

Effect of salvage logging on seedling recruitment of a serotinous pine species (*Pinus pinaster* Aiton)

Jorge Castro¹, Juan Lorite², Mercedes Molina-Morales³, Regino Zamora¹ and Craig D. Allen⁴

Abstract

This study analyzes the effects of salvage logging on the recruitment of a serotinous pine species (*Pinus pinaster*) after the first growing season following a high-severity wildfire in southeastern Spain. In September 2005 a stand-replacing fire burned ca. 1400 ha of pine reforestation in the Sierra Nevada Natural and National Park (near Granada, in Andalucía). These pine reforestations were planted during the 1960s and 1970s, with individual stands dominated by *Pinus pinaster*, *Pinus nigra* and *Pinus sylvestris*. Four plots of ca 25 ha each were established in fire-killed pine stands along an altitudinal gradient (from ca 1500 m to 2300 m a.s.l.). *Pinus pinaster* plantations are located at the lower altitude, with a density of ca 1500 per ha. In each plot, three treatments were implemented during the winter of 2005-2006, each with three replicates of ca 2.7 ha. The treatments are: 1) "Control", no cutting or removal of the standing dead trees (snags); 2) "Branches", ~90% of the snags were cut but left on site, with cut tree branches spread across the soil surface to provide a coarse woody biomass mulch; 3) "Extraction", all snags were cut, with the woody biomass (logs and branches) removed from these sites (salvage logging). Salvage logging was done manually in the experimental plots, although heavy machinery was also used in the rest of the area. For one replicate of each treatment in the *Pinus pinaster* plot, we sampled density of seedlings and marked 150 randomly chosen seedlings; 150 additional seedlings were tagged in areas without branches in the Branches treatment, that acted as a procedural control (thus 600 seedlings in total). Density of seedlings was considerably lower in the Extraction treatment. Seedling survival, however, was high in all the treatments. Seedling growth was lowest in the Control treatment. As a result, the effect of salvage logging on this serotinous species depends largely on the impact on initial seedling density. This ongoing research is also studying the effects of these post-fire treatments on herbaceous and woody vegetation recovery, ecosystem nutrient cycling and carbon fluxes, and restoration of species and ecological interactions, particularly key mutualistic interactions fostering vegetation succession.

¹ Departamento de Ecología. Universidad de Granada. Granada. Spain.

² Departamento de Botánica. Universidad de Granada. Granada. Spain.

³ Departamento de Biología Animal. Universidad de Granada. Granada. Spain.

⁴ US Geological Survey, Jemez Mountains Field Station, Los Alamos, NM, USA.