HYDROLOGIC AND EROSION IMPACTS OF THE 2010 SCHULTZ WILDFIRE, COCONINO NATIONAL FOREST, ARIZONA

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ABSTRACT
The Schultz Fire burned 6,100 ha on the eastern slopes of the San Francisco Peaks. The fire burned between June 20th and 30th, 2010, across moderate to very steep ponderosa pine and mixed conifer watersheds. About 40% of the fire area was classified as high-severity, mostly on mountain slopes greater than 30% and in places exceeding 100%. Eleven burned watersheds were evaluated for potential threats from storm runoff and debris flows, with 50% of five basins and 70% of two basins burned to high severity. Upper mountain slopes rise to over 3,300 m and are the source for high-energy water, coarse sediments, and woody material. Steep mountain basins have ephemeral swales with slopes that can exceed 30%, while well-defined ephemeral piedmont and lower-fan channels slope up to 5%. Over the course of an active 2010 Monsoon, ranking the fourth highest in rainfall on record, the burned area received numerous precipitation events. The largest event occurred on 20 July and was characterized by a peak rainfall of 24 mm in ten minutes, resulting in numerous debris flows, historic floods, and substantial hillside soil and channel alluvium erosion. Flood flows were an order of magnitude larger than those produced by similar pre-fire rainfall events. Debris flows were common in most of the mountain drainages, with some flows reaching the toe of the piedmont. Substantial amounts of soil were eroded from a newly developed rill and gully system, removing the A horizon and much of the B horizon. All upper channels were incised deeply, some up to 5 m, with most scouring to bedrock. Sediment sorted out rapidly below the piedmont with only sands and finer sediments reaching the toe of the lower fans.

INTRODUCTION
The Schultz Fire burned for 10 days in late June 2010. It produced a mosaic of areas burned at varying fire severities with some basins having as much as 70% high severity. Post-fire response mitigation efforts included water bars, straw wattles, straw mulch, aerial seeding, Jersey barriers, culvert removals, and drainage crossing armoring to mitigate anticipated accelerated post-fire flooding and soil erosion. Flooding impacted a larger area in the wildland-urban interface than the fire (Fig. 1). Flash flooding impacted housing and transportation routes on an alluvial fan below the burned area (Figs. 2 & 3). Debris flows occurred in a number of steep watersheds (Fig. 4), cutting one of Flagstaff’s water pipelines that provided up to 20% of the summertime water supply.

CONCLUSIONS
The Schultz Fire resulted in extensive flooding and erosion due to steep topography, ~70% of high to moderate burn severity, and the 4th wettest Monsoon on record. Impacts on residential properties and infrastructure, areas undamaged in the wildfire, have been substantial and are likely to be long-lasting. Post-fire monitoring is required after events like the Schultz Fire to provide warnings for local governments, residents, and to educate the public, especially in the wildland-urban interface where post-fire hazards pose higher risk.

REFERENCES