

Hydrology and Hydraulics

What are the hydraulic and hydrologic implications of the LIFE III Restoration project?

1. Reach-Scale Hydraulics

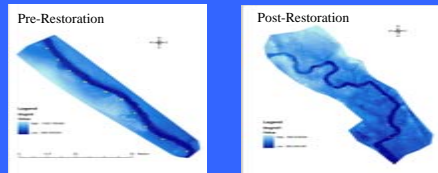


Figure 1:- Locations of crest gauges before and after restoration

Pre-restoration, the highly channelised channel with bank heights of up to 2.5m meant that the channel was effectively disconnected from its floodplain. By restoring the original channel form the channel was reconnected with its floodplain and this is shown in the crest gauge data where overbank inundation was not observed at all during the pre-restoration monitoring period (December 2003-August 2004) but occurred 5 times in the post-restoration monitoring period (October 2004-May 2005). The discharge required for floodplain inundation pre-restoration was $7.35\text{m}^3\text{s}^{-1}$ compared to a relatively small $0.3106\text{m}^3\text{s}^{-1}$ post-restoration.

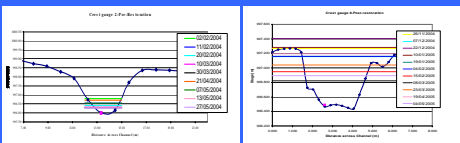


Figure 2: Crest gauge Results before and after restoration (not too scale)

2. Inundation Patterns

Restoration also influenced inundation patterns. Figures 3 and 4 show two flood events that were of similar magnitude before (05/05/04) and after (11/01/05) restoration ($0.17\text{m}^3\text{s}^{-1}$ and $0.158\text{m}^3\text{s}^{-1}$ respectively). Water surface elevations were surveyed and added to a digital elevation model of the respective reaches. Visually it can be seen that there is a marked difference in the patterns of inundation with the inundation being confined to areas close to the main channel before restoration. Post-restoration the inundation patterns display more of an island effect with complex floodplain topography routing flow through distributary channels.

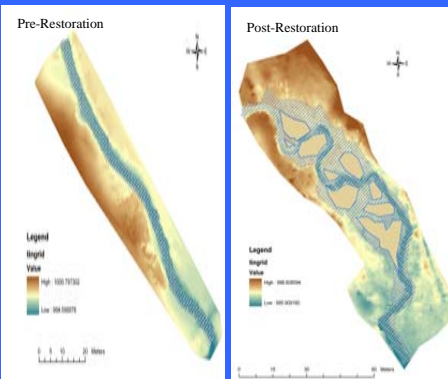


Figure 3:-Flood extent for site pre-restoration

Figure 4:-Inundation extent post-restoration

3-Catchment Travel Times

Taking hydrological data from two gauging stations it was possible to assess how long it took a flood peak to travel the 4000m between the two gauging stations (see figure 5) before and after restoration. A comparison of a number of different sized events shown in figure 6 shows that the flood peak travel time in minutes was higher post-restoration (2 hours 16 minutes) than it was pre-restoration (1 hour 39 minutes). This is an increase of 37 minutes or 37%. This increase in flood peak travel time is a result of the increase in channel length due to the modification of the channel platform, the increased inundation of the floodplain and the resistance offered by the installed large woody debris dams.

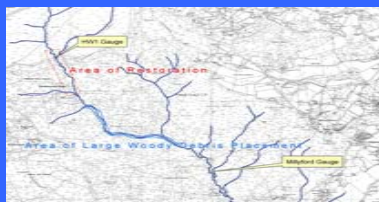


Figure 5: Location of Gauging Stations

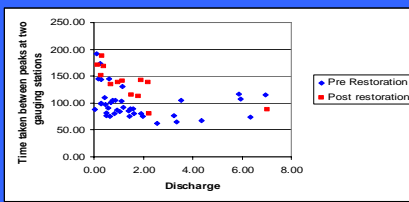


Figure 6:- Travel time of a range of flood event peaks

Geomorphology

How successful has the restoration been at establishing the floodplain geomorphological processes found in natural reaches?

1. What is the floodplain geomorphology in natural reaches?



Diverse, with in-channel debris dams flow causing sediment deposition and erosion on the floodplain creating a network of floodplain channels.



2. What was the floodplain geomorphology at the restored site before restoration?



Uniform because the flow did not reach the floodplain to cause erosion and deposition.

3. What geomorphological processes are occurring on the floodplain post restoration?

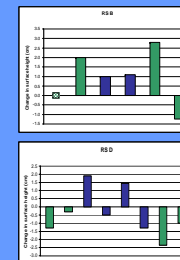
A. Overbank flow due to smaller channel dimensions and debris dams



B. Erosion and deposition caused by overbank flow



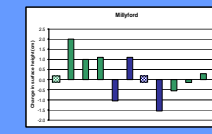
(ii) Results from two sets of erosion pins on the floodplain of the restored site



In local areas the floodplain surface height changed by over 2 cm which is high considering that we have had a very dry winter.

Key
Level of precision: +/- 0.1cm
Positive values indicate deposition
Negative values indicate erosion

(i) Results from erosion pins on the floodplain of a natural site



C. Erosion and deposition resulting in the formation of diverse floodplain geomorphology e.g. floodplain channels



