

Stream Nutrient and Carbon Consequences of the 2012 High Park Fire

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Abstract. Recent wildfires along the Colorado Front Range demonstrate the tenuous link between forest fire and water quality. Such events cause immediate and lasting changes in stream nutrient, sediment, temperature and the potential to impair drinking water supplies and aquatic habitat. After the 2012 High Park Fire, the Poudre River, a primary water supply for the City of Fort Collins, was affected by a combination of wildfire and post-fire flooding and sedimentation. Post-fire mulch treatments have been applied throughout the High Park Fire in areas affected by high severity burning in order to reduce sediment loss and maintain forest and soil productivity. These treatments may influence retention of soil nutrient and carbon (C) and downstream losses, yet their effect on biogeochemistry at hillslope, catchment and drainage-scales are unknown. We compare post-fire stream nutrients and C sampled at the catchment (~ 1500 ha) and sub-catchment (100-200 ha) scales for an extensively-treated catchment (Hill Gulch: 46% treated) and a largely untreated (Skin Gulch: 4% treated) catchment. We examine stream nutrients and C in the context of pre- and post-fire and flood water quality in the Poudre River. Our preliminary catchment-scale findings are consistent with expectations that post-fire treatments will lower stream nitrate, yet comparisons at the sub-catchment scale provide a different, more complex picture. Summer and fall stream nitrate concentrations are more closely correlated to the extent of high severity combustion within sub-catchments with the extent of post-fire treatment. Regardless of treatment, storm events elevated catchment-scale stream nitrate and dissolved organic carbon, more than 10-fold above baseline concentrations. Nitrate occasionally surpassed drinking water standards during some such events. Spring 2015 sampling will quantify solute concentrations and export during snowmelt runoff conditions that are of greatest interest to water providers.