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Wildfire early effects on soil properties in Mediterranean pinewoods: Insight from the 2020 Wildfire in Patemisco, Italy

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Soil is exposed to increasing threats from human activities, including land use change and abandonment, as well as climate change-induced events such as droughts, floods and wildfires. Although the Mediterranean environment has a coevolutionary history with fire, it is not exempt from the threat posed by the recent increase in the frequency and severity of this disturbance. In Italy, for instance, the total burned area in 2021 exceeded that of 2017, a year remembered as particularly critical from this point of view.

In this context, the research project FLER_MeCoFor aims to study the conservation status, *sensu* Habitats Directive, of the Habitat of priority interest 2270* - Wooded dunes with *Pinus pinea* and/or *Pinus pinaster*, of the Special Areas of Conservation (SAC) IT9130006 (Apulia, Southern Italy). In particular, several wildfires from 1981 to 2020 affected different pinewoods within the SAC.

Here, this study presents preliminary results of the medium-term impacts of fire severity on soil properties following the most recent wildfire that occurred in 2020 within the Patemisco pinewood. Four years after the fire and prior to the fieldwork (April 2024), areas of different levels of fire severity (Low, Medium and High) were identified through differenced Normalized Burn Ratio (dNBR) index analysis by remote sensing. At sites representing the three different fire severity levels and at a nearby unburned (control) site, litter and mineral soil samples (depth 0-5 cm, 5 replicates per site) were collected to determine the physical, chemical and biological properties of the soil.

Spectral variations between pre- and post-fire images assessed by dNBR index, in addition to guiding the field sampling, suggested potential alteration in soil characteristics in the most severely affected areas. The effect of the fire was still evident within the litter layer four years after the fire. Although this layer was observed in the low and medium severity burnt sites, it was significantly lower (in terms of weight) than the control. Furthermore, no litter was found in the high severity burnt site. Preliminary results on the mineral soil analysis showed that the burnt sites had no significant changes in the physical properties compared to the control. On the contrary, an

increase in pH and a decrease in organic carbon content were still detected at all burnt sites, as a function of fire severity.
These changes suggest a potential alteration in the soil microbial community. For this purpose, further investigations, aiming to reveal the effect on the soil microbial activity and biomass, are fundamental for a comprehensive understanding of the fire recovery status of this woodland. Considering the significance of the Habitats of priority interest conservation for overall ecosystem functioning, this research is essential for developing post-fire land management measures to mitigate the impacts of forest fires.