

Impact of Fire Frequency and Severity on Post-Fire Recovery and Growth of Mediterranean Serotinous Pines

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Abstract

The projected warmer and drier climate in the Mediterranean Basin is expected to increase the frequency of fires and severity of burns in pine forests (Vázquez et al. 2015; Flatley & Fulé, 2016). The aim of our study is to evaluate the impact of fire frequency and burn severity on the medium-term recovery and growth of Mediterranean serotinous pines. We specifically examined a serotinous pine forest dominated by *P. pinaster*, which experienced a high-intensity crown fire in the summer of 2012. Additionally, we analyzed the number of wildfires from 1978 to 2012 and assessed the burn severity of the most recent fire (2012) using the dNBR spectral index. Our field sampling was focused on a 3000 ha area, considering three fire frequency scenarios and two burn severity scenarios. Four years and three years after the wildfires, we measured the density, coverage, and height of pine seedlings, as well as the coverage of woody understory species, in 936 plots measuring 1m² each. The findings indicate that the density and coverage of pine seedlings were low following two fires combined with high severity, as well as after three fires, regardless of burn severity. We observed that high severity contributed to the height development of pine seedlings only when the cover of woody species was not extensive, probably due to greater resource availability for pine growth (Pausas et al. 2003) in this area. The interaction between the cover of woody understory species and pine regeneration demonstrated that interspecific competition was more apparent in scenarios with fire frequency and severity that were most favorable for seedling establishment and growth. These results emphasize the negative ecological implications of a potential future regime characterized by higher fire frequency and severity (Fernandes et al., 2008). They also suggest that the natural recovery of serotinous pines may be insufficient to restore full forest cover after two wildfires in a span of 34 years. Therefore, it is crucial to minimize the occurrence of frequent severe fires to safeguard serotinous pine forests. This can be achieved by strategies such as breaking up fuel continuity, reducing surface fuel accumulation, and promoting the utilization of non-timber resources provided by these stands

Keywords: Competition, Fire regime, *Pinus pinaster*, Seedling growth, Seedling recruitment

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