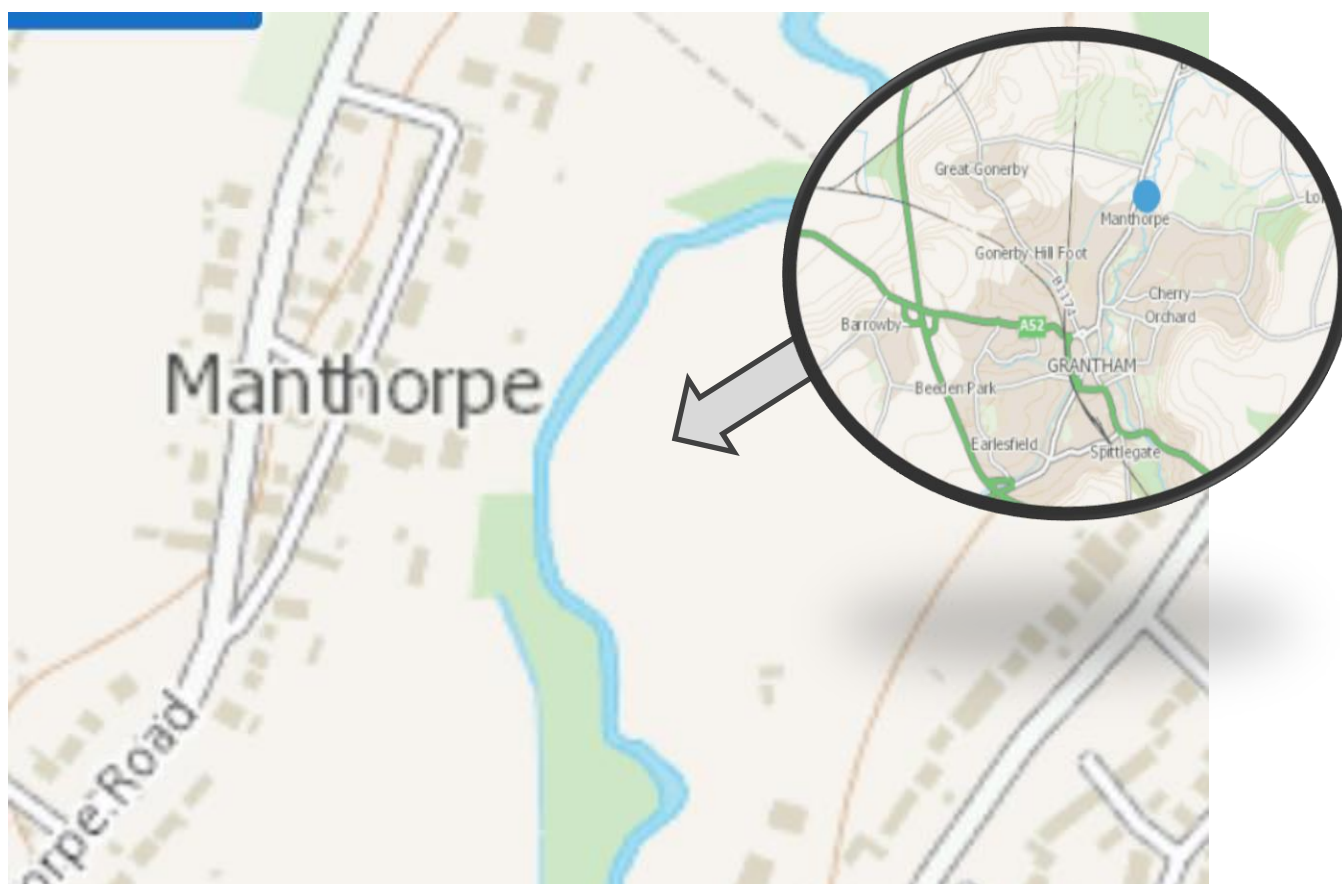


River Witham - River Restoration Case Study

| | | |
|--|---|---------------------------------------|
| Catchment & Waterbody: | Upper Witham. Manthorpe | |
| Location: | Manthorpe, Grantham | |
| Upstream Grid Ref: | SK9222737685 | Completion Date: November 2021 |
| Length of river enhanced: | 200m and 3.7ha of meadow reconnected | |
| Partners: | Wild Trout Trust, Lincs Wildlife Trust, Lincolnshire Rivers Trust, Witham Blue Green corridor project, Grantham RiverCare | |
| Budget: | £196k including design and delivery of works | |
| Related Plans & Strategies: | Grantham Urban River and Wetlands Plan Natural Flood Management Upper Witham Strategy | |



