



# UPSTREAM MANAGEMENT

Upstream management, otherwise known as slow the flow, is a collective term for techniques used to manage flood risk and includes flood storage solutions as well as natural flood management (NFM). Upstream management is the alteration, restoration or use of landscape features to manage flood risk. One technique is using river and floodplain restoration.

## RIVER AND FLOODPLAIN RESTORATION

River and floodplain restoration aims to improve the ability of a river to manage floodwater by restoring a more natural hydrological regime and improving connectivity. Floodplain restoration is appropriate where a floodplain is connected to the watercourse, where there is potential for re-connection, and in areas where land cover is suitable for wetland.

### River re-meandering

River re-meandering is the reinstatement of natural meanders to river channels which have previously been modified and/or straightened. Re-meandering increases the length of a river channel and decreases flow conveyance, allowing more water to be stored in-channel and helping to decrease flood risk downstream. Having a more natural river channel condition can also help with biodiversity.

### Floodplain reconnection

A river can be connected to its floodplain through the removal of embankments or by changing the rivers shape to allow water to spill out. This restores and encourages the natural hydrological connectivity of the channel to its floodplain and increases floodwater storage to decrease the flood peak and reduce the flood depth downstream.

### River bank stabilisation

Stabilising excessively eroding river banks reduces the deposition of sediment downstream. This can be achieved through better riparian management practices such as using stock fencing to prevent livestock destabilising the bank, allowing the bank to re-vegetate and re-stabilise naturally, or through direct re-vegetation.

### Benefits

- Reduces downstream flood risk by increasing water storage and slowing the flow of water in channel.
- Reduces levels of bank erosion and sediment loss.
- Improves habitat diversity and increases biodiversity both in channel and on land.

## CASE STUDY: Padgate Brook

The Padgate Brook River Restoration was part of the wider Warrington Flood Risk Management scheme which aims to reduce the risk of flooding to surrounding properties using river restoration, embankment removal and floodplain re-connection techniques. The Padgate Brook work was carried out by the Environment Agency in partnership with Warrington Borough Council, and was completed in 2015. Wider benefits have been achieved from this project in relation to water quality, habitat restoration, aesthetic value and improved access to green space.



### Issues

Previous aims to reduce flood risk via straightening of the channel and the creation of embankments disrupted the natural flow of the brook and cut it off from its floodplain, which actually increased flood risk.

### Solutions

- 500m of straightened and deepened watercourse restored to a more natural, sinuous channel.
- Embankment set back 200m to allow watercourse to reconnect with floodplain.
- 5 hectares of reed bed restored.
- £250,000 spent on this part of the scheme (5% of budget).

### Benefits

- Reduced risk of flooding to 226 properties.
- Created a self-cleansing channel which has avoided the need for routine maintenance.
- Created a number of pools adjacent to the main channel to help trap sediment.
- Wider benefits for water quality and wildlife.
- The floodplain has been inundated after heavy rainfall a number of times since the restoration, with no major flood events occurring.