

Yearls Weir Riverbank Reinstatement

Following flooding in west Cumbria, significant bank erosion led to the loss of an access track and compromised the integrity of a weir. Salix were contracted to reinstate the riverbank with a bioengineering solution. The solution consisted of Salix AquaRockBags and large live root wads, to provide erosion protection in a high energy environment.

It was necessary to provide an alternative access to the weir, needing some form of protection against future erosion.



Erosion processes during flood events were twofold, firstly severe bank erosion caused by toe scour, bank failures and associated bank retreat and secondly the stripping back of the turf layer on the flood plain, exposing further floodplain soils to erosion. The river also began to cut a new channel on a shorter course across the floodplain, bypassing a large weir structure, a process known as avulsion.

A detailed bathometric survey was undertaken followed by hydraulic modelling of the existing channel and flood plain to build up a map of bed, bank and floodplain flow velocities and map shear stress for 1:200-year flood return events. This data informed the design process. A further model was then produced to inform the client and statutory permit agency of any potential future channel change as a result of the bank reinstatement works.

As an ecologically sensitive site the use of traditional hard engineered bank protection was not an option, and bioengineered designs were favoured. Bioengineering solutions and AquaRockBags are the best option in a sensitive environment.



The scour pools provided a particular challenge, as bioengineering techniques would not control the rate of erosion in 2-3 metres of water. Large rip rap stone was also ruled out due to the geomorphological impact downstream and the adverse ecological impact. The solution to controlling the erosion in the scour pools came in the form of AquaRockBags. These were installed to average water level and above this level more traditional bioengineering solution could be used. AquaRockBags support vegetation, invertebrates, and fish. The smaller stone size also negates the issue of the downstream morphological impacts that larger rip rap has on channel processes.

From average low flow water level, a continuous run of linear toe logs, root wads and live willow staking were installed. Additional tree planting on the re-profiled riverbanks and the adjacent floodplain will slow flood flows and reduce erosive force in the future.



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The banks were also protected with a high-performance turf reinforcement system, using a combination of woven HP-TRM and Gripple ground anchors. The matting was extended from the bank to also cover the area where avulsion process had created the new river channel in the floodplain and where future major floods would otherwise try to reform this channel feature.



Since installation, the vegetation has fully established with an abundance of native species. Fry, lamprey and eels thrive in the silted margins, with improved marginal habitat to assist with cover and invertebrate abundance. The large root wad revetment will sustainably protect the bank whilst offering substantial environmental benefits.