Post-Fire Fallout: Measuring Fallout Radionuclides to Understand Soil Erosion in a Burn Scar

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The 2020 Bridger Foothills Fire raged for over a month, burning > 8,000 acres just 15 miles outside the city of Bozeman. A year later, the landscape is still torched, yet with sprouts of green across the soil. Wildfire is widely recognized to change erosion dynamics, especially in mountain landscapes, and the purpose of this investigation was to quantify soil transport one year following the Bridger fire. I used topographic analysis, field observations, and isotopic tracers of sediment movement to compare erosion on slopes that experienced high-burn intensity or were unburnt. Isotopic measurements focused on Fallout Radionuclides (FRNs, Cs-136 and Pb-210), isotopes with known decay rates that accumulate in surface soils and thus relate to soil age and disturbance to the surface. I hypothesize that the areas of high burn intensity will have higher erosion, characterized by lower fallout radionuclide inventories, as compared to the unburnt soils. To measure the erosion, the top 12.5 centimeters of soil were collected across three high intensity sites and one unburnt site. Samples were dried and analyzed in Broad Energy Germanium Detectors that record the natural gamma radiation in the samples. I found that FRN inventories in the high-intensity burn, were not consistently lower than the unburnt area as hypothesized. However, high-intensity soils showed significantly greater variance in Cs-137 inventories at each site, consistent with greater local disturbances.