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Fire-induced changes of high and low intensity prescribed fires in a Canadian boreal forest

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The degree of fire-induced effects on boreal forest soils substantially depends on the intensity of fire. Especially high-intensity fires may drastically alter the quality and quantity of the soil organic matter pool. In this study, we investigated the effects of low and high intensity prescribed fires on soil carbon and nitrogen contents, soil pH, soil temperature, and soil moisture in a Canadian boreal forest. The study was based on intensive field sampling during August 2018 in Jack pine (*Pinus banksiana*) forest stands located 50 km north of Fort Providence, Northwest Territories (61.582˚; -117.165˚). We measured the soil parameters from two short-term fire chronosequences — one with high-intensity prescribed fires happening in years 2000, 2012, 2015, 2016, and 2017; and the other with low-intensity prescribed fires happening in years 2015, 2017, and 2018. Additionally, we measured soil temperature and moisture before and after a low-intensity prescribed fire. In the high-intensity fire chronosequence, the study site burned in year 2012 had the lowest soil temperature. Even though temperatures seemed slightly higher in the most recent years of the fire chronosequence (2015, 2016, and 2017), we did not identify a clear trend. Soil moisture was the lowest in the study site burned in year 2000, with mostly no significant differences between the following years. We did not find significant differences in soil moisture and soil temperature before and after a low-intensity prescribed fire. However, both time-after-fire and fire intensity were important for soil moisture prediction, whereas only fire intensity was important for predicting soil temperature. Soil pH in the humus layer of the study site burned in 2012 was significantly lower compared to the other age classes (no pH data for year 2000) of the high-intensity fire chronosequence. Neither C nor N content were significantly different between the fire age classes at the humus layer or at the mineral layers. We believe that the small sample size did not allow the identification of further differences between the age classes, and it prevented direct comparisons between high and low intensity fires. Despite its exploratory nature, this study offers some insight into short-term effects of fire on some soil parameters, for example, the observed changes on soil moisture, soil temperature, and soil pH. Therefore, we will progress this work by increasing the sample size and analysing autotrophic and heterotrophic soil respiration to directly infer on fire-induced changes on the soil organic matter pool.