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Does substrate affect the potential for establishment of boreal feather mosses after forest fire?

The rarity of boreal feather mosses for several years after a forest fire is believed to be due to their low dispersal ability and hostile environmental conditions. However, their establishment will also depend on the suitability of available substrates. Substrate chemistry, physical structure and water-holding capacity influence plant growth. After a forest fire, substrate pH is initially relatively high. Low severity fires leave charred, undecomposed organic material on the forest floor that does not retain moisture and is nutrient-poor. Even mineral soil dries rapidly under the high exposure typical of burned sites. Forests where feather mosses are abundant have low exposure, comparatively high humidity, nutrient-containing throughfall, and an acidic humus substrate beneath the moss carpet. In a growth chamber I am testing the hypothesis that burned substrates are unsuitable for the establishment of feather mosses. Three sizes of vegetative fragment (branches, shoot tips and mulch) from two feather mosses, Schreber's moss (*Pleurozium schreberi*) and knight's plume (*Ptilium crista-castrensis*), were sown on three burned substrates (ash, burned mineral soil and burned moss) and on humus from an undisturbed stand. There was a significant difference between the pH of burned moss (mean=4.3) and both ash and mineral soil (9.0, 5.6, respectively), but not humus (4.6). Twelve replicates of each fragment-size/species/substrate combination were kept constantly moist. Another 12 replicates were watered bi-weekly to see if the water-holding capacity of the substrates varied. After 67 days, growth of constantly moist *Ptilium* was negligible, but over half of all *Pleurozium* branches had new shoots on all substrates except ash. Few mulch and shoot tip replicates showed new growth. In the low moisture treatment, over 90% of humus and burned moss replicates dried out between waterings. Only 3 *Pleurozium* branches had new shoots (2 on burned mineral soil, 1 on burned moss). These results show that *Pleurozium* fragments can produce new growth on burned substrates of acidic pH under constant hydration. Low moisture and high pH apparently inhibit growth. *Ptilium* fragments might be less effective propagules. The experiment is ongoing in the growth chamber and the field. This research addresses outstanding questions concerning post-fire succession in economically important coniferous boreal forests.

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