Background

Located downstream of Queen Elizabeth Park in Grantham this short section of the River Witham is inaccessible to the public. The river has been modified for mill use and land drainage with gravels removed from the bed and used to embank the river to help build a head of water to drive the mill downstream but also to prevent the river from coming out of bank as an attempt to improve agricultural productivity. This has left the river trapped in its modified shape with no real ability to restore itself and limits its ecological potential. The reach has some historic coppiced willows present and as part of a previous project some of these willows had been hinged to provide fish and crayfish cover.

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03708 506 506

Incident hotline
0800 80 70 60

Floodline
0345 988 1188

enquiries@environment-agency.gov.uk

Low gradient rivers like the Witham rely on fallen timber to provide slightly higher energy to allow the river to move across the floodplain and evolve. The river disperses its energy across the floodplain when it comes out of bank, but when channels are embanked and entrained this increases the rivers available energy which can lead to erosion of flood defences and the backing up of water within the confined channel impacting on upstream neighbours. To reduce the risk from this loss of storage and backwater impacts the channel needs a more interventional approach to channel maintenance and bankside trees to reduce flood risk preventing natural processes for the river to try to restore itself.

Asset performance had assessed the flood banks along the reach and came to the conclusion that the right bank doesn't provide flood defence benefits and had started the process of decommissioning and handing over the asset to the landowner. An early conversation was had between FBG and AP to whether there might be other options like floodplain reconnection which would remove the burden of maintenance from the landowner, allow natural processes to take place, creating space for the river and cost savings on ongoing maintenance for the EA.

The overall Ecological Status of the section of the Witham, which includes the Manthorpe reach, is classified as Moderate, due to the heavily-modified channel which lacks morphological and habitat diversity, poor fish populations and high levels of phosphates. (See <http://environment.data.gov.uk/catchment-planning/WaterBody/GB105030056780>).

Project Objectives

Floodplain reconnection brings a variety of societal benefits, and addresses a lot of the Water Framework Directive reasons for failure. Floodplains act as sponges or filters absorbing high water events which compliments existing flood defence assets but also provide low flow resilience by releasing this water back to the river in low flows. Floodplains also help the river to improve water quality through trapping nutrient rich fine sediment on the floodplain rather than in channel and reduces the need for more interventional ongoing channel maintenance which provides carbon and cost savings. Floodplains also provide space for nature and support a wider range of habitats both terrestrially and aquatic, providing opportunities for fish and invertebrates to escape high flows and feeding opportunities.

This project aims were to showcase some of these benefits and deliver a reconnected floodplain that inundates frequently and at different flow events. To provide the river space and time to restart natural processes in a previously entrained reach that probably hasn't had that freedom in hundreds of years. To put back into the river the building blocks that rivers need to evolve, such as gravel supply, woody material and life. This then allows the river to restore itself and evolve over time providing a more stable environment for processes and life to take refuge from high flows. The works are aimed at redressing historic ecosystem loss but will benefit a variety of individual riverine species like native brown trout, white-clawed crayfish, water voles and otters as wells as terrestrial ecology improvements for reptiles, amphibians, wild flowers and pollinators and the wider landscape and wildlife corridors. Provide a demonstration site that landowners and colleagues can visit to showcase societal benefits that floodplain reconnection can bring without necessarily losing productive farmland.

