# Wildfire and Watershed Hydrology: A Demonstration of the BROOK90 Hydrologic Model as a Tool for Estimating Post-Wildfire Stream-flows in South Boulder Creek, Colorado

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**Abstract.** Wildfire can have significant effect on certain watershed-scale parameters which combine to produce increases in stream-flow, peak flow discharge, and sediment yield. In particular, wildfires reduce the forest canopy which in turn reduces intercept storage. Additionally, soil infiltration is reduced by pore clogging and the development of hydrophobic soil layers. These effects are increased by the high severity fires that have occurred in recent years as a result of fire suppression management practices. A discussion of the state-of-research related to how wildfire alters watershed parameters and in turn affects the observed stream-flows and peak flow is presented. In addition, data and information from the body of past research is applied to examine the potential of watershed-scale models as a tool to improve the understanding of wildfire-induced watershed response. The deterministic, multi-parameter model BROOK90 was used in a hypothetical application to the South Boulder Creek watershed in Boulder, Colorado. Parameters controlling soil impermeability, infiltration rates, and intercept storage were manipulated to simulate the effects of moderate-severity and high-severity wildfires. In the simulations, both annual stream-flow and peak flows increased by 42% and 26%, respectively in the case of a high-severity wildfire. A sensitivity analysis was performed and found that the resultant change in predicted stream-flow within the model was most sensitive to parameters related to the soil permeability and infiltration.