

Case study 7. Mill Brook – Tattenhall, Cheshire

Authors: Duncan Revell, Lee Swift, Dave Brown

Main driver: Habitat creation

Project stage: Constructed February 2016



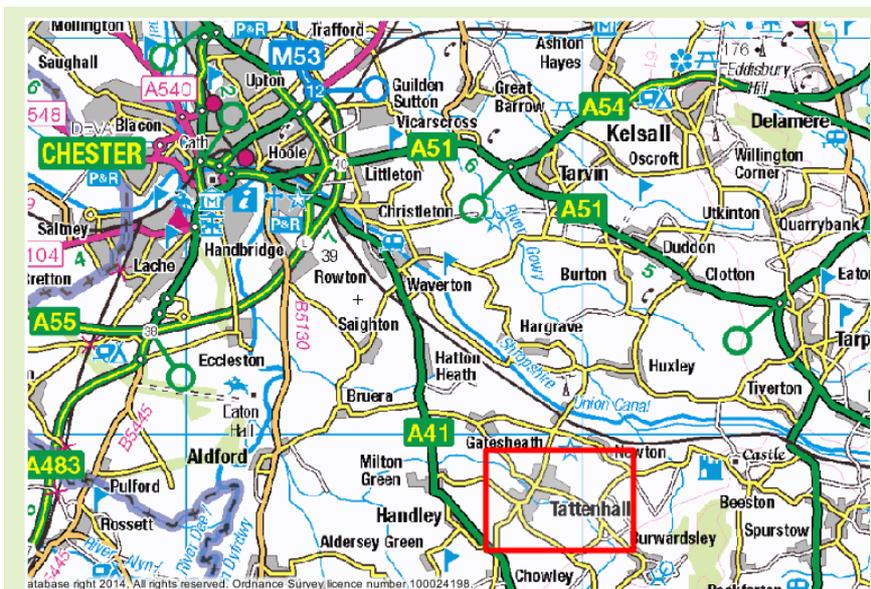
Photo 1: Mill Brook scheme following construction (source: Environment Agency)

Project summary:

This was a habitat creation scheme (Photo 1) which incorporated innovative, Natural Flood Management (NFM) techniques along 230m of Mill Brook, upstream of Tattenhall near Chester (Map 1). This partnership project with the Bolesworth Estate and Tattenhall Wildlife Group created 1.5ha of priority reedbed and wet grassland habitats within a new excavated floodplain area. The project helps attenuate flood peaks and reduces risk downstream in Tattenhall. The North West Regional Flood and Coastal Committee allocated £13,500 of funding to this scheme from the North West 'Slowing the Flow' project.

Key facts:

- 1.5ha of priority habitats created
- Wider and improved riparian zone and wildlife corridor
- Reduced diffuse agricultural pollution leading to reduced sediment input and improved water quality, helping to meet Water Framework Directive objectives
- Increased floodwater storage upstream and flood peak attenuation, which slows the flow of the brook, leading to some flood risk reduction benefits to the downstream village of Tattenhall



Map 1: Location of Tattenhall (source: Ordnance Survey)

1. Contact details

Contact details	
Names:	Duncan Revell, Lee Swift and Dave Brown.
Lead organisation:	Environment Agency
Partners:	Bolesworth Estate and Tattenhall Wildlife Group
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2. Location and catchment description

Catchment summary	
National Grid Reference:	SJ 48883 58162
Town, County, Country:	Tattenhall, Cheshire, UK
Regional Flood and Coastal Committee (RFCC) region:	North West
Catchment name(s) and size (km²):	Dee: 2,251km ² (river basin catchment)

	Aldford Brook: 108km ² (subcatchment) Mill Brook: 16km ²
River name(s) and typology:	Mill Brook (lowland), low, calcareous
Water Framework Directive water body reference:	GB111067052120
Land use, soil type, geology, mean annual rainfall:	Agricultural Loam over clay/sand, sandstone Mean annual rainfall: 800mm

3. Background summary of the catchment

Socioeconomic/historic context

Mil Brook was straightened from east to west hundreds of years ago for the village mill and, probably, agricultural land gain. This has resulted in some loss of floodplain connectivity.

Flood risk problem(s)

Tattenhall is an identified 'community at (flood) risk' with 22 properties in fluvial Flood Zones 2 and 3. On 6 November 2000, 14 properties in the village flooded. A report on the flood by JBA Consulting highlighted the main flood mechanism as poor culvert capacity under the main road, followed by overtopping of the dam and, additionally, surface water (JBA 2013). Following this event, an extra culvert under the main road has assisted the situation and flooding has not occurred since, though the risk remains.

Other environmental problems

A high concentration of phosphate is the reason this water body is not achieving 'good status' under the Water Framework Directive. This is likely due to diffuse pollution from agriculture and discharges from wastewater treatment works.

4. Defining the problem(s) and developing the solution

What evidence is there to define the flood risk problem(s) and solution(s)

Detailed hydrological modelling by JBA Consulting in 2013 identified several flood risk management options, including raised embankments and flood walls in the village, a larger culvert under the high street and upstream flood water storage. All of these options are still being considered and partnership funding sought, but an opportunity arose to incorporate NFM 'slowing the flow' techniques into the proposed habitat creation scheme just upstream of the village. The RFCC commissioned a 'Slowing the Flow' project in the north-west, which has funded smaller schemes that incorporate NFM techniques upstream of communities at risk using Local Levy council tax funding; £13,500 was allocated to this scheme at Tattenhall.

What was the design rationale?

