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Assessing the role of large wood entrained in the 2013 Colorado Front Range flood in ongoing channel response and reservoir management

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Considerable quantities of large wood (LW) may be entrained during floods with long lasting impacts on channel morphology, sediment and LW export, and downstream reservoir management. Here we present an analysis of LW entrained by an extensive flood in Colorado, USA. Over a 5 day period commencing 9th September 2013, up to 450 mm of rain, or ∼1000% of the monthly average, fell in catchments spanning a 100-km-wide swath of the Colorado Front Range resulting in major flooding. Catchment response was dramatic, with reports of 100s – 1000s of years of erosion, destruction of infrastructure and homes, and sediment and LW loading within reservoirs. One heavily impacted catchment is the North St Vrain, draining 250km2 of the South Platte drainage basin. In addition to widespread channel enlargement, remote imagery reveals hundreds of landslides that delivered sediment and LW to the channel and ultimately to Ralph Price Reservoir, which provides municipal water to Longmont. The City of Longmont facilitated the removal of ∼1050 m3 of wood deposited at the reservoir inlet by the flood but the potential for continued movement of large wood in the catchment presents an on-going concern for reservoir management. In collaboration with the City of Longmont, our objectives are (1) to quantify the volume of wood entrained by the flood and still stored along the channel, (2) characterize the size and distribution of LW deposits and (3) determine their role in ongoing catchment flood response and recovery. We utilize freely available pre and post flood NAIP 4-band imagery to calculate a normalized differential vegetation index (NDVI) difference map with which we calculate the area of vegetation entrained by the flood. We combine this with field assessments and a map of vegetation type automatically classified from optical satellite imagery to estimate the total flood-entrained volume of wood. Preliminary testing of ‘stream selfies’ – structure from motion imaging of LW deposits using a hand-held GoPro camera on an extended platform, demonstrates the potential of this technique to characterize LW deposits and monitor their role in ongoing channel response and recovery.