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Is the current increase in fire recurrence causing a shift in the soil fertility of Iberian ecosystems?

Ángeles G. Mayor (1), Jan Jacob Keizer (2), Óscar González-Pelayo (3), Alejandro Valdecantos (4), Ramón Vallejo (5), and Peter de Ruiter (1)

(1) Wageningen University, The Neherlands, (2) CESAM, University of Aveiro, Portugal, (3) University of Valencia, Spain, (4) CEAM, Spain, (5) University of Barcelona, Spain

Since the mid of the last century fire recurrence has increased in the Iberian peninsula and the overall Mediterranean basin due to changes in land use and climate. The warmer and drier climate projected for this region will further increase the risk of wildfire occurrence and of increasing fire recurrence. Although the impact of wildfires on soil nutrient content in this region has been extensively studied, still few works have assessed this impact on the basis of fire recurrence. This study assesses the changes in soil nutrient status of two Iberian ecosystems, Várzea (N Portugal) and Valencia (E Spain), affected by different levels of fire recurrence and where short inter-fire periods have promoted a transition from pine woodlands to shrublands. Trends towards soil fertility loss with increasing fire recurrence (one, two, three or four fires in 37 years) were observed in the two study sites. The sites differed when soil fertility of areas burned several times were compared with long unburned references. In Valencia, overall soil fertility of the surface mineral soil was lower in areas burned two or three times than in long unburned areas, twenty and eight years after the last fire, respectively. On the contrary, total organic matter in Várzea was higher in burned than in unburned soils one year after the occurrence of one or four fires. However, a negative impact of fire was observed for integrated indicators of soil quality, such as hot-water carbon and potentially mineralizable nitrogen, suggesting that fire also had an adverse effect on substrate quality in Várzea. Our results suggest that the current trend of increasing fire recurrence in Southern Europe may result in losses or alterations of soil organic matter, particularly when fire promotes a transition from pine woodland to shrubland.