Case study 11. Low Stanger Floodplain Reconnection Project

Author: Ian Creighton

Main driver: Flood alleviation

Project stage: Completed 2015

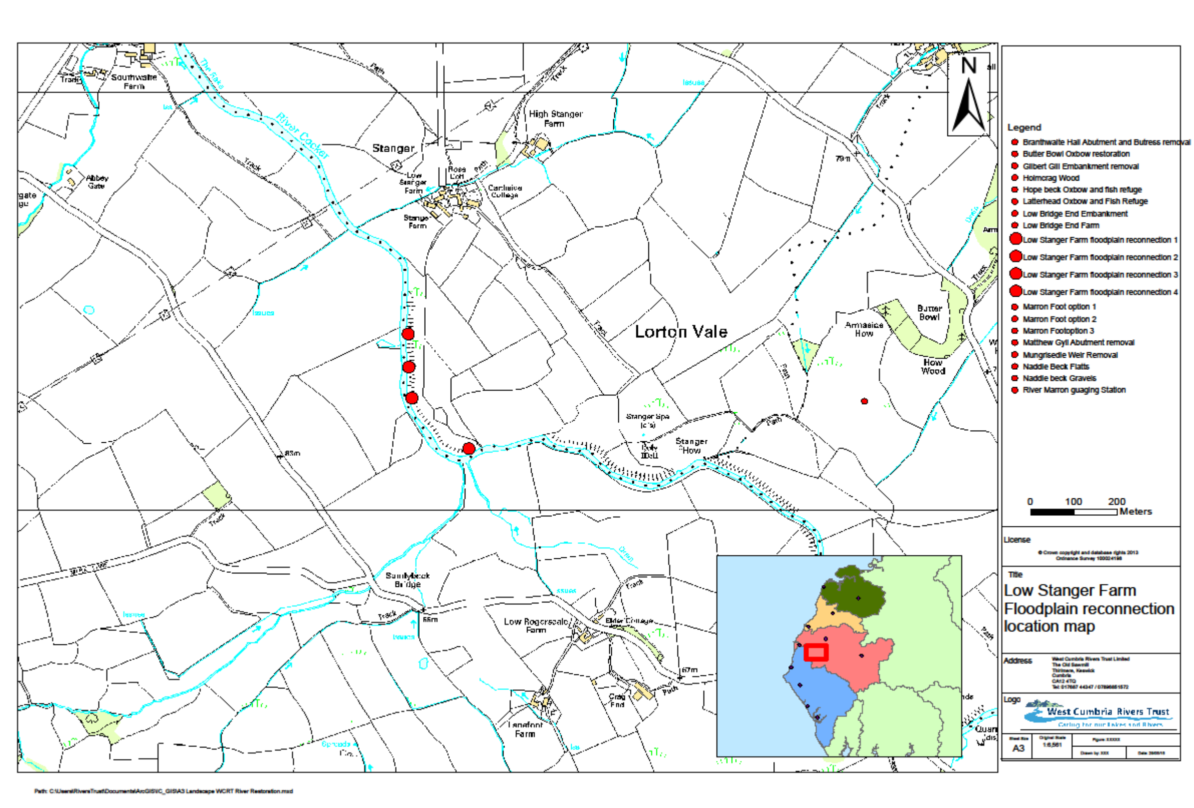
Photo 1: Downstream breach, Low Stranger Farm (source: West Cumbria Rivers Trust)

Project summary:

There have been significant flooding issues in the town of Cockermouth in recent years. A new flood defence scheme was constructed in 2014, which was overtopped by Storm Desmond in December 2015. There is no single solution and it will need multiple and varied solutions working with landowners to help flatten the flood peak in order to reduce future flood risk. At Low Stanger Farm (see Map 1), the existing flood embankment was breached along 4 sections to increase flood storage when the River Cocker is out of channel (Photo 1).

Key fact:

Survived Storm Desmond intact! An additional flood storage area of 5ha was created.



Map 1: Location of Low Stranger Farm (source: West Cumbria Rivers Trust)

1. Contact details

Contact details	
Name:	Ian Creighton
Lead organisation:	West Cumbria Rivers Trust
Partners:	Environment Agency and Natural England
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2. Location and catchment description

Catchment summary	
National Grid Reference:	NY 1365 2740
Town, County, Country:	Lorton, Cumbria, UK
Regional Flood and Coastal Committee (RFCC) region:	North West
Catchment name(s) and size (km^2):	Cocker catchment,: 148 km^2
River name(s) and typology:	River Cocker – spatey upland gravel river
Water Framework Directive water	GB112075070400

body reference:	
Land use, soil type, geology, mean annual rainfall:	Mixed upland farming (beef and sheep) Thin skeletal peat-based soils on the hills overlying igneous and Skiddaw slate bedrock. Brown earths and alluvial soils dominate the valley floors. Annual rainfall varies between approximately 40 inches in Cockermouth up to 140 inches on Great Gable in the headwaters.

3. Background summary of the catchment

Socioeconomic/historic context

Hundreds of homes and businesses are at risk of flooding in Cockermouth. Historically significant sections of the River Cocker have been diverted off its natural line and are either raised up off the valley floor and/or embanked to prevent and/or minimise flooding of the surrounding grazing land. Many of these changes pre-date the first Ordnance Survey maps in the 1860s.