The principal design centred on the excavation and lowering of the south bank to create a floodplain area for priority reedbed and wet grassland habitats. NFM 'slowing the flow' techniques were incorporated into the scheme design to encourage more water to spill onto the floodplain. Two large woody material dams were installed in the channel of Mill Brook. The gradient is such that

remeandering the watercourse into a defined channel was not practical and the preferred, most feasible and effective option was to improve floodplain connectivity, increase storage and install woody material dams.

Project summary	
Area of catchment (km²) or length of river benefitting from the project:	16km ² 230m
Types of measures/interventions used (Working with Natural Processes and traditional):	Floodplain excavation Lowering embankments Improved floodplain connectivity Installation of 2 woody material dams to slow the flow
Numbers of measures/interventions used (Working with Natural Processes and traditional):	3
Standard of protection for project as a whole:	Flood risk has been reduced to some extent, but this is very difficult to calculate. Approximately 300m ³ of additional floodplain storage was created by excavation works. This allowed increased connectivity to low-lying ground, with a storage volume of ~750m ³ . The area of works is equivalent to .0.3% of the Mill Brook catchment. While this will result in a marginal reduction in risk to downstream properties, this reduction cannot formally be quantified.
Estimated number of properties protected:	22 properties and a main road will benefit from this intervention

How effective has the project been?

Once properly established, the project will lead to the creation of 1.5ha of priority reedbed and wet grassland habitats.

The excavation works has increased floodplain storage by more than 1,000m³. Increased channel roughness created by the woody material jams and overland flows is likely to reduce peak flows to Tattenhall village and to remove fine sediment from the watercourse.

In recent years, the land adjacent to Mill Brook has been grazed by dairy cattle. As part of the project, the fence line has been moved 55m south from the water's edge, reducing the impact of diffuse agricultural pollution (reduced fine sediment delivery) and increasing the width of the wildlife corridor.

5. Project construction

How were individual measures constructed?

The embankments and floodplain were lowered using a 13-tonne excavator and the spoil was deposited 50m to the south. The woody material dams were constructed using fallen trees and branches from nearby woodland. The works were undertaken by the Environment Agency's Operations Field Team. The Tattenhall Wildlife Group installed the second dam.

How long were measures designed to last?

100 years

Were there any landowner or legal requirements which needed consideration?

Yes. A formal access agreement with the landowner, the Bolesworth Estate, was required. The Bolesworth Estate provided the land and fencing materials. The work was carried out using the Environment Agency's permitted development rights and so there was no need for planning permission from the local authority.

6. Funding

Funding summary for Working with Natural Processes (WWNP)/National Flood Management (NFM) measures

Year project was undertaken/completed:	2016
How was the project funded:	North West RFCC, Local Levy council tax funding
Total cash cost of project (£):	13,500
Overall cost and cost breakdown for WWNP/NFM measures (£):	13,500
WWNP/NFM costs as a % of overall project costs:	100
Unit breakdown of costs for WWNP/NFM measures:	13,500
Cost-benefit ratio (and timescale in years over which it has been estimated):	The assumed benefit for the creation of water-dependent habitat used (Outcome Measure 4a: £15,000 per hectare) exceeds the full project costs. Furthermore, multiple benefits have been achieved (see Section 7).

7. Wider benefits

What wider benefits has the project achieved?

Multiple benefits:

- Priority habitat creation and enhanced biodiversity
- Wider and improved riparian zone and wildlife corridor
- Reduced diffuse agricultural pollution leading to improved water quality under the Water Framework Directive
- Increased flood water storage upstream to slow the flow – leading to some flood risk benefit
- Reduced maintenance costs for the Environment Agency, with the Tattenhall Wildlife Group managing the site in the long term
- Engagement with the local community, with new NFM technique skills acquired
- Good value for money with the works carried out by the Environment Agency's Operations Field Team

How much habitat has been created, improved or restored?

1.5ha of water-dependent priority habitats created and 230m of river improved

8. Maintenance, monitoring and adaptive management

Are maintenance activities planned?

Yes. This stretch of main river will now be maintained in the long term on behalf of the Bolesworth Estate by the Tattenhall Wildlife Group (with the Environment Agency retaining permissive powers).

Is the project being monitored?

Yes – by the Tattenhall Wildlife Group and the Environment Agency

Has adaptive management been needed?

No. The Tattenhall Wildlife Group is monitoring the site and reporting any works that may require use of Environment Agency machinery.

9. Lessons learnt

What was learnt and how could it be applied elsewhere?

It was relatively straightforward to incorporate NFM techniques to enhance the habitat creation scheme and the skills learnt were easily passed on to the project partners and the local community. Considering the benefits achieved, this project demonstrated excellent value for money.

Photos 2, 3 and 4 show the site before, during and after construction.



Photo 2: The site pre-construction (source: Environment Agency)



Photo 3: The site during construction (source: Environment Agency)



Photo 4: The site following construction (source: Environment Agency)

10. Bibliography

JBA, 2013. *Investigation into the flooding at Tattenhall, Cheshire*. Skipton, Yorkshire: JBA Consulting.

RRC, 2013. *Manual of River Restoration Techniques* [online]. Cranfield, Bedfordshire: River Restoration Centre. Available from: <http://www.therrc.co.uk/manual-river-restoration-techniques> [Accessed 3 April 2017].

Project background

This case study relates to project SC150005 'Working with Natural Flood Management: Evidence Directory'. It was commissioned by Defra and the Environment Agency's [Joint Flood and Coastal Erosion Risk Management Research and Development Programme](#).