



The geomorphic and hydrological responses to flood embankment lowering on a medium sized gravel-bed river.

Steve Addy and Mark Wilkinson

The James Hutton Institute, Aberdeen, United Kingdom (stephen.addy@hutton.ac.uk)

Floodplain reconnection has been highlighted as a river restoration technique that could improve the ecology of river corridors and reduce flood peaks. However, empirical evidence of its effectiveness – needed to inform best practice – is limited. In October 2015, a 70 m long artificial embankment was lowered on a bend of the upper River Dee, North-east Scotland. The catchment area upstream of the site is 370 km² and the river is medium sized with a gravel-bed. Three goals were set by the restoration project partnership: firstly, to improve river morphology, secondly to remove waste contained within the embankment and lastly to improve river-floodplain connectivity. Comparison of 2 years pre- and 3 years of post-restoration morphological change and water level data, shows the lowering and subsequent adjustment, assisted by several floods including a ≥ 1 in 200-year event, have altered the morphology and hydrological dynamics appreciably. In the channel, aggradation of up to 1 m and rearrangement of bedforms occurred. Further lowering of the bank by up to 0.4 m caused by the floods and deposition of gravel within the relict channel and the floodplain were the dominant geomorphic responses elsewhere. The floodplain hydrology changed as a result of the changes in channel cross section geometry. The threshold river discharge for floodplain inundation reduced from ca. 70 m³ s⁻¹ to ca. 40 m³ s⁻¹. Furthermore, for river flows exceeding the post-restoration threshold, floodplain water level responses were noticeably quicker, and the amount of overspill was higher. The monitoring demonstrates that significant but localised hydro-geomorphic responses both within the channel and the adjacent floodplain can result from targeted embankment lowering. The socio-economic and technical implications of these findings for restoring the hydro-geomorphology, floodwater storage and ecology of floodplains will be discussed.