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Micromorphological changes in soil affected by a prescribed burn: the Sierra de Manantlán case, Jalisco, México.

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Abstract

Prescribed burn (PB) is a valuable management tool for reducing the probability of wildfires. PB consists of applying fire under controlled conditions to minimize the charge and the continuity of forest fuels. PB must be a low soil burn severity (SBS) event to prevent physical, chemical, and biological soil properties deterioration. Some works suggest that after a PB event, the most significant impacts on chemical soil properties are: the organic matter thermal modification due to the aromatic structures formation; the increase of the concentration soil available nutrients; the increase of pH and hydrophobicity. Physical properties are also affected (colour, structure, bulk density, among others). Changes in the soil structure have been also evaluated, but not at micromorphological level. In consequence, this work aims to assess soil micromorphological changes after a PB in the pine forest of *Reserva de la Biósfera Sierra de Mantlán*, Jalisco, México in March 2017. Unaltered samples were collected, following a SE-NW-200 m transect, every 25 m, at a depth of 10 cm, 28 h after fire. From undisturbed samples, thin sections were obtained for micromorphological analysis that was made in a petrographic microscope. The results reveal that in this thermic event, litter and soil organic matter were affected. The combustion process oxidized organic components until charred, and in some cases, ash was the final product of this process. In thin sections, numerous soil fire evidence were detected, including ashes, charcoal fragments, different charred vegetal materials, burning pellets, and charred, fractured, and reddened aggregates. The mineral soil was only affected in the first 2 cm. Mineral soil fraction exhibits reddish colour in very few punctual zones and a partial structural loss. With this microscopic evidence and field assessment, we determined that the soil burn severity level was 2 that corresponds to a low SBS with surface temperatures of < 250 °C. Therefore, this PB event accomplished its purpose.

Keywords: Prescribed burn, soil burn severity, micromorphology.

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