



## First results of a field campaign focused on overwintering zombie fires

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Fire is a major disturbance in the boreal forests of the high northern latitude. Fire extent and severity have been increasing in recent decades, and the occurrence of overwintering ‘zombie’ fires has been linked to recent fire extremes. Overwintering fires are fires which were seemingly extinguished at the end of the boreal fire season yet smolder during winter to re-emerge as a flaming fire in the subsequent spring. So far, overwintering fires have only been investigated using satellite imagery. Here, for the first time, we show preliminary results from a field campaign that measured *in situ* impacts of fires that overwintered from 2014 to 2015 in the Canadian Northwest Territories. We measured among other the burn depth in organic soils, and characterized micro-topography. We also qualitatively assessed how fires may have overwintered. We compared nine overwintering fire sites, which burned during both 2014 and 2015, with six sites that only burned in 2014 and five nearby unburned sites. The average burn depth ( $\pm$ SD) of the overwintering fires was  $6.8 \pm 1.6$  cm and significantly deeper compared to  $6.1 \pm 1.2$  cm in the single fire sites ( $P < 0.01$ ). Somewhat surprisingly, the majority of overwintering fires occurred in mesic sites with large productive trees. Only two overwintering sites were sampled in mesic-subhygric to subhygric sites dominated by black spruce (*Picea mariana*). The unburned control sites often featured a micro-topography of hummocks and hollows. This micro-topography was leveled in overwintering fires sites because of severe burning in organic soils. In overwintering sites, most of the organic layer was consumed. This may have led to prolonged smoldering in the root systems of trees. Our results are the first to quantify the burn depth of overwintering fires, and also show that overwintering does not only happen through deep smoldering in organic soils, yet can also occur from smoldering in tree boles and root systems of burned and fallen trees.