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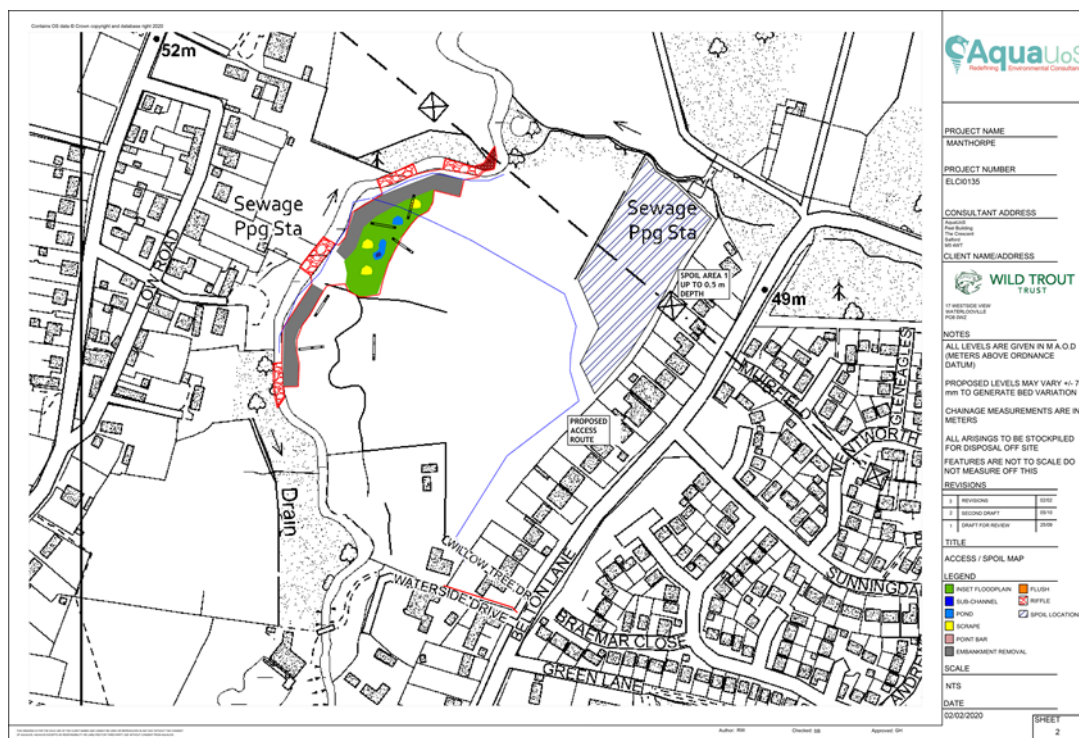


Fig 1. Before (Feb 2021). High water event and heavy rain had caused the Witham to come out of bank further downstream overtopping defences – at Manthorpe flood water didn't occupy the floodplain but instead the defences prevented surface water draining into the Witham



Fig 2. Post works – (Nov 2021). Flood embankments removed from floodplain and part of floodplain lowered by 30cm with ponds and scrapes added to increase habitat types. The floodplain is terraced with a lower more frequently inundated landscape close to the river and then gently rises up towards the valley sides which will inundate less frequently but in higher flood event magnitudes..

The Scheme and designs



There were five components to the scheme:

- Decommissioning the asset and handing over to landowner – see Manthorpe bank decommission 2018 document produced by Asset Performance. G:\FRM\07_Manage_Assets\05_Witham\S075 Grantham\01_General\01_Correspondence\Decommissioning Manthorpe Right Bank
- Removal of redundant flood bank, and lowering of the floodplain to create a terraced floodplain with a lower more frequently connected floodplain and a higher terrace of un-lowered floodplain. This gives maximum

benefit to the river and natural processes whilst providing some variation in flood event storage and habitat evolution and variety.

- Addition of riffles and gravel supply in the form of point bars and islands and splitting of channel into multiple threads creating a more natural form and allowing the river space to adjust to changes in flow but also allow natural processes like silt deposition, channel evolution, less intensive management, woody material to be retained in channel and on flood plain. The gravel raises the bed helping to connect the river into the floodplain reducing the amount of spoil generated to lower floodplain as well as providing rich habitats for riverine wildlife.
- Creation of floodplain ponds and terrestrial habitat features like habitat piles, stone piles for hibernacular, and woody material on the floodplain to encourage further hydraulic roughness in high flow events
- Spreading of spoil over the top of the valley sides outside of the floodplain, this was then reseeded with appropriate wildflower grassland mix and provides pollinator benefits.

