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Post-Fire Moss Recovery in Northern Peatlands: Separating the Effects of Species and Water Content on Moss Water Repellency

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Wildfire is the largest disturbance affecting peatlands, where northern peat reserves are becoming increasingly vulnerable to wildfire as climate change is projected to enhance the length and severity of the fire season. However, little is known about the spatio-temporal variability of post-fire recovery in these ecosystems. High water table positions after wildfire are critical to limit atmospheric carbon losses and enable the re-establishment of keystone peatland mosses (i.e. Sphagnum). Post-fire recovery of the moss surface in Sphagnum-feathermoss peatlands, however, has been shown to be limited where moss type and burn severity interact to result in a water repellent surface. While in situ measurements of moss water repellency in peatlands has been shown to be greater for feathermoss in both a burned and unburned state in comparison to Sphagnum moss, it is difficult to separate effects of water content from species. Consequently, we carried out a drying experiment in the lab where we compared the water repellency of two dominant peatland moss species, Sphagnum and feathermoss, for several burn severity classes as well as for unburned samples. The results suggest that water repellency in moss is primarily controlled by water content, where a sharp threshold exists at gravimetric water contents (GWC) lower than $\sim$3 g g-1. While GWC is shown to be a strong predictor of water repellency, the effect is enhanced by combustion. Based on field GWC, we show that there are significant differences in the frequency distribution of near-surface GWC between moss type and burn severity. The differences in the distributions of field GWC are related to characteristic moisture retention curves of unburned samples measured in the lab, as well as morphological differences between moss type.