

Quantifying sedimentological, geomorphic and habitat adjustment following river restoration

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Project background and aims:

Restoration aims to return a river to its pre-existing structural and functional state, thereby invoking natural processes, including sediment transport, with the hope of subsequent positive responses from biological communities. To date, there has been a lack of post-restoration monitoring. This arises partly from the technical challenge of acquiring affordable, high-resolution data to assess whether natural ecosystems and geomorphic dynamism are reinstated. The aim of this project was to monitor the sedimentological and geomorphological adjustment of two contrasting gravel-bed restoration schemes in Cumbria, at Whit Beck and the River Lyvennet (Figure 1). These schemes have been developed to help deliver the joint Natural England and Environment Agency obligation to improve the quality and function of Sites of Special Scientific Interest (SSSI) and Special Areas of Conservation (SAC) within the Eden and Derwent catchments.

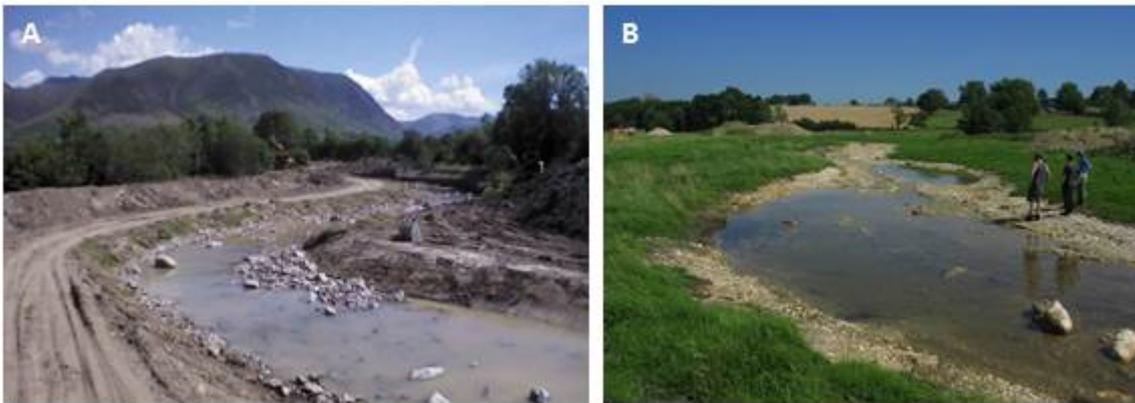


Figure 1 (A) The new Whit Beck channel imposes over 1 km of new channel pathway and increases channel length by a factor of three. (B) Design of the new River Lyvennet channel contrasts that at Whit Beck and has used palaeochannels and gravel deposits to guide the location and bed level of the 1.5 km long restored channel.

Project methodology

Aerial imagery surveys of the Whit Beck and River Lyvennet restoration schemes were undertaken in March 2015, July 2015 and June 2016, using a consumer grade DJI Phantom 3 Unmanned Aerial Vehicle. These surveys supplemented terrestrial laser scanning surveys that were acquired in October 2014 and June 2016. Imagery was processed using Pix4D to produce high-resolution Digital Elevation Models and spatially continuous imagery (DEMs; Figure 2). These surveys were supplemented by macroinvertebrate and sediment sampling in August 2015 and May 2016, and a fish survey in August 2015.

Continuing project progress

Current analysis is focusing on producing DEMs of Difference (DoDs). These DoDs will be used as a metric for habitat disturbance to consider the impact of channel change on macroinvertebrate communities. DEMs will also provide a boundary condition for 2D hydraulic modelling, which will be used to delineate geomorphic units. Earth Surface Processes and Landforms will be considered for publication of the results.

Follow on funding

Data collected from this BSG grant supported a successful application for an MPhil Knowledge Economy Skills Scholarship (KESS) studentship (approx. value £20k). Results also supported a Royal Academy of Engineering Industrial Secondment application (approx. value £25k; under consideration).



Figure 2 Aerial image of the Whit Beck restoration scheme, from survey in July 2015.