The Outcome (also see the photos below)

4200 m3 of earth was removed from the floodplain during the lowering and removal of embankments. Reconnecting the floodplain has created 19,500m3 of space for water which now reconnects to the lower floodplain frequently after intense rainfall events at a 1 in 2 event magnitude. Brown trout have already been observed spawning on the new limestone gravels. Crayfish monitoring was carried out pre works and showed a very low baseline population with only 6 individuals caught, repeat monitoring of this will be carried out along with repeat bird surveys of the site.

Further Information

Contact the Fisheries, Biodiversity and Geomorphology Team, Lincs and Northants Area, Lincoln. Matt Parr Geomorphology Technical Specialist

Photos



Fig 3. The presence of the historic floodbanks are counter productive for land drainage and improvement. The floodbanks might protect floodplain from inundation from river but trap surface water run off behind the banks reducing drainage of land. The Witham is a ground water fed river which naturally has a high water table and despite considerable effort to drain this landscape through deepening of river and flood banks has not achieved aims of improving agricultural yields and has left the river unable to recover ecologically without significant intervention,



.Fig 4 – Pre restoration works aerial shot showing embankment in situ and hinged trees in channel.

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Fig 5. Post works showing channel widening, gravel riffle, island and point bars installed and multiple threaded channels installed with woody material secured in the river and on floodplain..



Fig 6. Modern historic land drains uncovered during floodplain lowering to try to drain and improve unsuitable heavy clay soils for agriculture.



Fig 7. Two stage floodplain with a lowered inset floodplain that will inundate more frequently and then the un lowered floodplain with grass still present to right of image. In places the floodplain was predominantly clay and scrapes were installed over the impermeable geology.



Fig 8. Floodplain ponds and scrapes added to create habitat diversity. Floodplain and top of valley where spoil was spread has been reseeded with native wildflower mixes to maximise benefits for pollinators and biodiversity.

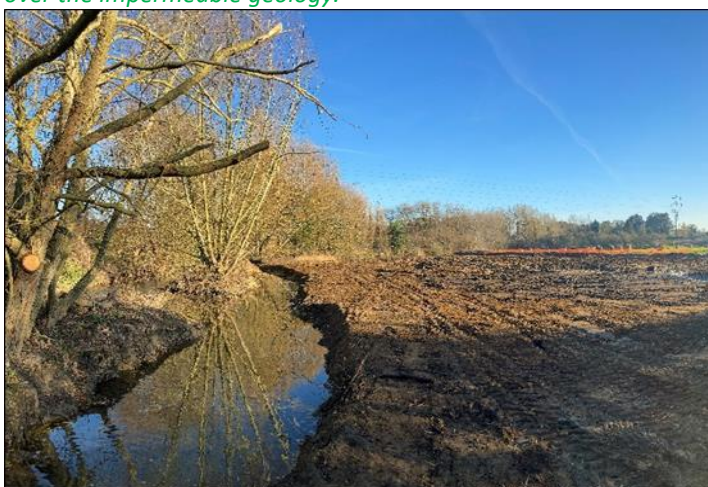


Fig 9. The newly restored multiple threaded channel. Low spots and ponds placed directly upstream of existing willow pollards. These trees if left unmaintained could then allow the river to evolve and change its shape providing new niches and habitats for life to colonise.



Fig 10 the multi team approach to river restoration, Analysis and Reporting carrying out crayfish surveys, Asset Performance assisting with landowner conversations, funded and assisted by Environment Programme, with FBG providing project support to Wild Trout Trust to deliver the works.

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Fig 11 The shows difference in height of historic embankment and of the newly lowered inset floodplain to illustrate what a well-connected floodplain should look like. ,



Fig 12 showing floodplain inundating and storing flood water after storm Franklin and Eunice.



Fig 13 River occupying floodplain note the absence of distinct flow pathways across the floodplain, the added roughness of woody and uneven floodplain slows the flow of water downstream and encourages fine sediment deposition whilst providing fish and invertebrates calm water to shelter from the higher flows in the channel.