



Can Charcoal Provide Information About Fire Effects and Fire Severity?

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Building an understanding of the impact of a wildfire is critical to the management of ecosystems. Aspects of fire severity such as the amount of soil heating, can relate to post-fire ecosystem recovery. Yet, there is no quantitative measure of this in current post-burn fire severity assessments, which are mostly qualitative ground-based visual assessments of organic matter loss, and as such can be subjective and variable between ecosystems. In order to develop a unifying fire severity assessment we explore the use of charcoal produced during a wildfire, as a tool.

Charcoal has been suggested to retain some information about the nature of the fire in which it was created and one such physical property of charcoal that can be measured post-fire is its ability to reflect light when studied under oil using reflectance microscopy. The amount of light reflected varies between charcoals and is thought to be explained by the differential ordering of graphite-like phases within the char however, to what aspects of a fire's nature this alteration pertains is unknown.

We have explored the formation of charcoal reflectance in 1) laboratory-based experiments using an iCone calorimeter and in 2) experimental forest scale and natural wildland fires occurring in Canada in spring 2015. In our laboratory experiments we assessed the formation and evolution of charcoal reflectance during pre-ignition heating, peak fire intensity through to the end of flaming and the transition to oxidative/smoldering heating regimes. In the prescribed and natural wildland fires we positioned the same woods used in our laboratory experiments, rigged with thermocouples in the path of oncoming fires in order to assess the resulting charcoal reflectance in response to the heating regime imposed by the fire on the samples. In this presentation we will outline our approach, findings and discuss the potential for charcoal reflectance to provide a tool in post-fire assessments seeking to determine levels of soil heating and fire severity.