Flood risk problem(s)

Significant flooding has occurred throughout Cockermouth's long history, but more recently in 2005, 2009 and 2015. Many houses have been inundated. The threat is not from the River Cocker alone: the Cocker's confluence with the River Derwent is in the middle of the town. A major flood protection scheme was completed in 2014, but unfortunately this was overtopped in December 2015. This confirmed that an engineering-based solution alone will not be sufficient to alleviate future flooding. A catchment-based approach is now seen as fundamental.

Other environmental problems

The canalisation and historic dredging of the River Cocker has meant that bed and marginal habitat variation is limited (uniform) and the bed is very mobile. This has a knock-on effect on spawning success (redd washout), juvenile survival (predation due to limited safe havens) and ultimately the number of returning mature adults.

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

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

Flood event mapping, LiDAR (light detection and ranging), topographical surveys and modelling have all been undertaken. Repeated large-scale flooding has convinced many people that engineering solutions alone will not suffice in our changing climate and that numerous and varied catchment-wide solutions are needed. To achieve this goal, however, will require the appropriate agricultural payments to be lined up so they do not cancel one another out and make good long-term business sense to landowners.

What was the design rationale?

The design sought simply to let the floodwater on and off the floodplain without significant erosion. Prior to the project, the embankment was breached during the biggest floods. This caused significant scour and gravel deposition on the hay and silage fields. To remove these deposits was not an insignificant (annual) cost as well as inconvenient (the land was wet so there was a limited opportunity to remove the material). The landowner wanted to keep sections of the old embankments for a number of reasons including its wildlife value (fenced off for many years) and the disturbance/cost of removing the material from site.

At the upstream end where the floodwater flows onto the floodplain with some force, the breach was 2.5 times the channel width so as to dissipate the energy – preventing scour and gravel deposition. The other breaches were not much more than the channel width since the floodwater behind the embankment acts as a hydraulic break preventing localised scour.

Existing hedges and a 'coppice' of blackthorn all help slow the flow across the floodplain. The land is permanent grazing or hay and silage, all of which help to protect the soil during large flood events.

Project summary	
Area of catchment (km^2) or length of river benefitting from the project:	500m of river 5ha of land
Types of measures/interventions used (Working with Natural Processes and traditional):	Flood embankment breaches to provide floodplain storage Hedges and coppice on floodplain to further slow the flood flow
Numbers of measures/interventions used (Working with Natural Processes and traditional):	2
Standard of protection for project as a whole:	100% working with natural processes
Estimated number of properties protected:	Not applicable

How effective has the project been?

The project has been very effective. Breaches were not fully vegetated following their construction in summer 2015, but despite Storm Desmond's best efforts there was no or only very localised scour. The floodwater drains rapidly off the land in line with the falling floodwaters. This project is very small in terms of the catchment scale and as a result has not been modelled.

5. Project construction

How were individual measures constructed?

The materials were removed mechanically in line with the calculated breach widths. The breaches were then compacted, top soil applied and seeded. Black thorn was planted in the upstream breach during the winter of 2015 to 2016.

How long were measures designed to last?

The breaches will become more permanent as stronger (wooded?) vegetation becomes established. This will be managed by the landowner.

Were there any landowner or legal requirements which needed consideration?

Projects are entirely voluntary, so the landowner needed to be fully on board before anything could happen. An agreement was then drawn up and signed before any work took place on the ground. The River Cocker is a designated site and Flood Drainage Consent was required.

6. Funding

Funding summary for Working with Natural Processes (WWNP)/Natural Flood Management (NFM) measures	
Year project was undertaken/completed:	2015
How was the project funded:	River Restoration Funding – funnelled through the Environment Agency and Natural England
Total cash cost of project (£):	£4,000
Overall cost and cost breakdown for WWNP/NFM measures (£):	£4,000 plus an annual payment through the landowners existing Higher Level Stewardship (HLS) agreement (amount unknown) No future maintenance cost Any management to be undertaken by owner (in his interest)
WWNP/NFM costs as a % of overall project costs:	100%
Unit breakdown of costs for WWNP/NFM measures:	Not applicable
Cost–benefit ratio (and timescale in years over which it has been estimated):	Not applicable

7. Wider benefits

What wider benefits has the project achieved?

Breaching the flood embankments has had the effect of reducing the energy through this section of the River Cocker during large flood events. This reduces bank erosion (diffuse pollution – nutrients and sediment) and bed scour/conveyance, which similarly reduces redd washout. Spending time with the landowner also had the benefit of further educating him on the benefits of soft engineering techniques in managing the river.

How much habitat has been created, improved or restored?

With this project, it was more of improving and securing what was already there. The landowner was already environmentally minded.

8. Maintenance, monitoring and adaptive management

Are maintenance activities planned?

The landowner is now much more versed in soft engineering techniques and the need for a 'stich in time'. He is happy to undertake appropriate maintenance if or when it is required.

Is the project being monitored?

Biannual site visits are being made and appropriate photographs taken. There is contact and/or inspections with the landowner following large flood events.

Has adaptive management been needed?

Not to date

9. Lessons learnt

What was learnt and how could it be applied elsewhere?

It is not always necessary or possible to remove all the flood embankments. How much and where is site-specific and needs careful thought in conjunction with the landowner and/or hydrologist. This leads to substantial savings and, in this case, all the gravels removed can and have been used elsewhere on the farm. Convincing the landowner of the attractiveness of this project was made easier because of the financial incentives that could be offered through his HLS agreement. Future liability is always an important issue. In this example, the landowner was happy that the advantages to him outweighed the risks.

10. Bibliography

Not applicable

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.