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Prescribed fires effects on physico-chemical properties and quantity of runoff and soil erosion in a Mediterranean forest

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Wildfires have an important influence in forest ecosystems. Contrary to high severity fire, which may have negative impacts on the ecosystems, low severity induce small changes on soil properties. Thus and in order to reduce fire risk, low-severity prescribed fires have been widely used as a fuel reduction tool and silvicultural treatment in Mediterranean forest ecosystems. However, fire may alter microsite conditions and little is known about the impact of prescribed burning on the physico-chemical properties of runoff. In this study, we compared the effects of prescribed burning on physico-chemical properties and quantity of runoff and soil erosion during twelve months after a low severity prescribed fire applied in twelve 16 m2 plot (6 burned plots and 6 control plots used for comparison) set up in the Lezuza forest (Albacete, central-eastern Spain). Physico-chemical properties and quantity of runoff and soil losses were monitored after each rainfall event (five rainfall events in total). Also, different forest stand characteristics (slope, tree density, basal area and shrub/herbal cover) affecting each plot were measured. Results showed that forest stand characteristics were very similar in all used plots. Also, physico-chemical runoff properties were highly modified after the prescribed fire, increasing water pH, carbonates, bicarbonates, total dissolved solids and organic matter content dissolved in water. Electrical conductivity, calcium, sodium, chloride and magnesium were not affected by prescribed fire. Soil losses were highly related to precipitation intensity and tree interception. Tree intercepted the rainfall and significantly reduced soil losses and also runoff quantity. In conclusion and after the first six-month experiment, the influence of prescribed fires on physico-chemical runoff properties should be taken into account for developing proper prescribed burnings guidelines.