Suspended sediment loads in the South Fork Cache la Poudre following the High Park fire

Sandra Ryan
US Forest Service, Rocky Mountain Research Station, Fort Collins, CO

Mark Dixon
Mountain Studies Institute, Durango, CO

Sara Rathburn
Department of Geosciences, Colorado State University

Abstract. The High Park fire burned over 35,000 ha within the Cache la Poudre basin in early summer 2012, including an eastern portion of the South Fork Cache la Poudre (SFCLP) watershed. Given the proximity of the burn and the implications for water quality supplied to local municipalities, there is an expressed interest in improved understanding of sediment loads in SFCLP and main stem Cache la Poudre River for the first few years post-fire. We present data on suspended sediment concentrations (SSC) collected over two years post-fire (2013 and 2014) at a site on the SFCLP below Old Flowers Road. Prior to burning, data on sediment transport, including SSC, were collected at this site by researchers from the US Forest Service, providing baseline information on sediment loads. Turbidity sensors were deployed post-fire as a continuous, surrogate measure of SSC. This signal was calibrated using both grab samples and samples obtained from an automated water sampler triggered by a turbidity threshold. During snowmelt runoff in 2013, peak SSC was about 70 mg L^{-1}, which is roughly 5 times higher than pre-burn values for comparable levels of flow. However, during individual moderate-to-high intensity storms in 2013, values of SSC ranged from 100 to 1000 mg L^{-1}, with some instantaneous concentrations up to 7000 mg L^{-1}. In 2014, SSC varied between 2 and 10 times greater pre-burn snowmelt values, but primarily on the rising limb of the seasonal hydrograph. This pattern is likely due to re-entrainment of sediment deposited during the September 2013 Northern Colorado Flood. During summer 2014, SSC exceeded 100 mg L^{-1} during 2 storms: July 12 (60 to 7000 mg L^{-1}) and July 29-30 (50 to 3000 mg L^{-1}). Additional sampling stations (Woodpecker Woods and Rocky Top) were established downstream of the SFCLP site in conjunction with assessments of channel extension and sedimentation from severely burned hillslopes and gulches, one of which was mulched for erosion control in spring 2013. SSC values measured during summer storms below both tributaries show progressive increases in SSC relative to the most upstream site in 2013. Data analysis for 2014 is in progress, but preliminary indications suggest that increases in suspended sediment from the 2 tributaries were lower than those generated in 2013. Finally, we compare these values to SSC measurements collected at Skin and Hill Gulches near Poudre Park on the main stem Cache la Poudre River in the summer of 2014.