Case study 4. River Frome Rehabilitation Plan

Author: Alasdair Maxwell

Main driver: River restoration

Project stage: Construction phase (multi-site and year 2010 to 2020)

Photo 1: Lower Woodsford, River Frome, Dorset (source: Environment Agency)

Project summary:

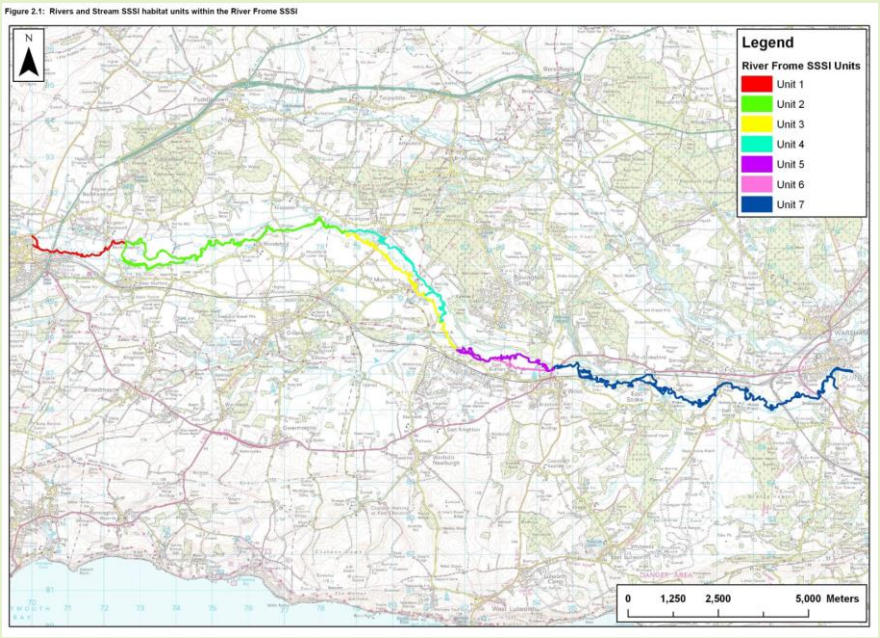
The River Frome is a chalk river of great value and is the most westerly example of a Chalk Stream in the UK. The nature conservation interest of the river is recognised nationally through its notification as a Site of Special Scientific Interest (SSSI), including approximately 50km of main river channel and small areas of associated floodplain and wetland habitat between Dorchester and Wareham (Map 1).

The Frome SSSI is in unfavourable ecological condition and the River Frome Rehabilitation Plan was produced in 2010 by the Environment Agency and Natural England as a strategic attempt to move the River Frome SSSI to favourable condition and work towards achieving good ecological status under the Water Framework Directive. The Frome Rehabilitation Plan aims to improve the geomorphological form and function of the river and its floodplain to support the habitats and species expected. This is to be achieved by removing barriers to natural processes occurring and restoring form and function to those reaches affected by historic management.

This project is principally a catchment-scale river restoration strategy but some of the individual measures put in place can also be considered as delivering Natural Flood Management (NFM) benefits as they are principally Working with Natural Processes (WWNP) creating a more naturally connected and functioning river and floodplain.

Key facts:

Projects reconnecting river and floodplain have assumed but small flood risk benefits. The accumulative benefit if multiple projects are implemented is where more measureable flood risk benefits are observed by communities. It is considered not cost-effective to perform effective modelling (other than that stated in the Lower Woodsford project), as the River Frome Rehabilitation Plan is principally for river restoration and habitat enhancement.



Map 1: River Frome SSSI, Dorchester to Wareham, Dorset

1. Contact details

Contact details	
Names:	Alasdair Maxwell, Helen Powell, Jacob Dew
Lead organisations:	Environment Agency Natural England
Partners:	Dorset Wildlife Trust Frome, Piddle and West Dorset Fishery Association
e-mail address:	Alasdair.maxwell@environment-agency.gov.uk

2. Location and catchment description

Catchment summary	
National Grid Reference:	SY700908 - SY927871
Town, County, Country:	Dorchester and Wareham, Dorset, UK
Regional Flood and Coastal Committee (RFCC) region:	Wessex
Catchment name(s) and size (km^2):	Frome, 109km^2
River name(s) and typology:	River Frome, active meandering
Water Framework Directive water body reference:	GB108044009690
Land use, soil type, geology, mean annual rainfall:	Mixed arable and pasture Deep loamy or sandy clays, shallow silts and clays, and

	loams over chalk, predominantly chalk in upper reaches with sand, gravels and clays, 800-900mm mean annual rainfall

3. Background summary of the catchment

Socioeconomic/historic context

The River Frome and its floodplain have been historically managed and modified for centuries. This has included using the river and floodplain for milling, water meadows, land drainage (for agriculture) and flood defence/risk management.

Flood risk problem(s)

Both fluvial and groundwater flooding occurs on the Frome. Despite being a partly groundwater-fed chalk river, it can also respond in a more flashy nature to heavy rainfall events, especially when groundwater is high. Between Dorchester and Wareham, the numbers of properties at risk of flooding are relatively low (except in Dorchester itself) but there are a number of small communities, isolated properties and road infrastructure that are at risk.

