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Does fire severity influence shrub resprouting after spring prescribed burning?



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ABSTRACT

Prescribed burning is commonly used to reduce the risk of severe wildfire. However, further information about the associated environmental effects is required to help forest managers select the most appropriate treatment. To address this question, we evaluated if fire severity during spring prescribed burning significantly affects the resprouting ability of two common shrub species in shrubland under a Mediterranean climate in NW Spain. Fire behaviour and temperatures were recorded in tagged individuals of *Erica australis* and *Pterospartum tridentatum* during prescribed burning. The number and length of resprouted shoots were measured three times (6, 12 and 18 months) after the prescribed burning. The influence of a series of fire severity indicators on some plant resprouting vigour parameters was tested by canonical correlation analysis. Six months and one year after prescribed burning, soil burn severity (measured by the absolute reduction in depth of the organic soil layer, maximum temperatures in the organic soil layer and the mineral soil surface during burning and the post-fire depth of the organic soil layer) reduced the resprouting vigour of *E. australis* and *P. tridentatum*. In contrast, direct measurements of fire effects on plants (minimum branch diameter, duration of temperatures above 300 °C in the shrub crown and fireline intensity) did not affect the post-fire plant vigour.

Soil burn severity during spring prescribed burning significantly affected the short-term resprouting vigour in a mixed heathland in Galicia. The lack of effects eighteen months after prescribed burning indicates the high resilience of these species and illustrates the need to conciliate fire prevention and conservation goals.

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1. Introduction

Shrub communities cover 21% of the land area of Galicia (Ministerio Medio Ambiente, 2011). In the period 2001–2010 there were about 8000 fires per year in Galicia, representing 46% of wildfires in Spain (Ministerio Medio Ambiente, 2010). In the same period, more than 70% of the wildland area burned annually in Galicia was shrubland (Ministerio Medio Ambiente, 2010). Many of these wildfires occurred in summer under unfavourable conditions (high temperatures and low relative humidity) and reached high intensities.

Prescribed fire is commonly used to reduce the risk of severe wildfires occurring (e.g. Pyne et al., 1996; Vega et al., 2000; Baeza et al., 2002; Oliveras and Bell, 2008). The Spanish Environmental Ministry is currently implementing a Forest Fires Prevention Programme that includes prescribed burning in shrubland areas with

the aim of reducing fire risk (Vélez, 2010). The present study was carried out within this context. Although prescribed burning is a flexible and relatively inexpensive method, it is also limited by the scant number of days when meteorological conditions are suitable for its application, as well as by the risk of fire spread, the potential effects on vegetation dynamics (e.g. Keeley et al., 2008; Potts and Stephens, 2009), the risk of soil erosion (e.g. Vega et al., 2005) and smoke effects on human health (Haines et al., 2001).

Management of fire severity in order to meet fuel reduction objectives and to minimize undesired effects is an important consideration in the use of prescribed burning. Different indicators have been used to estimate fire severity. For example, Moreno and Oechel (1989) and Pérez and Moreno (1998) proposed post-fire plant minimum stem diameter as good indicator of fire properties; this parameter has also been used to study post-fire shrub resprouting in Californian shrublands (Moreno and Oechel, 1992; Keeley, 1998; Keeley et al., 2005, 2006). Most studies on fire severity and post-fire shrub regeneration have been carried out in areas affected by wildfire or with experimental fires of high intensity. However, few studies have addressed the relationship:

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