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Rock and Roll: Passive sensing of fluvial bedload and wood transport and interaction

Georgina L. Bennett (1) and Sandra Ryan (2)

(1) School of Environmental Sciences, University of East Anglia, Norwich, UK (georgina.bennett@uea.ac.uk), (2) U.S. Forest Service, Rocky Mountain Research Station, Colorado, USA (sryanburkett@fs.fed.us)

Fluvial bedload transport is a fundamental process by which the coarse sediment fraction is transferred through landscapes by flowing water. Studies using Passive Integrative Transponders (PITs) to track bedload have shown that bed- particles move like a random walk model with intermittent periods of movement followed by long periods of rest. In cobble-bed channels, storage often occurs in distinct patches, typically controlled by large roughness elements, such as large cobbles and boulders. Large wood is also major component of many rivers, but its influence on bedload transport is poorly understood. Rivers across the western USA are currently experiencing increased wood loading due to infestation of forests by the mountain pine beetle over the past decade. Here we have started to investigate the impact of increased wood loading on bedload sediment transport dynamics in a stream within a beetle-infected riparian forest using PIT technology.

In August 2016 we seeded 1000 PIT tagged cobble-sized rocks in St Louis Creek, a cobble to boulder bed channel in Fraser Experimental Forest, Colorado, USA. We also installed a discharge gage in order to continuously monitor discharge at the upper end of the seeded reach and establish hydrological control on bedload transport. We resurveyed the reach for the first time in August 2017 and relocated 90% of the rocks, with 30% of these showing movement from their initial seed location to up to 100 m along the river bed and evidence for the clustering of rocks behind boulders and large wood. Over the next decade, we plan to annually resurvey downstream movement and storage and grow a database of sediment transport and wood recruitment in order to establish the impact of increasing wood on bed-particle rest intervals and travel distances and stream geomorphology.