Sagebrush steppe Abiotic factor changes at microsites post prescribed-burn and influences on vegetation recovery

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The rapid expansion of invasive annual grasses, particularly cheatgrass (*Bromus tectorum*), has increased wildfire frequency in the sagebrush steppe, with over 500,000 ha burning annually. While wildfire impacts are well documented, the changes at the microsite level to the abiotic factors following wildfire is poorly understood. We investigated how localized abiotic changes influence the recovery of native vegetation and the expansion of cheatgrass during the first-year post prescribed burn. In a sagebrush steppe ecosystem 30 km north of Reno, NV, we established twenty 3 x 4 m plots. We compared three microsites—below shrub, interspace, and cheatgrass dominated—to quantify shifts in soil organic matter (SOM), plant available soil nutrients (inorganic N,P,K), and soil erosion in relation to shifts in plant functional group cover. Plant available soil nutrients were measured using plant root simulator (PRS) probes one year pre-burn and one-year post-burn. SOM was determined via the loss on ignition test during the spring and fall one-year pre- and post-burn. Soil erosion was monitored seasonally post-burn. Pre-burn results revealed significantly lower nitrate and ammonium availability at the shrub microsite than interspace ($p < 0.001$, and $p = 0.003$, respectively) and lower nitrate at the shrub than cheatgrass ($p < 0.001$). SOM was significantly higher in the shrub than interspace microsite in pre-burn ($p = 0.001$). Post-burn, SOM remained significantly higher in the shrub microsite ($p = 0.034$) suggesting that while prescribed burns alter the abiotic factors, pre-existing microsite legacies heavily influence early post-fire nutrient availability and soil organic matter. These legacies create resource islands that may either facilitate native vegetation or be exploited by cheatgrass. Understanding these localized abiotic changes are essential for predicting whether a site will successfully recover with native vegetation or be dominated by cheatgrass.