorched and unaffected crown—were compared. Seed dispersal and first cohort pine (November 2001) seedling density, before salvage logging, were significantly and positively affected by fire severity. Between November and January, a fungal attack caused a noticeable decrease in seedling density in both levels of fire severity. The first cohort survival was significantly reduced by harvesting and slash treatments carried out in February 2002. However, slash chopping favoured a new pine cohort, particularly in the unaffected crown plots, in which seedling density was significantly higher than in the scorched crown plots between July 2002 and February 2003. First cohort seedling survival and height were positively related. Fire severity levels, combined with post fire management, did not appear to determine final pine seedling density and height. Finally, reduction in seedling density caused by post-fire management did

not threaten pine establishment and may reduce the need for subsequent thinning operations.

Keywords Wildfire · Fire severity · *Pinus pinaster* · Regeneration · Forest harvesting · Slash management

Introduction

Most Mediterranean pine forests have been strongly shaped by fire (Naveh 1974, 1990, 1994; Ne'eman et al. 2004; Pausas and Verdú 2005). Maritime pine (*Pinus pinaster* Ait.) forests are considered fire-prone ecosystems (e.g. Agee 1998; Keeley and Zedler 1998), partly due to their frequently dense understorey, favoured by a light canopy, which facilitates considerable fuel loads and high intensity fire (Fernandes and Rigolot 2007). In fact, maritime pine is the forest species most affected by fire in the Iberian Peninsula (Ministerio de Medio Ambiente 2006). Increases in wildfire frequency and burned areas are widely expected under the predicted climate change scenarios for the Mediterranean region (Moreno 2005; Carvalho et al. 2008; Good et al. 2008; Moreno 2009). These changes in fire regime may coincide with enlarged environmental limitations for post-fire tree recruitment, which have the potential to modify the composition of Mediterranean forest species (Peñuelas and Filella 2001; Peñuelas et al.

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