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# Estimating Fire Hazard in A Protected Area of Central Spain (Cabañeros National Park) by A Full Characterization of Vegetation Using LiDAR †

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**Abstract:** The hazardousness of Mediterranean landscapes has increased since the second half of the 20th century, and fuel loads of highly flammable vegetation types have increased throughout the region. Moreover, under the context of more severe fire weather, large fires of high intensity may cause losses in ecosystem services. According to this, fire prevention tools to monitor when and where a fire will have the most negative effects through increases in fire severity are required. Fuel characterization is key to wildfire prevention as fuel is one of the primary factors affecting wildfire risk and behavior. Here, we characterized the valuable natural vegetation in Cabañeros National Park (Central Spain) (part of the Natura-2000 network), composed of typical Mediterranean ecosystems, by using LiDAR and other auxiliary data. LiDAR data were obtained from the 1st Spanish National LiDAR flight, carried out over the study area in 2009-2010. LiDAR data was pre-processed and ground returns were classified using the progressive TIN filter algorithm carrying out a sensitivity analysis using different settings. Later, the height of the points above the ground were normalized and the Canopy Height Model (CHM) was calculated. Fuel models were derived using the Prometheus fuel classification framework, and they were determined using several LiDAR height metrics and some compositional metrics (i.e., percentage covered by different height ranges ([<0.6 m, 0.6–1m, 1–2m, 2–4m and ≥4m] at 30 m. All those metrics allowed for estimating fractional canopy cover, fuel height, and vertical continuity. Moreover, tree-tops and crowns were delimited and standard height metrics, as well as vertical profiles, were obtained. All this data, joined with information about the flammability of dominant species and the vulnerability to fire based on functional traits, allowed for the identification of which resource values were most severely exposed to wildfires.

**Keywords:** Fire hazard; fuel complexes; LiDAR; flammability; vulnerability; Natura-2000 network

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