Assessment of the performance of a riffle-pool restoration project over two years of floods using Radio Frequency Identification (RFID) tracking

Bruce MacVicar[1],
Margot Chapuis[2],
Julian Krick[1],
Elli Papangelakis[1]
Thomas Raso[1]
Peter Ashmore[3]
André Roy[4]
[1]*University of Waterloo, Waterloo, Canada*
[2]*University of Nice-Sophia Antipolis, Nice, France*
[3]*University of Western Ontario, London, Canada*
[3]*Concordia University, Montreal, Canada*

Riffles and pools are commonly used in in-channel restoration projects due to the perceived benefits for channel stability and fish habitat. With regards to channel stability for instance, it is thought that the large size material used in the riffles will resist erosion while the deep pool will encourage energy dissipation. Very little is known, however, about the actual effects of riffles and pools on sediment dynamics. A successful design should be distinguishable from unrestored reaches in terms of how frequently and how far sediment moves during floods. The objective of the current work is to compare the sediment dynamics of reaches with and without riffle-pool restoration using Radio Frequency Identification (RFID) tags for sediment tracking. These tags are advantageous because of their long life, unique ID codes, and because they don't require the bed to be disturbed for detection. The field site is Wilket Creek in Toronto Ontario, a highly urbanized system with negligible stormwater management infrastructure and massive instability problems. We installed a series of water level gauges and tracked sediment within and upstream of a reach that was restored in 2012. In this study we compare five floods over a two year period. Analysed metrics include particle mobility (percent of particles that move in a flood) and travel-distance. Results show that the restoration did not reduce the mobility of the mean bed sediment size, but did reduce the mobility of larger sized particles. For particles in motion, the distance of travel during individual floods was not significantly affected by the restoration. Overall the results indicate that the design is relatively stable due to the reduced mobility of the larger particles, but sediment continues to be exported out of the creek. Over time instability is likely to result in long term sediment deficits.