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# Negligible Soil Erosion After Wildfire Disturbance: Role of the Duff Layer

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Wildfires are generally thought to result in increased soil erosion in the immediate post-disturbance years, but many unanswered questions remain regarding the controls of erosional response in different regional settings. Post-fire soil erosion is most often studied and reported in regions where noteworthy erosion occurs. In many of these studies, it may be the case that the duff layer has been removed and a hydrophobic layer has developed, leading to significant soil erosion. However, results and inferences of such studies may not be representative of other regions. Rates of post-fire soil erosion often go unreported or are ignored when negligible amounts occur, meaning that the environmental scenarios leading to low soil erosion rates are often not documented.

The field site for our study is located in a closed canopy, boreal forest in Kootenay National Park, British Columbia, Canada, that experienced a high-intensity crown fire in the summer of 2003. Soil erosion values in 2004 were very low, despite the occurrence of significant rainfall events. We postulate that a probable cause of our low erosion rates relative to higher rates often reported in the literature is the notable duff coverage (the duff layer includes the fermentation and humus soil organic layers) remaining after the wildfire at our field site. Our results show that significant duff coverage remained above the mineral soil following the wildfire, with somewhat higher duff coverage found on lower gradient slopes vs. steep slopes. Duff provides detention storage for rainfall input, and thus enhances the ability of water to infiltrate into the underlying mineral soil. Moreover, the duff layer provides a physical barrier to soil erosion. Duff may thus help to effectively buffer the soil against the effects of high rainfall intensities.

Few studies have explicitly highlighted the role of duff coverage in influencing post-fire erosional response in different regions, even though it may be a very important factor in explaining observed differences. It is often thought that high-intensity crown fires remove most or all of the duff layer, making any landscapes subjected to such fires susceptible to significant erosion; in fact, this is not necessarily the case for all ecosystems. For example, similar to the results of our study, earlier research has shown duff consumption during high-intensity crown fires in the boreal forest of Canada to result in patchy yet notable duff coverage. Complete or nearly complete duff removal does not necessarily occur during all high intensity crown fires.

It is recommended that researchers and land managers consider the extent of post-fire duff coverage in different environments to better assess the potential for notable soil erosion after wildfire occurrence.