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Conifer Dispersion on Subalpine Pastures in Northeastern Spain: Characteristics and Implications for Rangeland Management

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Abstract

Pinus sylvestris L. and *Pinus mugo* Turra originating from two plantations established during the 1960s are invading subalpine heathlands higher than 1500 m above sea level in Montseny Natural Park (northeast Spain). Both species are native at a regional scale but may not have been present in the park's subalpine vegetation previously. In addition, *Abies alba* P. Mill., which is in regression in many areas in Europe, is also colonizing the area from a neighboring natural forest. This invasion appears to be stimulated by a combination of natural and human factors, including differences between vegetation components, climate (i.e., drought periods), changes in land use due to conservation policies (i.e., suppressing fire or grazing practices), the creation of the plantations, and probably the nurse role played by accompanying dwarf shrubs (*Calluna vulgaris* [L.] Hull and *Juniperus communis* subsp. *nana* [Willd.] Syme). We examined the effects of this process in terms of the spatial dispersion and characteristics of the established conifers and deduce implications for the conservation of isolated subalpine pastures in Mediterranean Basin mountains. *P. sylvestris* was the most successful invading species in this area. The *P. mugo* invasion is distributed mainly near the plantation. The only native conifer species, *A. alba*, appears to be colonizing only the eastern slope. The invasion process is related to the diversity and species richness recorded on each slope. Conserving valuable subalpine heathlands at the latitude of the Montseny mountain range implies suppressing propagule pressures from the plantations. The option of removing conifers that are nonnative, at a local scale, must be considered. However, in the case of the native *A. alba* this option leads to a management conflict between conserving former pastureland and the dispersion of *A. alba*.

Resumen

Las especies *Pinus sylvestris* L. y *Pinus mugo* Turra, procedentes de dos plantaciones establecidas durante la década 1960–1970, están invadiendo los páramos subalpinos superiores a los 1500 m sobre el nivel del mar (snm) en el Parque Natural del Montseny (NE España). Ambas especies son nativas a escalas regionales, pero puede que no hayan estado presentes en la vegetación subalpina del Parque con anterioridad. Además, la especie *Abies alba* P. Mill., que se encuentra en regresión en muchas zonas de Europa, también está colonizando la zona desde un bosque natural colindante. Esta invasión parece ser estimulada por una combinación de factores naturales y humanos, incluyendo diferencias entre componentes vegetacionales, clima (p.e. períodos de sequía), cambios en el uso de la tierra debido a las políticas de conservación (p.e. supresión de fuegos o prácticas de pastoreo), creación de plantaciones y probablemente el papel nodriza desempeñado por los arbustos enanos (*Calluna vulgaris* [L.] Hull y de *Juniperus communis* subsp. *nana* [Willd.] Syme). Hemos examinado los efectos de este proceso en términos de la dispersión espacial y las características de las coníferas establecidas y deducimos las implicaciones para la conservación de los pastizales subalpinos aislados en las montañas del Mediterráneo. *P. sylvestris* fue la especie invasora más exitosa en este área. La invasión de *P. mugo* se distribuye principalmente cerca de la plantación. La única especie nativa de coníferas, *A. alba*, parece está colonizando sólo la pendiente este. El proceso de invasión está relacionado con la diversidad y con la riqueza de especies encontradas en cada pendiente. La conservación de valiosos páramos subalpinos en la latitud de la sierra del Montseny implica suprimir las presiones de los propágulos de las plantaciones. La opción de eliminar las coníferas que no son nativas, a escalas locales, debe ser considerada. Sin embargo, en el caso de la nativa *A. alba* esta opción conduce a un conflicto de manejo entre la conservación de antiguos pastizales y la dispersión de *A. alba*.

Key Words: *Abies*, colonization, land use, Mediterranean mountains, *Pinus*, plantation

INTRODUCTION

Invasions can be considered as one negative aspect of global environmental change because they may represent a serious threat to conserving the host ecosystems (Lodge 1993; Groves and Di Castri 1991; Pimentel 2002; Wolf et al. 2003). In

particular, invading conifer species have become dominant in many parts of the world and have experienced rapid increases during the last 100 years producing significant environmental impacts, even leading to species extinction on the affected lands (Richardson et al. 1994; Richardson 1998).

In terms of land use changes, successful conifer invasions, particularly of pines, have been widely reported (e.g., Richardson and Bond 1991; Richardson and Higgins 1998). In the Pyrenees, pines occupy former *Fagus sylvatica* L. forests cut for timber and exposed to erosion (Villar et al. 1993).

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