Other environmental problems

Historic activities such as milling and water meadows and river dredging for land drainage have:

- disconnected the river and floodplain (by lowering the bed and raising embankments)
- trapped sediment within the river channel
- reduced the ability for fish to migrate
- disconnected river habitats

Land drainage and the disconnection of floodplains have reduced the extent and quality of wetland habitats.

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

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

Not applicable

What was the design rationale?

The aim was to provide a flexible and sustainable river and floodplain design to reconnect the river and floodplain through targeted removal of existing raised embankments, structures and in-channel works.

Project summary	
Area of catchment (km^2) or length of river benefitting from the project:	19km of direct improvement 50km of the SSSI will receive overall improvement
Types of measures/interventions used (WWNP and traditional):	River restoration, embankment removal/lowering, structure removal, educed in-channel vegetation management, arable reversion
Numbers of measures/interventions	

used (WWNP and traditional):	
Standard of protection for project as a whole:	There has been no significant improvement in the standard of protection due to this project, but no detriment either.
Estimated number of properties protected:	No estimate of properties protected has been produced for any projects within the Frome strategy.

How effective has the project been?

The catchment-wide strategy has identified a range of projects to contribute to SSSI favourable condition and to work towards good ecological status under the Water Framework Directive. The projects also seek to deliver multiple benefits such as improved fishing access and reduced flood risk.

The most important projects delivered so far that can also be considered as NFM/WWNP are:

- **Woodsford Channel**: approximately 2km of river channel improved with reprofiled banks, allowing improved river and floodplain connection. Large woody debris introduced to create diverse flow patterns and redistribute river gravels to create diverse habitats and also help slow down bankfull flows.
- **Martins River Island**: removal of 300m of raised embankment and replacing 2,000 tonnes of removed river gravels allowing natural river and floodplain connection.
- **Lower Woodsford**: removal of 300m of raised embankment, bed raising of 600m of deep drainage ditches, creation of 600m of floodplain channels and planting of 20,000 trees within 15ha of arable reversion floodplain. Embankment removal has been modelled to show inundation area and depth change in the floodplain and to show the impact of mature floodplain woodland on floodplain flow and depth.

5. Project construction

How were individual measures constructed?

In most cases the measures were constructed by an Environment Agency Field Services team using heavy plant machinery.

How long were measures designed to last?

Not applicable

Were there any landowner or legal requirements which needed consideration?

Each project delivered within the strategy has required extensive negotiations and sign-up by landowner, tenant and fishing clubs before work could begin.

6. Funding

Funding summary for Working with Natural Processes (WWNP)/Natural Flood Management (NFM) measures	
Year project was undertaken/completed:	2010 to 2021
How was the project funded:	Wessex Flood Defence Grant-in-Aid
Total cash cost of project (£):	£850,000

Overall cost and cost breakdown for WWNP/NFM measures (£):	Most of the NFM related projects have been delivered by an Environment Agency Field Services team. Costs for individual activities are not usually broken down. A cost estimate is given based on the expected duration of the overall project and therefore it is difficult to cost for individual activities.
WWNP/NFM costs as a % of overall project costs:	Not able to complete
Unit breakdown of costs for WWNP/NFM measures:	Not able to complete
Cost–benefit ratio (and timescale in years over which it has been estimated):	Not able to complete

7. Wider benefits

What wider benefits has the project achieved?

Reconnecting the river and floodplain could contribute to managing the diffuse pollution (sediment, phosphate and nitrogen) issue from which the Frome also suffers, allowing floodplains to be inundated and the silt load to accumulate on the fields. This is predominantly related to arable land use further up in the catchment and outside the SSSI. This could also help contribute to improving the particle size analysis (PSA) status of Poole Harbour into which the Frome flows.

Reconnecting rivers and floodplain could also help to create new wetland habitats such as wet woodland and fen, or improve existing ones.

How much habitat has been created, improved or restored?

- 15ha of floodplain woodland (including 3ha open space and 20,000 trees) created in the Lower Woodsford Project
- 7.5km of improved chalk river habitat up to 2016
- 11.5km of chalk river to be improved between 2017 and 2021
- 10ha of wetland habitat to be created by 2021

8. Maintenance, monitoring and adaptive management

Are maintenance activities planned?

Most river restoration projects require minimal maintenance and management. Fishing clubs will generally take on most management requirements. The landowner at Lower Woodsford will need to manage the trees (as part of their Forestry Commission grant) for 5 years to ensure establishment.

Is the project being monitored?

Fixed point photography is the main monitoring approach, although Natural England will be conducting river habitat surveys at agreed times to determine the relative favourable condition of the SSSI.

Biotope mapping has been carried out as a baseline at Lower Woodsford to enable future repeat surveys to show any geomorphological improvement.

Has adaptive management been needed?

None required

9. Lessons learnt

What was learnt and how could it be applied elsewhere?

River restoration projects generally need to be bold to ensure benefits are long-lasting. Large woody debris needs to be robust to flood events and long-lasting to maintain the effects.

Landowners and managers need to be made fully aware of the direct and indirect consequences of implementing projects, especially those reconnecting floodplains. Downstream or adjacent landowners may also need to be consulted as flood flows are likely to cross land boundaries.

So long as flood risk to property or infrastructure is low, available budget should be directed towards greater delivery and a lighter touch appraisal and design.

The modelling performed for the Lower Woodsford Project could be used as an example in other projects, reducing the requirement for repeat modelling elsewhere.

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.