

Colorado Front Range flood of 2013: peak flows, flood frequencies, and impacts

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Abstract. In September of 2013, the Colorado Front Range foothills experienced an extensive period of rainfall that culminated in flooding that peaked in many streams on Friday, the 13th. Rainfall depths of up to 18 inches were recorded over a 10 day period, with a large proportion of the rainfall falling over a 36 hour period. In response, many streams in the South Platte and Arkansas River basins flooded. At multiple spatial scales, peak flow estimates, flood frequencies, and impacts are to be presented. Peak discharges of up to 1700 cms (60,000 cfs) were quantified. Peak flow unit discharges varied by catchment size, as would be expected. Unit discharges as large as 14.6 cms/km² (1340 cfs/mi²) were measured in watersheds less than 10 km² (4 mi²) in size, up to 5.2 cms/km² (480 cfs/mi²) in watersheds up to 65 km² (25 mi²), and up to 3.5 cms/km² (320 cfs/mi²) for watersheds up to 520 km² (200 mi²). The highest unit discharges were oftentimes associated with highest severity damages. Large unit discharges were computed at some higher elevations, contradicting the often assumed assumption that high-intensity rain events are limited to elevations below 2300 meters (7500 feet) in the Colorado Front Range. For locations with streamgages, revised flow frequency estimates were developed using the logPearson methodology as presented in Bulletin 17B. The 2013 peaks were included in this analysis. For the larger streams impacted by the flooding, return intervals ranged from a 5- to 25-year flood (Fountain Creek), 25- to 50-year flood (Cache la Poudre River, South Platte River), 100-year flood (Big Thompson River), 100- to 200-year flood (Boulder Creek, Coal Creek), and greater than the 200-year flood (Lefthand Creek, Saint Vrain Creek, Fish Creek).