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Geomorphic influences on salmonid recolonization in a Colorado post-fire environment

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Abstract. Little Beaver Creek (LBC) is a third-order tributary within the Cache la Poudre River basin in the Colorado Front Range, USA. In 2020, the Cameron Peak Fire ignited and continued to burn through late October 2020 in the LBC watershed. Rugged terrain and beetle-killed forests in the fire perimeter made it difficult to suppress the burn and contributed to the large percentage of high severity burn areas. Before the fire, LBC had ongoing research on water quality, wood dynamics, historic beaver-influenced valley morphology, and hyporheic exchange. Although this research has continued to monitor post-fire conditions, little has been done to understand the relationship between conditions and salmonid recolonization. LBC contains high quantities of relic beaver dams which create obstructions where wood and sediment are readily captured. These areas develop anastomosing channels which return to single thread in the interim reaches. My work will synthesize previous research with a complete census of channel adjustments, hydrologic connectivity, habitat heterogeneity, and salmonid abundance (Salvelinus fontinalis and Salmo trutta) to understand the relative importance of heterogeneity on success after a major disturbance. We show that the presence of geomorphically heterogenous reaches increases the spatial scale and distribution of habitat refugia for salmonids and increases resilience for the whole system. Due to retention of fire related inputs, preliminary results show these areas are providing new habitat, corroborated by higher abundance of fishes at these sites, as well as overall geomorphic stability in the face of watershed adjustments. These trends are seen even while overall simplification and habitat loss is seen in other locations in the system. Not only are third-order streams important to the health and quality of downstream rivers, but trends show that large fires will become more common in Colorado. Prolonged drought, increased impacts on forests, increased water demand, and regional warming from climate change will continue to put pressure on already sensitive river systems and salmonids. If we can show that the preservation of functioning, heterogenous reaches has a positive impact on watershed and salmonid recovery post-disturbance, then we will provide insight for management of watersheds that directly increases resilience.