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Modeling post-fire hydro-geomorphic recovery in the Waldo Canyon Fire

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Wildfire can have significant impacts on watershed hydrology and geomorphology by changing soil properties and removing vegetation, often increasing runoff and soil erosion and deposition, debris flows, and flooding. Watershed systems may take several years or longer to recover. During this time, post-fire channel changes have the potential to alter hydraulics that influence characteristics such as time of concentration and increase time to peak flow, flow capacity, and velocity. Using the case of the 2012 Waldo Canyon Fire in Colorado (USA), this research will leverage field-based surveys and terrestrial Light Detection and Ranging (LiDAR) data to parameterize KINEROS2 (KINematic runoff and EROSion), an event oriented, physically-based watershed runoff and erosion model. We will use the Automated Geospatial Watershed Assessment (AGWA) tool, which is a GIS-based hydrologic modeling tool that uses commonly available GIS data layers to parameterize, execute, and spatially visualize runoff and sediment yield for watersheds impacted by the Waldo Canyon Fire. Specifically, two models are developed, an unburned (Bear Creek) and burned (Williams) watershed. The models will simulate burn severity and treatment conditions. Field data will be used to validate the burned watersheds for pre- and post-fire changes in infiltration, runoff, peak flow, sediment yield, and sediment discharge. Spatial modeling will provide insight into post-fire patterns for varying treatment, burn severity, and climate scenarios. Results will also provide post-fire managers with improved hydro-geomorphic modeling and prediction tools for water resources management and mitigation efforts.