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Abstract

Dead wood remaining after wildfires represents a biological legacy that remains during forest regeneration, and its decay is both cause and consequence of a large set of ecological processes. As dead wood and coarse woody debris represent an important nutrient pool in forests, different degrees of forest management (e.g., clear cutting, thinning, etc.) can affect the ecosystem nutrient budget. However, the rate of wood decomposition after fires is still poorly understood, particularly for Mediterranean-type ecosystems. In this study, we estimate dead wood decomposition after a fire in a Mediterranean mountain across an elevational gradient in Sierra Nevada National Park (SE Spain). Four plots were established after the 2005 Lanjarón fire at different elevation (1477, 1750, 2053 and 2317 m a.s.l.), and standardized samples of logs of 75 cm length and variable diameters (samples, hereafter) were left on the ground for long-term monitoring. The initial wood density and nutrient content was estimated as a baseline, and thereafter a subsample of 30-50 logs per plot were harvested for analysis at different intervals (after 2, 4, 8, 10 and 15 years). The greatest density loss of the logs occurred in the last 5 years of the study. At the end of the experiment the logs had lost an overall 55% of their density, although this value ranged from an average 46% at the highest-elevation plot to 63% at an intermediate elevation. Contrary to studies in other climates, large-diameter logs decomposed faster than small-diameter logs, which might be motivated by a higher moisture content in larger logs. Nutrient content in the logs after 15 years differed sharply from the original content, supporting the promoting effect of burnt wood on soil fertility. Our results provide one of the longest time series for wood decomposition in Mediterranean ecosystems and suggest that wood decomposition is regulated by a complex interaction between moisture and temperature. Moreover, the results support that burnt wood is a key biological legacy to promote forest regeneration and restoration through its effect on habitat structure and nutrient provisioning.

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