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# Historical Human System Drivers of Wildland Urban Interface Fire Risk in Spain: A Coupled Human Natural Systems Approach

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## Abstract

Fire effects in European Mediterranean Basin (EMB) forests are mediated by historical management practices linked to different forms of land use and their lasting legacy effects on forest composition and structure. In this article we characterize historical management practices linked to preindustrial era pastoralist and industrial era resin tapping uses and their lasting legacy effects in two Wildland Urban Interface (WUI) sites located in Central Spain. As part of this evidence we collected complementary palynologic, dendroecological and historical archive data. We explore the hypothesis that variations in land and fire use linked to different historical forest management regimes (FMRs) have resulted in alternative ecological states defined by differences in forest structure and species composition. We find that higher fire frequency coupled with a pre-industrial era pastoralist FMR contributed to favor, in one site, the emergence and maintenance of an open canopy savanna-like heterogenous forest dominated by *Pinus pinaster* and *Quercus pyrenaica* with small fire size whereas, conversely, lower fire frequency associated with an industrial era resin tapping FMR contributed to the emergence and maintenance of a closed canopy homogeneous *Pinus pinaster* dominated forest that has experienced one large fire (>500 hectares) since 1980. These findings have important management implications for EMB forest ecosystems where there is an ongoing debate over the adequate use of pastoralism and prescribed fire for wildfire prevention while uncertainties continue to exist regarding fire and pastoralism's overall effect on forest ecosystem sustainability.

**Keywords:** Wildland Urban Interface; Large fires; Coupled human and natural systems

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