



Fuel reduction at a Spanish heathland by prescribed fire and mechanical shredding: Effects on seedling emergence



Cristina Fernández^a, José A. Vega, Teresa Fonturbel

^a Centro de Investigación Forestal-Lourizán, Xunta de Galicia, P.O.Box 127, 36080 Pontevedra, Spain

ARTICLE INFO

Article history:

Received 25 January 2013

Received in revised form

18 July 2013

Accepted 14 August 2013

Available online 13 September 2013

Keywords:

Seed bank

Prescribed burning

Soil heating

Mastication

Mulching

Erica

Halimium

Pterospartum

ABSTRACT

Traditional heathland burning has declined in Spain, leading to fuel accumulation and fuel reduction treatments have become common for severe wildfire hazard reduction. These methods need to maintain the botanical composition of those shrub communities. Prescribed fire has been widely used in the past, but we need to compare mechanical fuel reduction with prescribed fire because it is easier and safer to carry out in a wide range of weather conditions. This information could be particularly useful in flammable ecosystems all over the world where traditional anthropogenic burning has declined. In this study, we compared the effects of prescribed burning and mechanical shredding on the seedling emergence and its relation to the mature vegetation in a fire-prone heathland dominated by *Erica australis* L. and *Pterospartum tridentatum* (L.) Willk., in Galicia (NW Spain). We combined a greenhouse experiment with periodic field inventories of seedling emergence.

In the greenhouse study, the seedling emergence was significantly higher in the soil samples after burning (383 seedlings m⁻²) than in samples before burning (242 seedlings m⁻²). In contrast, there was no significant difference in seedling density before and after mechanical shredding (243 compared with 261 seedlings m⁻²). Also, the number of seedlings that emerged after burning was significantly higher than that emerged after mechanical shredding. The maximum temperatures at the soil organic layer surface during burning were significantly and positively related to the density of *Halimium lasianthum* ssp. *alyssoides* and *P. tridentatum* seedlings.

In the field study, the observed seedling density was very low both after prescribed burning and mechanical shredding. There was a high degree of similarity between emerged seedlings and mature vegetation in both the treated and in the untreated soils, which was probably a consequence of the dominance of resprouting species.

Some consequences for the management of these shrublands are also discussed.

© 2013 Elsevier Ltd. All rights reserved.

1. Introduction

Shrub communities cover 21% of the land in Galicia (MMAMRyM, 2011). In the period between 2001 and 2010, approximately 8000 fires occurred per year in Galicia, representing 46% of forest fires in Spain (MMA, 2010). In the same period, more than 70% of the wildland area burned annually in Galicia was shrubland (MMA, 2010).

These communities contain a mixture of sprouters and obligate seeders, which have different fire-adaptive traits (Reyes and Casal, 2008). Both fire and grazing regimes can potentially alter the species composition. Successful restoration following such

perturbations and human interventions may depend on the size and quality of the viable seed bank (Granström, 1988; Legg et al., 1992; Thompson et al., 1997). More insight into seed bank effects after fuel reduction treatments may provide criteria for choosing the most viable method for restoration. Furthermore, the capability of plant species to produce seeds that persist in the soil for many years allows them to survive unfavourable environmental conditions and await favourable conditions for germination, conserving, thus, genetic variation in the long-term (Bossuyt and Honnay, 2008).

Fuel reduction treatments are commonly used to reduce the risk of severe wildfire and for ecological objectives (Covington et al., 1997; Vega et al., 2000; Davies et al., 2008), particularly fuel management has become a priority at the wildland–urban interface. The Spanish Environmental Ministry is currently implementing a Forest Fire Prevention Programme in different shrubland

* Corresponding author. Tel.: +34 986 805013; fax: +34 986 856420.
E-mail address: cfilgueira@gmail.com (C. Fernández).